Validation report form for CDM project activities

(Version 01.0)

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

VALIDATION REPORT	
Title of the project activity	Clinker Optimization in cement types production at Derba MIDROC cement plant
Version number of the validation report	Version 1.0
Completion date of the validation report	28th January 2016
Version number of PDD to which this report applies	Version 2.0 dated 8th January 2016
Date when PDD was uploaded for global stakeholder consultation	28th October 2015
Project participant(s)	1. Derba MIDROC Cement PLC 2. Ethan Bio-Fuels PLC
Host Party	Federal Democratic Republic of Ethiopia
Estimated annual average GHG emission reductions or net removals in the crediting period (tCO2e)	329,091 tCO2e per year
Sectoral scope(s) and selected methodology(ies)	Scope 04; Manufacturing Industries, Methodology : Approved consolidated baseline and monitoring methodology ACM0005 Version 07.1.0; "Increasing the blend in cement production"
Name of DOE	EPIC Sustainability Services Private Limited (ESSPL/CDM/2015/047)
Name, position and signature of the approver of the validation report	R. Vijayaraghavan Lead Auditor R. Vijayaraghavan K. Sudheendra Head of Operations and Director [signature]

SECTION A. Executive summary

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Derba MIDROC Cement Private Limited Company (hereinafter referred to as Derba) and Ethan biofuels Private Limited Company (hereinafter referred to as EBF) had together engaged EPIC Sustainability Services Private Limited (hereinafter referred to as EPIC) to perform validation of the "Clinker Optimization in cement types production at Derba MIDROC cement plant" (hereinafter called "the project activity"). Derba MIDROC Cement PLC is executing the 5600 tpd clinkerization (7000 tpd cement) production plant at Derba 70 km from Addis Ababa which is the largest and state-of-the-art cement production plant in the country. Both Derba and EBF are acting as project participants (both parties are collectively referred to as PPs) for this CDM project activity.

The project activity produces Portland Pozzolana Cement (hereinafter referred to as PPC), Portland Limestone Cement (hereinafter referred to as PLC) and Pozzalonic Cement (hereinafter PC) respectively meeting the requirements of Ethiopian National Standard EN 1177-1: 2005 (CES 28:2013). Anthracite coal is used in the kiln. Among the major raw materials required for cement production, limestone, clay, basalt, sandstone, and gypsum are abundantly available in the Derba-Muger Valley. As it was observed from the preliminary geological survey of the raw materials study, that the deposit of the above materials is much more than enough for the whole plant life for the 5,600 tpd clinker production capacity. Since, pumice, the raw material, required for production of PPC cement, is not available in Derba-Muger valley, this material has to be transported by trucks from Nazareth or Zeway area. The power requirement of the plant is estimated to 45 MVA. Power to the plant will be conveyed through a 132kV transmission line up to a substation at the boundary of the plant, then stepped down and distributed to the different user departments.

The main purpose of the project activity is to implement increased use of share of additives thereby reducing the share of clinker than its corresponding benchmark towards production of different blended cement types such as Portland Pozzolana Cement, Portland Limestone Cement and Pozzalonic Cement respectively. The reduced share of clinker is directly linked to the emission reduction to be achieved by the project activity.

This report summarizes the findings of the validation of the project, performed on the basis of UNFCCC criteria for CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to the Kyoto Protocol, the CDM rules and modalities as agreed in the Bonn Agreement, the Marrakech Accords and the CDM Executive Board's decisions. The validation team has employed a risk-based approach in the validation based on the recommendations in the Validation and Verification Standard version 9.0 (VVS[/1/]), Project Standard[/1/] version 9.0 and Project Cycle Procedure[/1/] version 9.0, focusing on the identification of significant risks for project implementation and the generation of CERs. The project (UNFCCC no: 7632) under the same PP and same methodology has been rejected by EB once.

The purpose of a validation is to have an independent third party assessment of the project design, applicability of the project under the methodology ACM0005 "Increasing the blend in cement production"[/2/] version 07.1.0, baseline of the project, additionality, monitoring plan, emission reduction calculation etc. and the project's compliance with relevant UNFCCC and host country criteria. The validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

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 review	On-site inspection	Interview(s)	Validation findings
1.	Lead Auditor	IR	Radhamadhavan	Vijayaraghavan	EPIC	√	√	√	√
2.	Technical Expert	ER	Belaye	Gebeyaw Workie	EPIC		√	√	

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

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	Anbalagan	Prabu Das	EPIC
2.	Technical expert independent of the validation team	ER	Seshan	Ranganathan	EPIC
3.	Approver	IR	Krishnachar	Sudheendra	EPIC

SECTION C. Means of validation

C.1. Desk review

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As a first step, the validation team has reviewed the PDD version 1.0/3/ and additional background documents submitted by the project participant. Based on the review, the validation team has issued corrective action requests/ clarification requests. As a result of these findings, the PP has revised the PDD version 2.0/3/ (hereinafter referred to as final PDD). The resolution of the findings by the validation is presented in Appendix 4 of this report.

C.2. On-site inspection

Duration of on-site inspection: 08/12/2015 to 09/12/2015				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	• General information about the project. • Serious consideration of CDM. • Chronology of Events/ Implementation cycle of the project activity. • Barriers faced/overcome in the processes (additionality) • Local Stakeholder consultation processes • Legal/ Statutory Clearances and Agreements Signed • Baseline determination • Application of appropriate Methodology • Operation and maintenance Procedures • Technical details of project • Data monitoring and storage practices • Calibration and maintenance requirement of the equipment • Monitoring Methodology	Project site	08/12/2015 to 09/12/2015	Full team

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Kebede	Tadesse	Project Director, Derba	As above	As above	Full team
2.	Alemayehu	Daniel	Factory Manager, Derba	As above	As above	Full team
3.	Amenu	Mulugeta	Environment Manager, Derba	As above	As above	Full team
4.	Admassie	Ambachew Fekadeneh	Chairman, Ethan Biofuels PLC	As above	As above	Full team
5.	Fiseha	Henok	Derba city (Local stakeholder)	As above	As above	Full team
6.	Girma	Legesse	Derba city (Local stakeholder)	As above	As above	Full team

C.4. Sampling approach

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No sampling approach is used for this validation scope by the validation team.

C.5. Clarification requests, corrective action requests and forward action requests raised

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Global stakeholder consultation	-	-	-
Approval	-	-	-
Authorization	-	-	-
Contribution to sustainable development	-	-	-
Modalities of communication	-	-	-
Project design document	-	-	-
Description of project activity	-	CAR 1, CAR 2, CAR 3 and CAR 5	-
Application of selected baseline and monitoring methodology and selected standardized baseline			
- Applicability of methodology and standardized baseline	-	-	-
- Deviation from methodology	-	-	-
- Clarification on applicability of methodology, tool and/or standardized baseline	-	-	-
- Project boundary	-	-	-
- Establishment and description of baseline scenario	CL 1, CL 2 and CL 3	CAR 4	-
- Demonstration of additionality	-	CAR 6, CAR 7, CAR 8, CAR 9, CAR 10 and CAR 11	-
- Emission reductions	-	CAR 12	FAR 1, FAR 2 and FAR 3
- Monitoring plan	-	CAR 13 and CAR 14	-
Duration and crediting period	-	-	-
Environmental impacts	-	-	-
Local stakeholder consultation	-	-	-
Others (please specify)	-	-	-
Total	3	14	3

SECTION D. Validation findings

D.1. Global stakeholder consultation

Means of validation	As per the paragraph 31 to 40 of VVS[/1/] version 9.0, the validation team has determined whether authentic and relevant comments in the global stakeholder consultation were taken into due account in the PDD of the proposed CDM project activity.
Findings	No CAR was raised in this section
Conclusion	EPIC has made the version 1.0 of the PDD[/3/] publicly available for 30 days for global stakeholder comments on 28th October 2015 through its dedicated interface on the UNFCCC CDM website[/3/] before undertaking the site visit on 8th and 9th December 2015. The validation team has confirmed that there was no comment received during this period.

D.2. Approval

Means of validation	As per the paragraph 43 to 48 of VVS version 9.0, the validation team has determined whether (DNA) of each Party indicated as being involved in the proposed CDM project activity has provided a written letter of approval.
Findings	No CAR is raised in this section.
Conclusion	The Environmental Protection Authority, Ethiopia (Designated National Authority) has issued the letter of approval (LoA[/4/]) (Reference No. 12/9.1/747) to the project activity dated 18th December 2012. The authenticity of the copy of the LoA provided by PP was verified by checking it against the original copy. The LoA confirmed the following: • Ethiopia is a party to the Kyoto Protocol • Participation of PPs in the proposed project activity is voluntary in nature. • The project under validation will assist in sustainable development in Ethiopia. • The project title is in line with the title mentioned in the PDD, Further, the participation requirements were validated based on confirmation of the following: • Derba MIDROC Cement Private Limited Company and Ethan Bio-Fuels Private Limited Company are the only PPs • The project participants listed in the tabular form in Section A.4 of PDD and the contact details provided in Annex 1 of the PDD is consistent and precise. • Participation of the PPs has been approved by the DNA, as confirmed in the letter of approval. • No entities other than those approved as project participants are included in relevant sections of PDD. • The LoA does not contain any conditional clause as regards to the above elements and it also does not refer to any specific version of the validation report. • The LoA has been verified to be unconditional with respect to all the above confirmed aspects.

D.3. Authorization

Means of validation	As per the paragraph 51 to 55 of VVS[/1/] version 9.0, the validation team has determined whether each project participant of the proposed CDM project activity or PoA has been authorized by at least one Party involved in a letter of approval.
Findings	No CAR is raised in this section.
Conclusion	Refer section D.2.

D.4. Contribution to sustainable development

Means of validation	As per the paragraph 57 of VVS[/1/] version 9.0, the validation team has determined whether DNA has considered whether the proposed CDM project activity assists the host Party in achieving sustainable development.
Findings	No CAR is raised in this section.

Conclusion	Refer section D.2.

D.5. Modalities of communication

Means of validation	As per the paragraph 60 to 64 and 66 to 67 of VVS[/1/] version 9.0, the validation team has checked the corporate identity of all PPs, and focal points included in the MoC statement, as well as the personal identities, including specimen signatures and employment status, of their authorized signatories and has checked that the MoC statement has been correctly completed and duly authorized.
Findings	No CAR is raised in this section.
Conclusion	A statement of Modalities of Communication (MOC[/5/]) with the EB and UNFCCC secretariat had been provided to the validation team. The validation confirmed that the authorized signatory of PP has signed the MOC form and Annex 1 of MOC form and further found that name of the authorized signatory is included in Annex 1 of PDD. The MOC is found to be appropriate as it clearly defined the responsible party for communicating with EB and UNFCCC regarding the issuance of CER of the proposed CDM project and applies the latest version of the form (CDM-MOC-FORM[/5/] - Modalities of communication statement) (version 2.3). All sections of the MOC are verified and found to be filled in accordance with the latest and active version of "Guidelines for completing the MoC form"[/5/] version 2.3.

D.6. Project design document

Means of validation	As per paragraph 69 of VVS[/1/] version 9.0, the validation team has determined whether the PDD was completed using the valid version of the PDD form appropriate to the type of the proposed CDM project activity.
Findings	No CAR was raised in this section.
Conclusion	The project design document uses the latest version of the template CDM-PDD (CDM-PDD-FORM[/6/] version 6.0) which is currently applicable and hence acceptable. All sections of the PDD are verified and found to be filled in accordance with the instructions provided in the PDD template.

D.7. Description of project activity

Means of validation	As per paragraph 71 to 76 of VVS[/1/] version 9.0, the validation team has determined whether the description of the proposed CDM project activity in the PDD is accurate, complete, and provides an understanding of the proposed CDM project activity.
Findings	Four CARs (CAR 1, CAR 2, CAR 3 and CAR 5) are raised in this section.
Conclusion	By reviewing the feasibility report[/7/], Mining Licence[/8/], Process flow diagrams[/9/], provisional acceptance certificate[/10/], the validation team has confirmed correctness and accuracy of site location, project design, installed capacities of the major equipments, processes, power requirements and relevant cement types produced by the project activity.

D.8. Application of selected baseline and monitoring methodology and selected standardized baseline

D.8.1. Applicability of methodology and standardized baseline

Means of validation	As per paragraph 78 to 85 of VVS[/1/] version 9.0, the validation has determined whether the baseline and monitoring methodology[/2/] (ACM0005 version 7.1.0) selected by the PPs are the valid versions of those approved by the EB and has checked that the selected baseline and monitoring methodology is applicable to the proposed CDM project activity and that the selected version is valid at the time of submission of the proposed CDM project activity for registration.
Findings	No CAR is raised in this section.
Conclusion	The validation has confirmed that applicable version of methodology[/2/] (ACM0005 version 7.1.0) is valid and project activity satisfies all the applicable conditions of the applied methodology. Refer Appendix 5 of this report for more details.

D.8.2. Deviation from methodology

Means of validation	As per paragraph 87 of VVS[/1/] version 9.0, the validation has determined whether

	the PP deviated from the approved baseline and monitoring methodology and/or methodological tool.
Findings	No CAR is raised in this section.
Conclusion	There is no deviation from the applied methodology.

D.8.3. Clarification on applicability of methodology, tool and/or standardized baseline

Means of validation	As per paragraph 90 of VVS[/1/] version 9.0, the validation team has determined to ensure that the request is not submitted with the intention of revising an approved methodology, an approved tool and/or an approved standardized baseline to expand its applicability.
Findings	No CAR is raised in this section.
Conclusion	There is no such request.

D.8.4. Project boundary

Means of validation	As per paragraph 91 to 94 of VVS[/1/] version 9.0, the validation team has determined whether all main GHG emission sources, the physical delineation of the proposed CDM project activity and other relevant project and baseline emission sources covered in the selected methodology and, where applicable, the selected standardized baseline are included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.
Findings	No CAR is raised in this section.
Conclusion	All main GHG emission sources, the physical delineation of the proposed CDM project activity and other relevant project and baseline emission sources covered in the selected methodology and, where applicable, the selected standardized baseline are included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity. The project boundary includes cement production plant, Diesel power plant of 1701 kW capacity (emergency purpose) and national grid (interconnected system). PP has also identified that for the GHG emissions that will take place in the project activity (project emission) includes 1) Emissions due to calcination of raw materials such as limestone in the clinker kiln and 2) Emissions due to combustion of coal in the kiln 3) Emissions due to DG set and indirect emission from plants connected to the grid supplying the plant with electricity for feeding system, preparation of materials, and driving kiln and for additives preparation and grinding of cement. This emission is accounted for in the project emissions calculations presented in section B.6.1 of the PDD which is validated as per this report. The source and approach of GHG project emissions and approach of project emissions is accepted by the validation team as it is line with applied methodology. Similarly, for the GHG baseline emissions in the project activity, PP has considered 1) CO_2 emissions due to calcination of raw materials such as limestone, clay, basalt, sandstone and gypsum in the clinker kiln and 2) CO_2 emissions due to use of coal in the kiln & burners 3) CO2 emissions due to DG set and indirect emission from plants connected to the grid supplying the plant with electricity for feeding system, preparation of materials, and driving kiln and for crushing and grinding additives and grinding cement. This emission is accounted for in the baseline emissions calculations presented in section B.6.1 of the PDD which is validated as per this report. The consideration of only CO_2 gas for the baseline emissions is conservative and is in line with the methodology and hence acceptable. PP has also considered 1) emissions related to transportation of additives and 2) emissions due to diversion of additives from existing uses. The source of GHG emissions and approach of project emissions is accepted by the validation team as it is line with applied methodology. This emission is accounted for in the leakage emissions calculations presented in section B.6.1 of the PDD which is validated as per this report.

D.8.5. Establishment and description of baseline scenario

Means of validation	As per paragraph 97 to 104 of VVS[1] version 9.0, the validation team has determined whether the baseline identified for the proposed CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the project activity and determined whether any procedure contained in the methodology to identify the most reasonable baseline scenario has been correctly applied.
Findings	One CAR and Three CLs (CAR 4, CL1, CL 2 and CL 3) is raised in this section.
Conclusion	Refer Appendix 6 of this report for more details.

D.8.6. Demonstration of additionality

Means of validation	As per paragraph 108 to 111, 113 to 119, 121 to 124, 126 to 131,133 to 135 and 137 to 138 of VVS[1] version 9.0, the validation team has determined whether the proposed CDM project activity is additional as demonstrated in the PDD; determined whether CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity; assessed the list of identified credible alternatives to the proposed CDM project activity in the PDD selected to determine the most realistic baseline scenario; if barrier analysis was used to demonstrate the additionality of the proposed CDM project activity, the validation team has determined whether the proposed CDM project activity faces barriers that prevent the implementation of this type of proposed CDM project activity or that do not prevent the implementation of at least one of the alternatives; For proposed large-scale CDM project activities, unless the proposed project type is a first of its kind as determined in accordance with the relevant guidelines, the validation team has assessed whether the project participants have conducted a common practice analysis. The validation team has determined whether CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity.
Findings	Six CARs (CAR 6, CAR 7, CAR 8, CAR 9, CAR 10 and CAR 11) are raised in this section.
Conclusion	Refer Appendix 6 of this report for more details. Refer Appendix 7 for prior consideration aspects.

D.8.7. Emission reductions

Means of validation	As per paragraph 140 to 144 of VVS[1] version 9.0, the validation team has determined whether the steps taken and the equations and parameters applied in the PDD to calculate project emissions, baseline emissions, leakage and emission reductions comply with the requirements of the selected methodology including applicable tools and the "Standard for sampling and surveys for CDM project activities and programme of activities"[11] version 5.0
Findings	One CAR and Three FARs (CAR 12, FAR 1, FAR 2 and FAR 3) are raised in this section.
Conclusion	Refer Appendix 8 of this report for more details.

D.8.8. Monitoring plan

Means of validation	As per paragraph 146 to 149 of VVS[1] version 9.0, the validation team has determined whether the description of the monitoring plan included in the PDD complies with the approved monitoring methodology including applicable tools and, where applicable, the "Standard for sampling and surveys for CDM project activities and programme of activities" version 5.0; confirmed whether the PPs have chosen to delay the submission of the monitoring plan for the proposed CDM project activity.
Findings	Two CARs (CAR 13 and CAR 14) are raised in this section.
Conclusion	Refer Appendix 8 of this report for more details. PP has not chosen to delay the submission of the monitoring plan for the proposed CDM project activity.

D.9. Duration and crediting period

Means of validation	As per paragraph 146 to 149 of VVS[1] version 9.0, the validation team has determined whether the PPs defined the Start date of the proposed CDM project

	activity, expected operational lifetime; type and duration of the crediting period and start date of the crediting period of the proposed CDM project activity in accordance with relevant requirements in the Project standard.
Findings	No CAR is raised in this section.
Conclusion	The validation team has reviewed the EPC[/12/] signed between CNBM and the PP. Since EPC is signed on turnkey basis and design and project cost was not decided at that time and the design was to be finalised only after financial commitment from the PP, signing of EPC is not taken as start date. Date of equity disbursement to EPC contractor was 14th August 2009 (Start date). The validation team has reviewed the evidence of equity disbursement to the EPC contractor and hence project has reached the point of no return. This is hence accepted as start date of the project activity. The validation team has reviewed the letter[/13/] from design consultant and contractor dated 28th September 2012 and accepted 20 years as life time for the project activity. The type and duration of crediting period (Fixed & 10 years) considered in line with the requirements of first of its kind criteria, hence accepted. PP has fixed the start date of the crediting period considering that the crediting period starts on 29th Jan 2016 or on the effective date of registration of the project activity (whichever is the latest) as a CDM project activity.

D.10. Environmental impacts

Means of validation	As per paragraph 157 to 159 of VVS[/1/] version 9.0, the validation team has determined whether the PPs conducted an analysis of the environmental impacts of the proposed CDM project activity including transboundary impacts, and whether those impacts are considered significant by them.
Findings	No CAR is raised in this section.
Conclusion	The Environmental Impact Assessment[/14/] (EIA) of the proposed project was carried out in accordance with the host country's legislation. The validation team has reviewed the EIA prepared by Holtec Consulting Pvt Ltd dated December 2007 which is carried out within the legal frame work of local and national environmental standards. The potential environmental impacts on Air, noise, waste water, water and solid waste, etc. have been sufficiently identified in the report and the same is documented in the PDD. The same was approved[/14/] by Environmental Protection Authority on 21st October 2008.

D.11. Local stakeholder consultation

Means of validation	As per the paragraph 161 to 165 of VVS[/1/] version 9.0, the validation team has determined whether the PPs completed a local stakeholder consultation process and that due steps were taken to engage stakeholders and solicit comments for the proposed CDM project activity.
Findings	No CAR is raised in this section.
Conclusion	Project consultant Holtec Consulting Private Limited has facilitated a detailed local stakeholder consultation under the requirement of Ethiopian Law for the Greenfield plant. A detailed comprehensive stakeholder consultation was carried out through various meeting conducted in the month of August 2007. The validation team has reviewed the local stakeholder consultation report[/15/]. The stake holders identified in include Federal Environment Protection Authority, Regional Environment Protection Authority, Ministry of Water Resources, Ministry of Agriculture, Ministry of Mines, Oromiya Regional Government and Wereda Administrative Offices. The local stakeholder agenda includes the following design parameters, Education & Health programmes, Minimising air & water pollution, Generation of employment, Community development fund and CDM aspects. The comments are adequately answered to the stakeholders hence accepted by the validation team. PP has also completed the local stakeholder consultation process before the start date of the project activity (14th August 2009) and has submitted the PDD to the previous DOE for validation (29th Dec 2011-Start date of the validation). The project was first webhosted[/16/] on 29th Dec 2011 and the request for registration[/16/] (UNFCCC: 7632) was rejected by the EB. Hence the validation team has concluded that PPs completed a local stakeholder consultation process in line with paragraph 161 to 165 of VVS version 9.0.

SECTION E. Internal quality control

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After the completion of assessment by the validation team all the relevant documentation is submitted to a qualified, Independent Technical reviewer as part of EPIC' internal quality control system. A Technical reviewer team is appointed to review the draft final validation report (Draft FVR). The comments made by the Technical reviewer team are taken into consideration and incorporated in the final FVR. The technical reviewer team assesses whether all the reporting requirements have been fulfilled and whether all the issues raised were closed satisfactorily by the validation team with justification. The technical review process can also raise issues in this regard which is resolved further by the validation team to the satisfaction of the technical reviewer. The technical reviewer team either accepts or rejects the report made by the validation team. The final report (after resolutions of all findings) is then submitted to the Head-operations for review and approval.

SECTION F. Validation opinion

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Derba MIDROC Cement PLC and Ethan biofuels had jointly engaged EPIC Sustainability Services Private Limited to perform validation of the "Clinker Optimization in cement types production at Derba MIDROC cement plant" The main purpose of the project activity is to implement increased use of share of additives thereby reducing the share of clinker than its corresponding benchmark towards production of different blended cement types such as Portland Pozzolana Cement, Portland Limestone Cement and Pozzalonic Cement respectively. The reduced share of clinker is directly linked to the emission reduction to be achieved by the project activity.

This report summarizes the findings of the validation of the project, performed on the basis of UNFCCC criteria for CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to the Kyoto Protocol, the CDM rules and modalities as agreed in the Bonn Agreement, the Marrakech Accords and the CDM Executive Board's decisions.

The purpose of a validation is to have an independent third party assessment of the project design, applicability of the project under the methodology ACM5 version 07.1.0, baseline of the project, additionality, monitoring plan, emission reduction calculation etc and the project's compliance with relevant UNFCCC and host country criteria. The validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs). The validation team has employed a risk-based approach in the validation based on the recommendations in the Validation and Verification Standard version 9.0 (VVS[/1/]), focusing on the identification of significant risks for project implementation and the generation of CERs.

In summary, it is opinion of EPIC that the project titled "Clinker Optimization in cement types production at Derba MIDROC cement plant" as described in as described in the final PDD meets all relevant UNFCCC requirements for the CDM is eligible as large scale CDM project activities and correctly applies the respective baseline and monitoring methodologies. As such, EPIC recommends the registration of the project as a CDM project activity.

Project title:	Clinker Optimization in cement types production at Derba MIDROC cement plant
PDD	Version 2.0, dated 8th January 2016
Sector and applied methodology	Sector: 4. Manufacturing industries ACM0005 version 7.1.0 - Increasing the blend in cement production Methane recovery in wastewater treatment
Estimated annual CER	329,091 tCO2e

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology
BC	Blended Cement
BSL	Baseline year
CCR	Central Control Room
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CNBM	China National Building Material Company Limited
DG	Diesel Generator
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPC	Engineering Procurement and Commissioning
ER	External Resources
FOIK	First of its Kind
GEF	Global Environment Facility
GHG	Green House Gas
IPCC	Intergovernmental Panel on Climate Change
IR	Internal Resources
LDC	Least Developed Country
MoC	Modalities of Communication
MVA	Mega Voltage Ampere
NCV	Net Calorific Value
NDA	Non-Disclosure Agreement
OPC	Ordinary Portland Cement
PAC	Provisional acceptance Certificate
PC	Pozzalonic Cement
PCP	Project Cycle Procedure
PDD	Project Design Document
PLC	Private Limited Company
PLC	Portland Limestone Cement
PPC	Portland Pozzolana Cement
TEFR	Technical Economic Feasibility Report
tpd	Tonnes per day
UNFCCC	United Nations Convention on Climate Change
VVS	Validation and Verification Standard
XRF	X-Ray Fluorescence

Appendix 2. Competence of team members and technical reviewers

The following validation team has been assigned to carry out the validation of the project.

Name	**Mr. R. Vijayaraghavan**	**Mr. Gebeyaw Workie**	**Mr. A. Prabu Das**	**Dr. Seshan Ranganathan**
Role	Lead Auditor	Technical expert	Technical Reviewer	Technical expert Independent of the validation team
Competence in the TA	-	Sector 4	-	Sector 4
Responsibility	Doc review, Interview, DVR preparation, DVR resolution, FVR preparation	Interview with PP	Technical review	Technical inputs to the technical reviewer

A brief summary of the personnel involved in the validation is indicated below.

Mr. R. Vijayaraghavan holds BE in Mechanical Engineering, M. Tech in Energy Conservation and Management and MBA in Technology Management. He is certified as Energy Auditor by Bureau of Energy Efficiency (BEE), Government of India. He has 11 years of working experience in energy sector including 6 years as validator. He has successfully completed around eighty CDM, VCS/GS projects. He has been qualified as Lead Auditor for Sectoral Scope 1 and 13.

Mr. Gebeyaw Workie holds B.Sc in Mechanical engineering and Business management. He has almost 9 years of working experience in cement industry as operation and maintenance engineer. He has trained in Statistical process control, applied failure analysis, cement technology, bearing technology, welding Technology and CATIA, thermography, fundamentals of condition monitoring (vibration analysis) and has been qualified as technical expert in the sectoral scope 4 under EPIC' procedures.

Mr. A Prabu Das, holds a M. Tech Degree in Energy Conservation and Management and B. Tech Degree in Petro-chemical Technology. He is a certified Energy Auditor by Bureau of Energy Efficiency (BEE), Government of India. He has around 8 years of work experience in Design of biomass Power plants, preparing Techno Economic Feasibility Reports (TEFR), carrying out energy audits, of which last six years have been in CDM consultancy and validation services. He has undergone extensive training on CDM validation and verification and is a qualified as Lead Auditor for technical areas TA 1.1, TA 1.2 and TA 13.1 in accordance with procedures of EPIC. He is also an ISO 26000 lead auditor certified by Professional Evaluation and Certification Board (PECB).

Mr. S Ranganathan, holds a Bachelor's Degree in Chemical Engineering and has done diploma course in Management and completed the graduate ship course in Industrial Engineering and has an overall working experience of around thirty two years with twenty four years" experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat -recovery, efficiency studies of boilers, power plants, safety audits and pollution control activities including waste water treatment, project management, corporate planning, sales, logistics in fertilizer & petrochemical industry. He is qualified validator, verifier and technical reviewer and has eight years' experience working with leading certification bodies. He is involved in the validation/verification of over 100 projects in various roles. He is a qualified expert for sector 4 in accordance with procedures of EPIC Sustainability Services Pvt. Ltd.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	UNFCCC	Validation and Verification Standard version 9.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150225165215954/accr_stan02.pdf Project Standard version 9.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150225165159970/reg_stan01.pdf Project Cycle Procedure version 9.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150226145113383/pc_proc01.pdf	1	Publicly available
2	UNFCCC	Consolidated Methodology ACM0005 "Increasing the blend in cement production" --- Version 7.1.0 https://cdm.unfccc.int/methodologies/DB/1AG8O523O2UQD01BAID55YT2LZZ6R0	2	Publicly available
3	PP	PDD version 1.0 dated 14th September 2015 (webhosted) https://cdm.unfccc.int/UserManagement/FileStorage/XBO2ZQKULNR73HPA0GC8IY95JDET4F PDD version 2.0 dated 8th January 2016 (Request for Registration)	3	PP
4	DNA	Letter of Approval dated 18th December 2012	4	PP
5	UNFCCC	MOC from template version 2.3 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150522141527731/Reg_form19.doc Guidelines for completing the MoC form version 2.3 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150601151154076/CDM-MOC-FORM%20Version%202.3.pdf	5	Publicly available
6	UNFCCC	CDM-PDD-FORM - Project Design Document form version 6.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20150630102530962/PDD_form05.doc	6	Publicly available
7	Holtec	Feasibility report dated October 2007	7	PP
8	Ministry of Mines, Ethiopia	Mining Licence granted on 27th May 2008 (Quarry) Mining Licence for pumice dated 25th November 2009	8	PP
9	CNBM	Process flow diagram	9	PP
10	CNBM	Provisional Acceptance Certificate dated 30th July 2012- Evidence for commissioning	10	PP
11	UNFCCC	Standard for sampling and surveys for CDM project activities and programme of activities version 5.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023110717966/meth_stan05.pdf Guidelines for sampling and surveys for CDM project activities and programme of activities version 4.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf	11	Publicly available
12	CNBM	Engineering Procurement Commissioning (EPC) agreement between Derba and CNBM International Engineering Co., Ltd dated 9th January 2007.	12	PP
13	Holtec	Letter from design consultant (Holtec) and EPC contractor dated 28th September 2012 – Evidence for lifetime	13	PP

14	Holtec	Environmental Impact Assessment dated December 2007 EIA approval dated October 21, 2008	14	PP
15	Holtec	Local stakeholder consultation report dated December 2007	15	PP
16	UNFCCC	Project webhosting page (previous) dated 29th Dec 2011 https://cdm.unfccc.int/Projects/Validation/DB/KSQLVGL4WQBRFR86VA1CGWVC4ZBS1Q/view.html Request for registration (UNFCCC: 7632) https://cdm.unfccc.int/Projects/DB/CarbonCheck_Cert1349705724.42/view	16	Publicly available
17	Environmental Protection Agency	Statistical data on cement plants (for calculating $B_{blend,1}$)	17	PP
18	PP	Tentative production plan via Derba' board decision dated 28th November 2011 (for calculating cement production in year y, clinker share, $P_{blend,y}$)	18	PP
19	Ethiopian Government	Ethiopian cement standard ES 1177-1: 2005 (CES 28:2013)	19	PP
20	PP	Actual production data from commissioning to November 2015	20	PP
21	PP	Evidence of equity disbursement to the EPC contractor dated 14th August 2009 (Evidence for start date)	21	PP
22	PP	Letter with Executive Director of Derba MIDROC for NDA dated May 28, 2008 together with relevant pages of the actual NDA dated June 30,2008	22	PP
23	PP/DoE	Validation agreement with the previous DOE dated 30th November 2011 Validation agreement with EPIC dated 3rd June 2015	23	PP
24	Energy Changes	Report on Combined margin emission factor of Ethiopia' electricity system dated 11th August 2008 (for calculating grid emission factor)	24	PP
25	Ethiopian Standards Agency	Letter drafted by Ethiopian Standards Agency dated 4th November 2013 (Evidence that production of cement outside the cement production plants is prohibited in Ethiopia)	25	PP
26	PP	Geological survey report (for proving L1 is satisfied)	26	PP
27	UNFCCC	Tool for the demonstration and assessment of additionality" Version 7.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf	27	Publicly available
28	UNFCCC	Tool -Additionality of first-of-its-kind project activities version 3.0 (erstwhile Guidelines on additionality of first-of-its-kind project activities") https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-23-v1.pdf	28	Publicly available
29	UNFCCC	Guidelines for objective demonstration and assessment of barriers" version 1.0 https://cdm.unfccc.int/Reference/Guidclarif/meth/meth_guid38.pdf	29	Publicly available
30	United Nations	List of LDC countries as on December 2015 (host country one of them) http://www.un.org/en/development/desa/policy/cdp/ldc/ldc_list.pdf	30	Publicly available
31	PP	Agreement the Derba and CDM consultant (Ethan biofuels PLC) dated 30th June 2008	31	PP
32	PP	Prior Intimation forms sent to DNA dated 9th November 2009 Prior intimation form dated 9th November 2009 Prior Intimation forms sent to UNFCCC (UNFCCC webpage) https://cdm.unfccc.int/Projects/PriorCDM/notifications/gotoPriorCDMForm?object_id=34KW7HBS86UZCFNLRDJA9TEYP0IXGO	32	PP
33	UNFCCC	Clarification by the EB (CDM-EB73-A15-CLAR) dated 31st May 2013 regarding delay in intimation of progress of the project activity to the UNFCCC secretariat. https://cdm.unfccc.int/filestorage/b/m/extfile-20130604104601657-reg_guid11.pdf/reg_guid11.pdf?t=dVF8bzFlaDQ0fDDCKAFN0Vu3p1wGMd-9BxFi	33	Publicly available

34	IPCC	IPCC report 2006 (Volume 2) http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2006gls_all_in.zip	34	Publicly available
35	UNFCCC	Tool to calculate the emission factor for an electricity system" version 5.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf	35	Publicly available
36	UNFCCC	Tool "Project and leakage emissions from road transportation of freight" version 1.1.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-12-v1.1.0.pdf	36	Publicly available

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

Table 1. CL from this validation

CL ID	1	**Section no.**	D.8.5	**Date:** 11/12/2015
Description of CL				
Pls provide exhaustive list of cement plants in Ethiopia (private and Public) in the following format; Cement type, private /public, clinker share, and commissioning date etc to the validation team.				
Project participant response				**Date:** 08/01/2016
The list of cement plants in Ethiopia and in the 200Km region that existed by the start date of the project activity has been exhaustively provided including their share of clinker and commissioning date in the CERs spread sheet document. The supporting documents for each of them containing the above parameters have also been provided separately.				
Documentation provided by project participant				
We re-sent the source (supporting) document on each cement plant has been provided before DOE visit and shown during onsite visit as well. The summery of data is included in the CERs spreadsheet and has been provided to DOE.				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the Statistical data[/17/] wherein all the cement plants with the average clinker share, production levels, commissioning dates are mentioned. The validation team has accepted the document as authentic.				

CL ID	2	**Section no.**	D.8.5	**Date:** 11/12/2015
Description of CL				
The geographical region for the calculation of benchmark clinker share of the relevant cement types is limited to 200 km region. Pls justify its appropriateness considering the definition mentioned in the applied methodology (Refer 9 of 36 of the applied methodology) to the validation team. In doing so, pls justify how those two cement plants (Mossobo and Mugher cement plants) are different from the other selected cement plants.				
Project participant response				**Date:** 08/01/2016
We have changed the region from 200km to entire country to include the two plants mentioned above and amended the relevant baseline clinker benchmark for the relevant cement type accordingly				
Documentation provided by project participant				
Revised PDD and CERs spreadsheet provided.				
DOE assessment				**Date:** 12/01/2016
As per step 2 of the applied methodology, para 13a of the additionality tool and para 8 of first of its kind guideline, default geographical area is host country. Since PP has used Ethiopia as default region, the validation team has accepted the same. The validation team has also accepted that justification for the defined region is required if PP preferred to define area smaller than the host country. Since default region is selected, PP need not provide justification prescribed in step 2 of the applied methodology. Hence defined region or applicable geographical area is deemed appropriate.				

CL ID	3	**Section no.**	D.8.5	**Date:** 11/12/2015
Description of CL				

PP is requested to provide the document to support the intended relevant cement types envisaged at the board level and actual cement types produced by the project as the project is already commissioned. The validation team has observed that there is no cement plant Portland Limestone Cement and Pozzalonic Cement. In this case, PP is also required to clarify why upper limit of regulatory limit is considered for Portland Limestone Cement and Pozzalonic Cement for determining its corresponding benchmark.
Project participant response — **Date:** 08/01/2016
The tentative production plans of the relevant cement types envisaged on the Project Plant are already documented in table. The last request for registration of Project 7632 was submitted to EB in December 2012 during the project plant commissioning period, which was intending to produce relevant project activity cement as soon as registration date is known. The delay in CDM registration has therefore already delayed its realization and limited the actual production to OPC and PPC only. The above observation of the validation team justifies that the PP is still waiting the registration of the Project Activity to enact the product diversification and additive increase as per the documented plan of the CDM project activity. Once CDM registration is achieved, each will be introduced through promotion and observation of the level of actual market absorption. The response to this CL: ID 3 is consistent with CAR: ID 4 issued by DOE below. Clinker benchmark needs to consider only the relevant cement type of the project activity (Page 9/36). As per the methodology (Page 2/36) Relevant cement type is the type of blended cement produced under the CDM project activity. The benchmark of share of clinker in the blended cement types produced in the host country is used to set the benchmark clinker share (Page 6/36). Blended cement types are defined (Page 1/36) by the national standard of the host country and in fact the methodology is not applicable if there is no national cement standard since the National cement standard contains the default bottom and ceiling clinker limit for each relevant blended cement type. In case the project activity consists of production of more than one cement type, the emission reduction shall be calculated for each cement type i produced (Page 20/36) and summed up. As there is no existing production practice of PLC and PC, the corresponding national standard default upper limits of each of the newly introduced project activity cement types will therefore be taken as the only remaining baseline alternative for PP to start producing them at lower clinker share under the CDM project activity. The DOE Validation team has, as confirmed in this CL above, observed that there is no cement plant in Ethiopia Producing Portland Limestone Cement and Pozollanic Cement. For the PC· cement, share of clinker will be gradually decreased from its own default 89%; and for the PLC cement, share of clinker will be decreased from its own default 94%. This unique situation has also been tackled in similar fashion with Registered Project 6811 that was intending to produce a cement type under the CDM that was not being produced before in the host country. EB also confirmed it as appropriate in a confidential letter to PP, dated 14 June 2014 Reference: AST/JK/jma.
Documentation provided by project participant
The tentative production plan[/18/], Ethiopian Cement standard[/19/], Statistical data[/17/] showing these new cement types are not produced
DOE assessment — **Date:** 12/01/2016
As per the Derba' board decision[/18/] dated 28th November 2011, relevant cement types are Portland Pozzolana Cement (PPC), Portland Limestone Cement (PLC) and Pozzalonic Cement (PC). The validation team has also checked the actual production[/20/] from commissioning till November 2015 and observed that other than ordinary Portland cement (not a blended cement type as per definition of applied methodology), only PPC is produced till date. The validation team has also accepted the argument of PP regarding upper limit.

Table 2. CAR from this validation

CAR ID	1	**Section no.**	D.7	**Date:** 11/12/2015
Description of CAR				
The cement types such as Portland Pozzolana Cement, Portland Limestone Cement and Pozzalonic Cement is not consistently specified in the PDD (Refer page 5 of 80) and elsewhere in the PDD and CER sheet.				
Project participant response				**Date:** 08/01/2016
We have revised the PDD and the CERs spreadsheet further to address issue of consistency				
Documentation provided by project participant				
PDD and the revised CERs spreadsheet				
DOE assessment				**Date:** 12/01/2016
The validation team has checked the PDD[/3/], CER sheet and now it is consistent.				

CAR ID	2	**Section no.**	D.7	**Date:** 11/12/2015

Description of CAR	
The table (Table 0.02a Family of cement in Ethiopian Standard) is not clear with respect to the description mentioned in the PDD therein (Refer page no 6 of 80)	
Project participant response	**Date:** 08/01/2016
We have included adequate description in revised PDD to show the family of cement for the relevant PA cement types.	
Documentation provided by project participant	
Revised PDD and relevant page of the Cement Standard	
DOE assessment	**Date:** 12/01/2016
The validation team has checked the PDD/3/, CER sheet and now it is consistent.	

CAR ID	3	**Section no.**	D.7	**Date:** 11/12/2015
Description of CAR				
The table (002c: Project activity cement types and targeted share of clinker) is not consistent with the other tables appeared in the PDD (Refer page no 8 of 80)				
Project participant response				**Date:** 08/01/2016
We have maintained consistency on Project activity cement types and targeted share of clinker in corresponding Pages of the PDD				
Documentation provided by project participant				
Revised PDD				
DOE assessment				**Date:** 12/01/2016
The validation team has checked the PDD/3/, CER sheet and now it is consistent.				

CAR ID	4	**Section no.**	D.8.5	**Date:** 11/12/2015
Description of CAR				
Portland cement is not the relevant cement type. But it is also considered in calculation of the benchmark (Refer CER sheet; Tab: clinker BenchmarkBBlend,1).				
Project participant response				**Date:** 08/01/2016
We have removed it wherever it is neither consistent nor in line with our clarification under CL: ID 3 above *and only considered the relevant cement type and benchmark in setting benchmark for each relevant cement type of the Project activity.*				
Documentation provided by project participant				
Revised CERs Spreadsheet and Revised PDD				
DOE assessment				**Date:** 12/01/2016
The validation team has checked the PDD, CER sheet and now details of Portland cement are removed to calculate BBlend, hence it is accepted.				

CAR ID	5	**Section no.**	D.7	**Date:** 11/12/2015
Description of CAR				
The following tools used in the PDD are not the current and valid version • Tool to calculate the emission factor for an electricity system (Version 2.2.1) • Tool for the demonstration and assessment of Additionality (Version 06.0.0) • Project and leakage emissions from road transport of freight (Version 01) (Refer 12 of 80 of PDD)				
Project participant response				**Date:** 08/01/2016
We have applied the same correction to the versions				
Documentation provided by project participant				
Revised PDD				
DOE assessment				**Date:** 12/01/2016
PP has now used latest versions of the tool, hence accepted.				

CAR ID	6	**Section no.**	D.8.6	**Date:** 11/12/2015
Description of CAR				
PP does not substantiate adequately the first of its kind nature with respect to output, commissioning dates etc. (Refer 15/16 of 80 of PDD)				
Project participant response				**Date:** 08/01/2016

<table>
<tr><td colspan="5">We have properly defined the elements of the PA Technology that make it first of its kind and included in the revised PDD. We have also included references to the sources of data and documents used to establish the FOIK. FOIK has been demonstrated both using the guideline and further provision of the methodology using statistical data before start date.</td></tr>
<tr><td colspan="5">Documentation provided by project participant</td></tr>
<tr><td colspan="5">Relevant sheet of the CERs Spreadsheet document and PDD</td></tr>
<tr><td colspan="4">DOE assessment</td><td>Date: 12/01/2016</td></tr>
<tr><td colspan="5">Refer Appendix 6 for DoE assessment.</td></tr>
</table>

<table>
<tr><td>CAR ID</td><td>7</td><td>Section no.</td><td>D.8.6</td><td>Date: 11/12/2015</td></tr>
<tr><td colspan="5">Description of CAR</td></tr>
<tr><td colspan="5">Percentage penetration of the project technology is not consistent (Refer Table 005 a: % penetration of the project technology and Table 005c: % of penetration of various blended cement types of PDD). In doing so, pls substantiate the “Table 005b: cement types produced/imported into host country before the start date” mentioned in the PDD.</td></tr>
<tr><td colspan="4">Project participant response</td><td>Date: 08/01/2016</td></tr>
<tr><td colspan="5">Removed the same as it also refers to private plant and has errors and made consistent revised PDD.</td></tr>
<tr><td colspan="5">Documentation provided by project participant</td></tr>
<tr><td colspan="5">Removed the same as it also refers to private plant and has errors and made consistent revised PDD.</td></tr>
<tr><td colspan="4">DOE assessment</td><td>Date: 12/01/2016</td></tr>
<tr><td colspan="5">The validation team has checked the PDD, CER sheet and now it is consistent.</td></tr>
</table>

<table>
<tr><td>CAR ID</td><td>8</td><td>Section no.</td><td>D.8.6</td><td>Date: 11/12/2015</td></tr>
<tr><td colspan="5">Description of CAR</td></tr>
<tr><td colspan="5">Step by step procedure for determination of alternatives for the relevant cement types as per additionality tool version 7.0 is not considered in the PDD.</td></tr>
<tr><td colspan="4">Project participant response</td><td>Date: 08/01/2016</td></tr>
<tr><td colspan="5">This was the result of a change in version of tool. We have now included a step by step procedure of determination and included in revised PDD</td></tr>
<tr><td colspan="5">Documentation provided by project participant</td></tr>
<tr><td colspan="5">revised PDD</td></tr>
<tr><td colspan="4">DOE assessment</td><td>Date: 12/01/2016</td></tr>
<tr><td colspan="5">The validation team has checked the PDD and now all the steps are detailed in the PDD. Refer Appendix 6 for DoE assessment.</td></tr>
</table>

<table>
<tr><td>CAR ID</td><td>9</td><td>Section no.</td><td>D.8.6</td><td>Date: 11/12/2015</td></tr>
<tr><td colspan="5">Description of CAR</td></tr>
<tr><td colspan="5">PP does not substantiate the Technology barrier due to Scale and Technology Barrier due to technical complexity in the PDD (Refer 21 of 80)</td></tr>
<tr><td colspan="4">Project participant response</td><td>Date: 08/01/2016</td></tr>
<tr><td colspan="5">Technology barrier due to Scale and Technology Barrier due to technical complexity have further been described using values and references and have been included in revised PDD Version 3</td></tr>
<tr><td colspan="5">Documentation provided by project participant</td></tr>
<tr><td colspan="5">The CERs spreadsheet document containing various independent sheets including for FOIK</td></tr>
<tr><td colspan="4">DOE assessment</td><td>Date: 12/01/2016</td></tr>
<tr><td colspan="5">The validation team has checked the PDD and now Technology barrier due to Scale and Technology Barrier due to technical complexity are substantiated in the PDD. Refer Appendix 6 for DoE assessment.</td></tr>
</table>

<table>
<tr><td>CAR ID</td><td>10</td><td>Section no.</td><td>D.8.6</td><td>Date: 11/12/2015</td></tr>
<tr><td colspan="5">Description of CAR</td></tr>
<tr><td colspan="5">Start date of the project activity is not internally consistent in the PDD (Refer page no 23 and 26 of PDD). PP is also requested to clarify when EPC is signed on Jan 2007, how this is not considered as a start date. Pls provide EPC document for validation.</td></tr>
<tr><td colspan="4">Project participant response</td><td>Date: 08/01/2016</td></tr>
</table>

Date discrepancy on relevant page of PDD Version 1 was a typo error and has been made consistent in revised PDD Version 3 *EPC (Engineering design, Procurement, Construction and Erection) is also called Turnkey contract which means the plant has to be designed based on routine findings. In case of cement plants routine investigative findings on raw materials in reference to the desired chemical characteristics of clinker, evaluation of various alternative options, availability and reserve size, ease of acquiring permits, alternative plant accessories, the cost implication of each on the investor's financial standing etc. With Derba EPC composing both plants and civil works, the plant to procure is only known after the design is confirmed with various parameters. The fact that the EPC contract signed on January 2007 for 5000TPD which is different from the final design outcome of 5600TPD shows itself that the plant technology is not pre-decided, for why EPC (Turnkey) contract is chosen for flexibility. While the EPC was signed on January 2007 the TEFR was itself concluded on October 2007 which shows that even the design component of the EPC needed to wait and be synergized with the TEFR outcome and the TEFR consultant's routine liaison with the investor on purchase capacity. TEFR itself may not always exactly reflect the actually implemented details. The plant and machinery estimated value itself varied from the initial EPC value of $141,986,246 to $185,876,000. Construction of civil works should resume independently of plant. The engineering design itself cannot be finalized until source of finance is identified since kiln capacity would only be fixed based on affordability of its capital cost and the capital cost has intern to be confirmed with investor's equity financial standing. CDM project activity product variety itself was revised on March 20, 2008. Hence EPC signing is not even close to the point of no return of the PA and hence cannot be considered as the start date of PA. The point of no return of the PA was reached when the owner has practically committed and fulfilled the Equity contribution requirement, by which time the PA product varieties were already agreed upon.*

Documentation provided by project participant	
Relevant pages showing EPC[/12/] signing date and original targeted 5000tpd clinker capacity, original contract value as well as conditions. TEFR[/7/] Ch-0 Page 3/20 containing narratives of chronology of EPC-TEFR; TEFR Section 9 (Pages 1&2 of 7) shows latest plant cost.	
DOE assessment	**Date:** 12/01/2016
Date of EPC report = Jan 2007 The validation team has reviewed the EPC[/12/] signed between CNBM and the PP. Since EPC is signed on turnkey basis and design and project cost are were not decided at that time and the design was to be finalised only after financial commitment from the PP, signing of EPC is not taken as start date Date of equity disbursement to EPC contractor =14th August 2009 (Start date) The validation team has reviewed the evidence[/21/] of equity disbursement to the EPC contractor and hence reached the point of no return. This is hence accepted as start date of the project activity.	

CAR ID	11	**Section no.**	D.8.6	**Date:** 11/12/2015
Description of CAR				
The following documents is not produced to the validation team 1. Letter with Executive Director of Derba MIDROC for NDA dated May 28, 2008, 2. Letter from EPA approving the final EIA 3. DOE agreement with the previous DOE 4. Commissioning certificate indicating commercial operation of the cement plant. 5. Confirmation letter by CNBM (2% advance to CNBM)				
Project participant response				**Date:** 08/01/2016
For number 1, we have also included the relevant pages of the associated NDA dated June 30,2008.We have also included the rest of the documents above in the new submission to DOE				
Documentation provided by project participant				
All of the following documents have been further provided to DOE 1. Letter with Executive Director of Derba MIDROC for NDA dated May 28, 2008 together with relevant pages of the actual NDA dated June 30,2008[/22/] 2. Letter from EPA approving the final EIA [/14/] 3. DOE agreement with the previous DOE [/23/] 4. PAC indicating commercial operation of the cement plant. 5. Confirmation from CNBM's Bank (2% advance to CNBM)[/21/]				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the documents submitted and in order.				

CAR ID	12	**Section no.**	D.8.7	**Date:** 11/12/2015

Description of CAR	
PDD does not contain the calculation procedure of emission grid factor. (Refer 34 of 80)	
Project participant response	**Date:** 08/01/2016
We have submitted the grid emission factor calculated for capacity building to the DNA using data before the start date. The outcome is 0.00591tCO2e/MWh. In case most recent data are rather appropriate, we have also included calculation using most recent data in the CERs spreadsheet. In this case the outcome is 0.000tCO2e/MWh. In both cases it is considered zero	
Documentation provided by project participant	
GEF[/24/] Previously calculated under DNA capacity building under Austrian Government and CERs spreadsheet with additional sheet for GEF.	
DOE assessment	**Date:** 12/01/2016
As per step 6 of the applied methodology, EF_{grid} is shall be calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" version 5.0 Energy Changes Projektentwicklung GmbH has been contracted by the Austrian Ministry of Environment for calculating the Combined margin emission factor of Ethiopia' electricity system. As per this report version 1 dated 11th August 2008 (which is based on Tool to calculate the emission factor for an electricity system), combined margin emission factor = 0.00591 tCO2/MWh. PP has considered it to be negligible. The validation team has accepted as reasonable.	

CAR ID	13	**Section no.**	D.8.8	**Date:** 11/12/2015
Description of CAR				
Pls provide document to support the following. Emission factor for coal, Fossil fuel of type i consumed for clinker production in the base year, Amount of fuel *m* consumed by relevant power sources *n* in the base year, Baseline MgO content in Clinker, Base year CaO content in Clinker. Further pls clarify base year is considered in estimating the ex-ante values.				
Project participant response				**Date:** 08/01/2016
TEFR pages containing the relevant data requested above have been further provided to DOE and stated in summery table in the CERs spreadsheet. *Base year values have been considered in estimating Ex-ante values. In all cases it is going to be monitored and Ex-post values are going to be taken.PDD has also been further revised based on this and references provided.*				
Documentation provided by project participant				
TEFR[/7/] CH-3, page 17/17,TEFR CH-0, Page 9/20, TEFR CH-0,table 014, page 17/20				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the feasibility report and accepted the values as reasonable.				

CAR ID	14	**Section no.**	D.8.8	**Date:** 11/12/2015
Description of CAR				
Table B.7.1 of PDD does not contain ex-ante source and ex-post source, value estimated for all the monitoring parameters etc. Not all parameters as per applied methodology is captured in this table. And the monitoring frequency, calibration frequency does not match with the actual practice prevailing at the site.				
Project participant response				**Date:** 08/01/2016
Relevant pages have been corrected and missing tables of monitoring parameter included under Revised PDD				
Documentation provided by project participant				
Revised PDD				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the PDD and accepted the correct.				

Table 3. FAR from this validation

FAR ID	1	**Section no.**	D.8.7	**Date:** 11/12/2015
Description of FAR				
As per the applied methodology, exported cement shall be excluded from the project activity or calculation of emission reduction. How will PP identify the portion of "to be exported cement" at the cement production site itself. What is the procedure adopted in the monitoring plan? The verifying DoE to check.				
Project participant response				**Date:** 08/01/2016

We agree. The Methodology also has provision for this. To further strengthen this action we have also included in the monitoring table for BCy that invoices will be checked to identify and deduct export quantity.
Documentation provided by project participant
Revised PDD
DOE assessment — **Date:** 12/01/2016
The validation team has reviewed the PDD and has agreed the argument of PP

FAR ID	2	**Section no.**	D.8.7	**Date:** 11/12/2015
Description of FAR				
As per the applied methodology, the base year for determining CO_2 emissions per tonne of clinker $BE_{clinker,BSL}$ is defined as first operational year which in this case is 2013. The verifying DoE to check/consider ex-post $BE_{clinker,BSL=2013}$ while calculating the emission reduction.				
Project participant response				**Date:** 08/01/2016
The base year is the year when data on parameters required for calculating $BE_{Clinker}$ are to be collected. In earlier version PP took the first crediting year of PA set as the base year. *We now took year 2013, the first operational year (commercial operation) of project plant as base year. The required parameters are commonly monitored under standard plant record norm.*				
Documentation provided by project participant				
Revised PDD				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the PDD and has agreed the argument of PP.				

FAR ID	3	**Section no.**	D.8.7	**Date:** 11/12/2015
Description of FAR				
As per the applied methodology, During each verification, DOE shall check that the additives are sourced from the same sites as indicated in the PDD.				
Project participant response				**Date:** 08/01/2016
We agree. We can show additives are sourced from the same sites as indicated in the PDD*.*				
Documentation provided by project participant				
Revised PDD				
DOE assessment				**Date:** 12/01/2016
The validation team has reviewed the PDD and has agreed the argument of PP.				

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Appendix 5:

1. This methodology is applicable to project activities that produce blended cement (BC) beyond current practices in the host country either: (i) in Greenfield cement plant or (ii) in existing cement production plant by increasing the share of additives (i.e. reduce the share of clinker).	By reviewing the provisional acceptance certificate[/10/], feasibility report[/7/], the validation team has confirmed that project activity is implemented as a greenfield project as there is no operational history at the time of commissioning of the project. As per the Derba' board decision[/18/] dated 28th November 2011, relevant cement types are Portland Pozzolana Cement (PPC), Portland Limestone Cement (PLC) and Pozzalonic Cement (PC). As demonstrated in the baseline section/additionality section, benchmark for the share of clinker in the current practice and actual target envisaged is as follows. Relevant Cement type / Benchmark (% share of clinker) or current practice in the host country / Actual target envisaged by the project in the first year PPC / 72.86% / 65% PLC / 94% / 65% PC / 89% / 61% Hence it is concluded that project activity produce blended cement types beyond current practices in the host country. Hence this condition is satisfied by the project activity.

2.The methodology is applicable under the following conditions: This methodology is applicable to domestically sold blended cement of the project activity plant and excludes export of blended cement;	The project activity is proposed for selling cement to domestic market only and excludes cement that is exported. The validation team during visual inspection observed that only OPC is being exported currently. For all practical purpose though PP is maintaining records for export and its corresponding invoices. PP has included this invoice check step as part of monitoring in the PDD. Hence this condition is satisfied by the project activity.
3.The methodology is not applicable if blending of cement outside the cement production plants is a common practice in the host country (e.g. localized blending in construction sites);	The validation team has reviewed the letter[/25/] drafted by Ethiopian Standards Agency dated 4th November 2013 which confirmed that production of cement outside the cement production plants is not permitted in Ethiopia which further states that continuous spot sampling and testing in cement plants is mandatory in Ethiopia. The validation has also reviewed the statistical data[/17/] on the all the cement plants in Ethiopia which gives its clinker share and cement production. It is evident that all the cement plants are having cement kiln and grinding inside the facility. Hence the validation team has concluded that cement plants are producing both clinker and cement. So production of blending cement outside the cement production plants is not a common practice in the host country. Hence the project activity can apply this methodology.
4.All clinker used in the project activity shall be produced by the cement plant that is included within the project boundary, hence, cement grinding only plants cannot use this methodology (e.g. plants with no clinker manufacturing facility);	Among the major raw materials required for cement production, limestone, clay, basalt, sandstone, and gypsum are abundantly available in the Derba-Muger Valley. As it was observed from the preliminary geological survey[/26/] of the raw materials study, that the deposit of the above materials is much more than enough for the whole plant life for the 5,600 tpd clinker production capacity. The main raw materials deposits are spread across the valley which has been brought in into the pre-blending stockpiles using high capacity belt conveyers. Since, pumice, the raw material, required for production of PPC cement, is not available in the valley, this material has to be transported by trucks from Nazareth or Zeway area. It is confirmed that all clinker used in the project activity shall be produced by the cement plant that is included within the project boundary. The feasibility report[/7/] also confirms the same. Hence this condition is satisfied by the project activity.
5.Adequate data are available on cement types in the market.	The validation team has reviewed the national standards[/19/] of Ethiopia and statistical data[/17/] on cement types produced in Ethiopia. So adequate data is available on cement types. Hence this condition is satisfied by the project activity.

Appendix 6:

The validation team has checked whether PP has demonstrated additionality and identified baseline in line with the latest approved version of the “Tool for the demonstration and assessment of additionality”[/27/] Version 7.0 (hereinafter referred to as additionality tool). The validation team checked if all the assumptions and data used by the project participants are listed in the PDD, including their references and sources, all documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD, assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable, the approved baseline methodology has been correctly applied to identify the most plausible baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed project activity. The validation of the project against the relevant requirements of the additionality tool (Step 0 to step 4) is detailed below.

Step 0: Demonstration whether the proposed project activity is the first-of-its-kind	This step identifies whether the project of its kind in the geographical area. The validation of this step prescribed by the additionality tool[/27/] is explained below.
Measure = Feedstock switch measure	As per para 16 of additionality tool[/27/], if the project applies measures that are listed in tool, then “Guidelines on additionality of first-of-its-kind project activities” shall be applied to demonstrate that the project activity is the first-of-its-kind. Since the proposed CDM project activity

	applies feedstock switch as a measure, the latest version of the Tool on "Additionality of first-of-its-kind project activities"[/28/] version 3.0 (hereinafter referred to as first of its kind tool) can be applied to demonstrate that the project activity is the first-of-its-kind. EB has reclassified this document from a guideline to a tool on 28th May 2015 through EB 84. The validation of the same is demonstrated below.
Applicable geographical area or region or defined region = host country	As per step 2 of the applied methodology[/2/], para 13a of the additionality tool and para 8 of first of its kind tool[/28/], default geographical area is host country. Since PP has used Ethiopia as default region, the validation team has accepted the same. The validation team has also accepted that justification for the defined region is required if PP preferred to define area smaller than the host country. Since default region is selected, PP need not provide justification prescribed in step 2 of the applied methodology. Hence defined region or applicable geographical area is deemed appropriate.
Proposed project activity = first-of-its-kind	As per para 12 of first of its kind tool[/28/], the proposed project activity is the first of its kind in the defined region if the following three conditions are satisfied (a) The project is the first in the applicable geographical area that applies a technology that is different from technologies that are implemented by any other project, which are able to deliver the same output and have started commercial operation in the applicable geographical area before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of the proposed project activity, whichever is earlier; (b) The project implements one or more of the measures; (c) The project participants selected a crediting period for the project activity that is "a maximum of 10 years with no option of renewal". The validation team has checked the compliance against the conditions a,b,c below.
Type of technology of the proposed project activity = different	As per the Derba' board decision[/18/] dated 28th November 2011, relevant cement types are Portland Pozzolana Cement (PPC), Portland Limestone Cement (PLC) and Pozzalonic Cement (PC). As demonstrated in the baseline section/additionality section, benchmark for the share of clinker in the current practice and actual target envisaged is as follows. Relevant Cement type / Benchmark (% share of clinker) or current practice in the host country / Actual target envisaged by the project in the first year: PPC / 72.86% / 65% PLC / 94% / 65% PC / 89% / 61% Hence the technology of the project activity is different by feedstock type and percentage of feedstock (Additive) in cement. Hence this condition a is satisfied.
Output = cement	The output service is production of cement hence accepted.
Measure = Feedstock switch measure	The proposed project activity is the production of cement with varying percentage of alternative raw materials. So it implements feed stock switch as a measure. Hence this condition b is satisfied.
Type of crediting period= Fixed (10 years)	As PP has selected a crediting period for the project activity that is "a maximum of 10 years with no option of renewal. Hence this condition c is satisfied.
Outcome of step 0: Proposed project activity = first-of-its-kind	Since all the three conditions are satisfied, proposed project activity is first-of-its-kind in the defined region or applicable geographical area. In addition, the validation team has also assessed first of its kind aspect against the requirements of the applied methodology[/2/] which states that the project activity shall be considered as 'first its kind' if it applies a technology that is different from any other technologies able

	to deliver the same output (blended cement) if the market share for blended cement in the host country is below 5%. The validation of the market share is detailed below.
Market share =0% Start date of the project =14th August 2009 Start date of the initial validation (initial webhosting) = 29th Dec 2011	As per the applied methodology[/2/], the market share shall be calculated as the percentage of the amount of blended cement in the total amount of all cement types produced in the host country during the last three years prior to: (a) the start date of the CDM project activity; or (b) the start of validation, whatever is earlier. By reviewing the statistical data[/17/] of cement by various cement plants in the region, the validation team has confirmed that the production of Portland Pozzolana Cement (PPC) with 65% clinker, Portland Limestone Cement (PLC) and Pozzalonic Cement (PC) by the project activity is the first in the defined region, market share is hence 0% during the last three years (2006 to 2008) prior to the start date of the CDM project activity. The start date is earlier to the start of the initial validation.
Outcome of step 0: Proposed project activity = first-of-its-kind	Since the relevant requirements of applied methodology, additionality tool, first of its kind guideline is satisfied, proposed project activity is first-of-its-kind in the defined region or applicable geographical area
Step 1: Identification of alternatives to the project activity consistent with current laws and regulations	This step identifies the all the alternatives complaint with the current laws available to the PP The validation of this step prescribed by the additionality tool[/27/] is explained below.
Sub-step 1a: Define alternatives to the project activity	As per para 20 of the additionality tool[/27/], realistic and credible alternatives available to the PP that provide outputs or services comparable with the proposed CDM project activity. The realistic and credible alternatives available to the PP include a) The proposed project activity undertaken without being registered as a CDM project activity (b) Other realistic and credible alternative scenario(s) to the proposed CDM project activity scenario that deliver outputs services (e.g. cement) or services (e.g. electricity, heat) with comparable quality, properties and application areas, taking into account, where relevant, examples of scenarios identified in the underlying methodology (c) If applicable, continuation of the current situation (no project activity or other alternatives undertaken. As per para 21 of the additionality tool[/27/], since relevant cement types of the project activity are Portland Pozzolana Cement (PPC), Portland Limestone Cement (PLC) and Pozzalonic Cement (PC), alternative scenarios for each of them are identified separately.
Outcome of Sub-step 1a: Define alternatives to the project activity	For Portland Pozzolana Cement (PPC): The realistic and credible alternatives identified by the PP include **Alternative a**: Production of PPC at 65% clinker but without CDM benefit (proposed project activity without CDM) **Alternative b**: Production of PPC at regulatory default clinker ceiling share (94%) Clinker; (1-6) % Pozzolana and (0-5) % gypsum. **Alternative c**: Continuation of the current production practice with bench mark rate of 72.86%. For Portland Limestone Cement (PLC): **Alternative a:** Production of PLC at 65% clinker but without CDM (proposed project activity without CDM) **Alternative b:** Production of PLC at 94% clinker, (1-6)% Limestone and (0-5)% Gypsum. **Alternative c:** Continuation of the current manufacturing practice of

<table>
<tr><td></td><td>PLC in other manufacturing plants in the region. Since there is no cement plant producing PLC, this is not realistic alternative which is accepted by the validation team.

For Pozzalonic Cement (PC):

Alternative a: Production of PC at 61% clinker but without CDM (proposed project activity without CDM)

Alternative b: Production of PC at 89% clinker, (6-11) % siliceous fly ash, (0-5) % Gypsum

Alternative c: Continuation of the current manufacturing practice of PC in other manufacturing plants in the region. Since there is no cement plant producing PC, this is not realistic alternative which is accepted by the validation team.</td></tr>
<tr><td>Sub-step 1b: Consistency with mandatory laws and regulations</td><td>As per para 24 of additionality tool/27/, the alternatives shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions.</td></tr>
<tr><td>Outcome: Sub-step 1b:
Identified realistic and credible alternative scenarios to the project activity that are in compliance with mandatory legislation and regulations</td><td>The validation team has checked the identified alternatives against the definition of cement types prescribed in the Ethiopian national Standards/19/ (ES 1177-1:2005 or new version CES 28:2013) and observed that all the alternatives are in compliance with the standard.</td></tr>
<tr><td>Step 2: Investment analysis</td><td>PP has chosen to proceed with step 3 (barrier analysis) and skipped step 2 (Investment analysis) which is line with para 28 of the additionality tool/27/.</td></tr>
<tr><td>Step 3: Barrier analysis</td><td>This step serves to identify barriers and to assess which alternatives are prevented by these barriers. This step is used to determine whether the proposed project activity faces barriers that prevent the implementation of this type of proposed project activity; and that do not prevent the implementation of at least one of the identified alternatives. The validation of the same is detailed below.</td></tr>
<tr><td>Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity</td><td>As per para 51 of the additionality tool/27/, such barriers include investment barrier, technological barrier and other barriers specified in the underlying methodology.</td></tr>
<tr><td>Outcome of sub-step 3a:

Technology barrier due to scale, due to technical complexity, due to lack of manpower and particular technology of project activity is not available in the relevant region</td><td>PP has used “Guidelines for objective demonstration and assessment of barriers”/29/ version 1.0 to identify the barriers which is line with para 46 of the additionality tool. As per para 10 the guideline/29/, for LDC countries/30/ such as Ethiopia, it is sufficient to transparently describe the relevant barriers, as less stringency is needed with regards to data availability in the actual demonstration of barrier, as compared to the projects in other countries.

Technology barrier:

a) Technology barrier due to Scale:
From the statistical data/17/ on the cement plants and tentative production sheet/18/ for the proposed project activity, the validation team has found that the proposed project is the biggest in terms of capacity.

<table>
<tr><td>Cement plant</td><td colspan="2">Cement production in year 2008 and %clinker</td></tr>
<tr><td rowspan="3">Mugher (not in 200 km region)</td><td>PPC</td><td>723,532 tons @72.86%</td></tr>
<tr><td>PLC</td><td>No production</td></tr>
<tr><td>PC</td><td>No production</td></tr>
<tr><td rowspan="2">Mossobo (not in 200 km region)</td><td>PPC</td><td>958,082 tons @73.49%</td></tr>
<tr><td>PLC</td><td>No production</td></tr>
</table>
</td></tr>
</table>

	<table><tr><td></td><td><table><tr><td>PC</td><td>No production</td></tr></table></td></tr><tr><td>National Cement</td><td><table><tr><td>PPC</td><td>112,275 tons @75%</td></tr><tr><td>PLC</td><td>No production</td></tr><tr><td>PC</td><td>No production</td></tr></table></td></tr><tr><td>Derba (Target)</td><td><table><tr><td>PPC</td><td>2,558,789 tons @65%</td></tr><tr><td>PLC</td><td>710,769 tons @65%</td></tr><tr><td>PC</td><td>302,950 tons @61%</td></tr></table></td></tr></table> The validation has accepted that there is no domestic experience in implementation and operation of the proposed cement plant in such a scale of production. There is no cement plant that is producing PPC at 65% clinker and there is no cement plant that is producing PLC or PC. Hence the validation team has confirmed that history of non-implementation of cement plant in such a scale and quality is a barrier to the proposed project activity. b) Technology Barrier due to technical complexity: The validation team at the onsite visit observed that the cement plant is erected and commissioned by CNBM International Engineering Co Limited, a Chinese entity due to lack of technical experience available in Ethiopia. The validation team has confirmed that OPC and PPC are the only ones being produced in the host country and blending various additives to produce various desired cement types increases the risk. Some of the CDM revenue would at least cover some cost of training towards cultivating skilled manpower for the complex technology. c) Manpower barriers During the onsite visit and interview with the PP, the validation team has confirmed that there is lack of skilled manpower shortage in the host country which is evident as lot of foreign consultants for operation are hired by the PP. This leads to high risk of which is further aggravated when product is diversified. The validation team has accepted the argument of PP that CDM revenue would critically serve as source of hard currency expenditure for foreign experts. Some of the CDM revenue would at least cover some cost of training towards cultivating skilled manpower for the complex technology. d) The Particular technology of project activity is not available in the relevant region As demonstrated above there is no cement plant producing PLC or PC or PPC with 65% clinker in Ethiopia and hence validation team has accepted this as a barrier. Thus the validation team has concluded that the identified barriers prevent the project activity to be implemented.
Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives <table><tr><td>Relevant cement type</td><td>Baseline</td></tr><tr><td>PPC</td><td>Production of PPC at 72.86% clinker</td></tr><tr><td>PLC</td><td>Production of PLC at 94% clinker</td></tr><tr><td>PC</td><td>Production of PC at 89% clinker</td></tr></table>	For Portland Pozzolana Cement (PPC): Since Continuation of the current production practice at the bench mark rate of 72.86% (alternative c) is already implemented by National Cement as demonstrated above, the identified barrier did not prevent the implementation of this alternative. Hence alternative c is the baseline for PPC. The calculation of 72.86% is demonstrated in appendix 8 of this report (under $B_{blend,1}$). For Portland Limestone Cement (PLC): Production of PLC at 94% clinker, (1-6) % Limestone and (0-5) % Gypsum (alternative b) is mandatorily enforced by the Ethiopian standard and moreover, cement producers are not obliged by the

	such regulation to increase additive and reduce clinker share below the regulatory default. The validation team has accepted the argument of PP that once established, producing cement at the regulatory norm is less exposed to risks associated with production scale, technology risks or manpower risks. Hence alternative b is the baseline for PLC. For Pozzalonic Cement (PC): Production of PC at 89% clinker, (6-11) % siliceous fly ash, (0-5) % Gypsum (alternative b) is mandatorily enforced by the Ethiopian standard and moreover, cement producers are not obliged by the such regulation to increase additive and reduce clinker share below the regulatory default. The validation team has accepted the argument of PP that once established, producing cement at the regulatory norm is less exposed to risks associated with production scale, technology risks or manpower risks. Hence alternative b is the baseline for PC. In view of the above, the validation team has concluded that there is atleast one alternative other than the proposed project activity that is not prevented by the identified barrier.
Step 4: Common Practice Outcome of step 4: Proposed project is not a common practice	Since the proposed project activity is established as first of its kind, common practice is not required to be demonstrated by the PP which is in line with para 137 of VVS[/1/] version 9.0. In view of the above (step 0 to step 4), the project is additional.

Appendix 7:

Date of EPC report = Jan 2007 Source: EPC report[/12/]	The validation team has reviewed the EPC signed between CNBM and the PP. Since EPC is signed on turnkey basis and design and project cost are were not decided at that time and the design was to be finalised only after financial commitment from the PP, signing of EPC is not taken as start date
Date of Local stakeholder report = August 2007 Source: Local stakeholder documents[/15/] (CDM event)	The validation team has reviewed the local stakeholder report and accepted as a valid one.
Date of feasibility report = October 2007 Source: Feasibility report[/7/]	The validation team has reviewed the feasibility report prepared by Holtec Consulting Pvt Ltd which is the basis of investment decision of in establishing the cement plant.
Date of EIA =December 2007 Source: EIA report[/14/]	The validation team has reviewed the EIA prepared by Holtec Consulting Pvt Ltd which is carried out within the legal frame work of local and national environmental standards. The same was approved by Environmental Protection Authority on October 21, 2008
Date of agreement the Derba and CDM consultant (Ethan biofuels PLC) =30th June 2008 (CDM event) Source: Agreement the Derba and CDM consultant (Ethan biofuels PLC)[/31/]	The validation team has reviewed the agreement between Derba and Ethan biofuels PLC the scope includes development of project activity as CDM project.
Date of equity disbursement to EPC contractor =14th August 2009 (Start date) Source: Invoice of equity disbursement to the EPC	The validation team has reviewed the evidence of equity disbursement to the EPC contractor and hence reached the point of no return. This is hence accepted as start date of the project activity.

contractor [21]	
Intimation to DNA for prior CDM consideration = 9th November 2009 Source: Prior Intimation forms sent to DNA[32] (CDM event)	The validation team has reviewed the notification letter drafted by the PP regarding commencement of the project to DNA. The validation team verified the notification letter and found that the date of notification is within six months of the start date of the project activity (14th August 2009).
Intimation to UNFCCC regarding progress activity of the project = 17th November 2009 Source: Prior Intimation forms sent to UNFCCC[32] (CDM event)	The validation team has reviewed the prior notification form[32] (dated 9th November 2009) sent to the UNFCCC in writing, informing about the commencement of the project activity and the intention to seek CDM status in the prescribed format (F-CDM-Prior Consideration, version 1.0). The validation team found that the date of notification is within six months of the start date of the project activity (14th August 2009). UNFCCC has acknowledged the receipt of the same on 17th November 2009. The validation team has reviewed the UNFCCC website[32] which indicates the project being listed as notified in the UNFCCC website on 17th November 2009. Since the project activity was webhosted (29th December 2011) after 2 years from the date of initial intimation (9th November 2009) to DNA, further progress intimation is required which is as per Para 12 of the CDM Project Cycle Procedure version 9.0[1]. The validation team has also checked whether the project activity conforms to the requirements of para 9 of PCP version 9.0. However, further notification was not submitted by the PP. The validation team has reviewed the documents such as prior intimations[32], contract with CDM consultants[31], local stakeholder documents[15], Agreement with previous DOE[23] and Meeting with host country approvals[4] show that serious consideration of obtaining the CDM revenue is taken by all the PPs and based on the latest clarification[33] by the EB (CDM-EB73-A15-CLAR), accepted the argument put forth by the PP.
Award of Letter of Approval from DNA = 26th November 2009 (CDM event)	The DNA of Ethiopia has accorded a written letter of approval[4] (LoA) to the PP. This has been confirmed through Letter of Approval from Environmental Protection Agency, Ethiopia (Reference No. 5.5.4/315) dated 26th November 2009. New LoA letter was dated on 18th Dec 2012.
Contract signed by PP with the DOE = 19th October 2011 (CDM event) Source: Contract with previous DOE[23]	The validation team has reviewed the contract letter[23] signed between PP and previous DOE and confirms the appointment of the DOE and is acceptable. PP has signed an agreement[23] with EPIC again on 3rd June 2015.
Webhosting of the PDD in UNFCCC for GSCP by the previous DOE =29th Dec 2011 (CDM event) Source : UNFCCC website[16]	The project was published for a period of 30 days from 29th Dec 2011 to 27th Jan 2012 for the global stakeholder consultation in the UNFCCC website[22]. Since this is the first web hosting of the project activity, it is accepted as real CDM activity. The project was published for a period of 30 days from 28th October 2015 to 26th November 2015 for the second time by EPIC for the global stakeholder consultation in the UNFCCC website.
Date of commercial operation date = 1st January 2013 Source: Provisional acceptance letter[10] from EPC contractor and actual production data[20]	The validation team has reviewed the Provisional acceptance letter from EPC contractor and actual production data till November 2015 and accepted 1st January 2013 as start date of commercial operation.

Appendix 8:

Emission reduction by the project activity (ER_y)	As per equation 32 of the applied methodology[/2/], ER_y is calculated as $ER_y = BE_y – PE_y – LE_y$ The validation of each is described below.
Baseline emissions (BE_y)	The baseline emissions depend on two factors: • The benchmark of share of clinker in the blended cement types produced in the host country; and • The CO_2 emissions per tonne of clinker in the base year, which in turn depends on: ○ Quantity and carbon intensity of the fuels used in clinker making; ○ Quantity and carbon intensity of electricity; ○ CO_2 emissions from calcinations. This methodology requires data from the base year to calculate the baseline emissions (CO_2 emissions per tonne of clinker in the base year: $BE_{clinker,BSL}$). As per equation 1 of applied methodology, Baseline emissions are calculated as follows: $BE_y = BC_y \times \left(BE_{clinker,y} \times B_{Blend,y} + BE_{ele,ADD,BC}\right)$ Where BC_y – Blended cement produced and sold in the domestic market in year y $BE_{clinker,y}$ – CO2 emissions per tonne of clinker in year y $B_{blend,y}$ –Baseline benchmark of share of clinker per tonne of blended cement updated for year y $BE_{ele,ADD,BC}$ – Baseline electricity emissions for blended cement grinding and preparation of additives.
Base year = 2013	As per the applied methodology[/2/] (Page no 6 of 36), for greenfield cement plants, the base year for determining CO2 emissions per tonne of clinker is defined as first operational year. The validation team has reviewed the Provisional acceptance letter[/10/] from EPC contractor and actual production data[/20/] of PPC till November 2015 and accepted 1st January 2013 as start date of commercial operation for PPC. Hence year 2013 is considered as base year for this project activity.
Blended cement produced and sold in the domestic market in year y (BC_y) (monitored parameter in year y)	PP is producing three kind of blended cement namely PPC, PLC and PC BC_y = percentage share of blended cement production x annual clinker production /percentage of clinker for corresponding blended cement
Percentage share of blended cement (see table below)	PP has targeted to produce the blended cement as per Derba' board meeting decision[/18/] dated 28th November 2011. The validation team has reviewed the report and accepted. As per the report[/18/], ordinary Portland cement distribution is 10% every year. Since ordinary Portland cement (OPC) is not blended cement as per definition of the applied methodology[/2/], it is not considered henceforth.

Percentage share of blended cement

Year	PPC	PLC	PC
1	90%	0%	0%
2	55%	25%	10%
3	55%	25%	10%
4	55%	25%	10%
5	55%	25%	10%
6	55%	25%	10%
7	55%	25%	10%
8	55%	25%	10%
9	55%	25%	10%
10	55%	25%	10%

<table>
<tr><td>Annual clinker production ($CLNK_{BSL}$)

(monitored parameter in base year)</td><td>Ex-ante estimation:
Annual clinker production = Daily clinker production x no of days</td></tr>
<tr><td>Daily clinker production = 5600 tonnes per day</td><td>It is sourced from feasibility report/7/. The validation team has reviewed the feasibility report and accepted.</td></tr>
<tr><td>No of working days in a year = 330 days per year</td><td>It is sourced from feasibility report/7/. The validation team has reviewed the feasibility report and accepted.</td></tr>
<tr><td>Annual clinker production ($CLNK_{BSL}$) = 1,848,000 tonnes per year

(monitored parameter in base year)</td><td>Ex-ante estimation:
Annual clinker production = Daily clinker production x no of days

Ex-post monitoring in base year:
As per the applied methodology/2/, it is to be measured using weight meters. As per the PDD/3/, it is measured using Weight meters/ Weighfeeder, the data is connected to control room. The sum of annual clinker tonnage utilized for producing each cement type provides the total clinker utilized to produce cement.

QA/QC procedure:
The weight feeders will be calibrated every two years.</td></tr>
<tr><td>Percentage of clinker for corresponding blended cement

<table><tr><td>Type of blended cement type</td><td>% clinker share</td></tr><tr><td>PPC</td><td>65%</td></tr><tr><td>PLC</td><td>65%</td></tr><tr><td>PC</td><td>61%</td></tr></table></td><td>As per Derba' board meeting decision/18/ dated 28th November 2011, Tentative targeted clinker share is proposed against each of the blended cement produced. The validation team has reviewed the report and accepted.</td></tr>
<tr><td>Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes

(monitored parameter during year y)

<table><tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr><tr><td>1</td><td>2.55</td><td>NP</td><td>NP</td></tr><tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr></table>
NP- No Production</td><td>Ex-ante estimation:
It is calculated as follows.
BC_y = percentage share of blended cement x annual clinker production /percentage of clinker of corresponding blended cement

The same figure appears in the Derba' board meeting decision/18/ dated 28th November 2011. The estimate provided by the PP is hence reasonable and accepted by the validation team.

Ex-post monitoring during year y:
As per the applied methodology/2/, this parameter is to be monitored annually. As per PDD/3/, it will be measured annually using weight meter/weighfeeder. It will be then cross checked with domestic sales record and export in respect of each type of cement classified as per the clinker share in the Ethiopian standard. The total cement produced under each cement type in a given year deducted by the total cement exported under each cement type in a given year, will give the cement domestically sold in each crediting year. Hence the description and the means of monitoring described in the plan comply with the requirements of the methodology.

QA/QC procedure:
Weigh meters will be calibrated as per manufacturer's specification or every 2 years.</td></tr>
<tr><td>CO_2 emissions per tonne of clinker in year *y* ($BE_{clinker,y}$)</td><td>As per step 1 or equation 2 of the applied methodology/2/, it is calculated as follows.
$$BE_{clinker,y} = \min\left(BE_{clinker,BSL}, PE_{clinker,y}\right)$$
Where $BE_{clinker,BSL}$ - CO_2 emissions per tonne of clinker in the base year
$PE_{clinker,y}$ - CO_2 emissions per tonne of clinker in the project activity plant in year y</td></tr>
<tr><td>CO_2 emissions per tonne of clinker in the base year ($BE_{clinker,BSL}$)</td><td>As per step 1.1 or equation 3 of the applied methodology, $BE_{clinker,BSL}$ is calculated as follows.</td></tr>
</table>

	$BE_{clinker,BSL} = BE_{calcin} + BE_{fossl\ fuel} + BE_{ele,grid,CLNK} + BE_{ele,sg,CLNK}$ Where BE_{calcin}- Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate $BE_{fossil\ fuel}$- Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production $BE_{ele,grid,CLNK}$- Baseline grid electricity emissions for clinker production per tonne of clinker $BE_{ele,sg,CLNK}$- Baseline emissions from self-generated electricity for clinker production per tonne of clinker The validation of each is detailed below.
Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (BE_{calcin})	As per step 1.1.1 or equation 4 of the applied methodology, Baseline emission per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (BE_{calcin}) is calculated as follows. $BE_{calcin} = \frac{0.785 \times (OutCaO - InCaO) + 1.092 \times (OutMgO - InMgO)}{CLNK_{BSL}}$ Where 0.785-Stoichiometric emission factor for CaO OutCaO- Baseline CaO content in the clinker produced InCaO- Baseline non-carbonated CaO content in the raw material 1.092-Stoichiometric emission factor for MgO OutMgO- Baseline MgO content in the clinker produced InMgO- Baseline non-carbonated MgO content in the raw material $CLNK_{BSL}$-Annual production of clinker in the base year
Baseline CaO content in the clinker produced (OutCaO)	Ex-ante estimation: OutCaO = CaO content in Clinker x Annual clinker production
CaO content in Clinker = 64.05%	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
Baseline CaO content in the clinker produced (OutCaO) =1,183,644 tonnes per year (monitored parameter used in base year)	Ex-ante estimation: OutCaO = CaO content in Clinker x Annual clinker production Ex-post monitoring in the base year: As per the applied methodology[/2/], this parameter shall be determined based on the monitoring value of the first operational year. As per the PDD[/3/], it is calculated as the CaO content (%) of the clinker times clinker produced. CaO content is measured using X-ray Efflorescence apparatus. QA/QC procedure: XRF apparatus will be calibrated every two years.
Baseline non-carbonated CaO content in the raw material (InCaO) =0 (monitored parameter used in base year)	Ex-ante estimation: It is sourced from feasibility report[/7/]. Since all the raw materials are carbonated materials and hence InCaO is zero. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring in the base year: As per the applied methodology[/2/], this parameter shall be determined based on the monitoring value of the first operational year. Non-carbonated CaO content (%) shall be calculated as the percentage of CaO in the total raw material. As per the PDD, on-site % non-carbonated CaO is measured in XRF records and InCaO calculated as the non-carbonated CaO content (%) of the raw material times total raw material used to produce clinker. QA/QC procedure: XRF apparatus will be calibrated every two years.
Baseline MgO content in the clinker	E-ante estimation:

produced (OutMgO)	OutMgO = MgO content in Clinker x Annual clinker production
MgO content in Clinker = 3.45%	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
Baseline MgO content in the clinker produced (OutMgO) =63,756 tonnes per year (monitored parameter used in base year)	E-ante estimation: OutMgO = MgO content in Clinker x Annual clinker production Ex-post monitoring in the base year: As per the applied methodology[/2/], this parameter shall be determined based on the monitoring value of the first operational year. As per the PDD[/3/], it is calculated as the MgO content (%) of the clinker times clinker produced. MgO content is measured using X-ray Efflorescence apparatus. QA/QC procedure: XRF apparatus will be calibrated every two years.
Baseline non-carbonated MgO content in the raw material (InMgO) =0 (monitored parameter used in base year)	Ex-ante estimation : It is sourced from feasibility report[/7/]. Since all the raw materials are carbonated materials and hence InMgO is zero. The validation team has reviewed the feasibility report[/7/] and accepted. Ex-post monitoring in the base year: As per the applied methodology, this parameter shall be determined based on the monitoring value of the first operational year. Non-carbonated MgO content (%) shall be calculated as the percentage of MgO in the total raw material. As per the PDD, on-site % non-carbonated MgO is measured in XRF records and InMgO calculated as the non-carbonated MgO content (%) of the raw material times total raw material used to produce clinker. QA/QC procedure: XRF apparatus will be calibrated every two years.
Annual production of clinker in the base year ($CLNK_{BSL}$) =1,848,000 tonnes per year (monitored parameter in base year)	The validation of the same is detailed above.
Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (BE_{calcin}) =0.54 tCO2/tonne of clinker	As per step 1.1.1 or equation 4 of the applied methodology, Baseline emission per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (BE_{calcin}) is calculated as follows. $BE_{calcin} = \frac{0.785 \times (OutCaO - InCaO) + 1.092 \times (OutMgO - InMgO)}{CLNK_{BSL}}$
Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production ($BE_{fossil\ fuel}$)	As per step 1.1.2 or equation 5 of the applied methodology, baseline emission per tonne of clinker due to combustion of fossil fuels for clinker production ($BE_{fossil\ fuel}$) is calculated as $BE_{fossil\ fuel} = \frac{\sum FF_{i,BSL} \times EFF_i}{CLNK_{BSL}}$
Fossil fuel of type *i* consumed for clinker production in the base year ($FF_{i,BSL}$) Where i_1 =coal (monitored parameter in base year)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,BSL}$ $FF_{i,BSL}$ = tonne of coal used per tonne of clinker x annual production of clinker
tonne of coal used per tonne of clinker =0.118 tonnes of coal/ tonne of clinker	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
Fossil fuel of type *i* consumed for clinker production in the base year	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,BSL}$

($FF_{i,BSL}$) =218,064 tonnes of coal per year (monitored parameter in base year)	$FF_{i,BSL}$ = tonne of coal used per tonne of clinker x annual production of clinker Ex-post monitoring in base year: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using Weight meters/ Weighfeeder, the data is connected to control room. QA/QC procedure: The weight feeders will be calibrated every two years.
Emission factor for fossil fuel *i* $E_{FF,i=coal}$ (in tCO2/tonne of coal)	$E_{FF,i=coal}$ = Emission factor of coal (in tCO2/TJ)x NCV of coal
Emission factor of coal = 98.3 tCO2/TJ (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
NCV of coal = 6250 kCal/kg of coal or 0.0261625 TJ/tonne of coal Type of coal = South African Anthracite coal (monitored parameter in base year and during year y)	Ex-ante parameter: It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC[/34/] Guidelines
Emission factor for fossil fuel *i* $E_{FF,i=coal}$ (in tCO2/tonne of coal) = 2.57 tCO2/tonne of coal	$E_{FF,i=coal}$ = Emission factor of coal (in tCO2/TJ)x NCV of coal
Fossil fuel of type *i* consumed for clinker production in the base year ($FF_{i,BSL}$) Where i_2=HFO (monitored parameter in base year)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,BSL}$ $FF_{i,BSL}$ = tonne of HFC used per tonne of clinker x annual production of clinker The validation team has confirmed during the onsite visit that, the kiln is designed to utilize both Coal and HFO. It is also understood from the factory manager that coal is convenient than HFO to use for logistical reasons and it is expected that coal only be used in future.
tonne of HFO used per tonne of clinker = 0 tonnes of HFO/ tonne of clinker	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
Fossil fuel of type *i* consumed for clinker production in the base year ($FF_{i,BSL}$) = 0 tonnes of HFO per year (monitored parameter in base year)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,BSL}$ $FF_{i,BSL}$ = tonne of HFO used per tonne of clinker x annual production of clinker Ex-post monitoring in base year: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using flowmeters, the data is connected to control room.

	QA/QC procedure: The flowmeters will be calibrated every two years.
Emission factor for fossil fuel *i* $E_{FF,i=HFO}$ (in tCO2/tonne of HFO)	$E_{FF,i=HFO}$ = Emission factor of HFO (in tCO2/TJ)x NCV of HFO
Emission factor of HFO = 77.4 tCO2/TJ (monitored parameter in base year and year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
NCV of HFO = 41.7 TJ/Gg of HFO (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC[/34/] Guidelines
Emission factor for fossil fuel *i* $E_{FF,i=HFO}$ (in tCO2/tonne of HFO) = 3.227 tCO2/tonne of HFO	$E_{FF,i=coal}$ = Emission factor of HFO (in tCO2/TJ)x NCV of HFO
Annual production of clinker in the base year ($CLNK_{BSL}$) =1,848,000 tonnes per year (monitored parameter in base year)	The validation of the same is detailed above.
Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production ($BE_{fossil\ fuel}$) =0.30 tCO_2/ tonne of clinker	As per step 1.1.2 or equation 5 of the applied methodology, baseline emission per tonne of clinker due to combustion of fossil fuels for clinker production ($BE_{fossil\ fuel}$) is calculated as $BE_{fossil\ fuel} = \frac{\sum FF_{i,BSL} \times EFF_i}{CLNK_{BSL}}$
Baseline grid electricity emissions for clinker production per tonne of clinker ($BE_{ele,grid,CLNK}$)	As per step 1.1.3 or equation 6 of the applied methodology, Baseline grid electricity emission for clinker production per tonne of clinker ($BE_{ele,grid,CLNK}$) is calculated as: $BE_{ele,grid,CLNK} = \frac{BELE_{grid,CLNK} \times EF_{grid,BSL}}{CLNK_{BSL}}$ Where $BELE_{grid,CLNK}$ -Grid electricity consumed for clinker production in base year $EF_{grid,BSL}$ -Baseline grid emission factor $CLNK_{BSL}$ -Annual production of clinker in the base year
Grid electricity consumed for clinker production in base year ($BELE_{grid,CLNK}$) (monitored parameter in base year)	Ex-ante estimation: It is calculated total electricity demand in kW x no of hours per year
Total electricity demand for clinker = 25 MW	It is taken from feasibility report[/7/]. Hence accepted by the validation team.
No of operating hours =330 days per year	It is taken from feasibility report[/7/]. Hence accepted by the validation team.

Grid electricity consumed for clinker production in base year ($BELE_{grid,CLNK}$) = 8250 MWh/year (monitored parameter in base year)	Ex-ante estimation: It is calculated total electricity demand in MW x no of hours per year Ex-post monitoring during base year: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.
Baseline grid emission factor ($EF_{grid,BSL}$) =0 tCO2/MWh (ex-ante parameter)	As per step 6.1 of the applied methodology[/2/], $EF_{grid,BSL}$ is shall be calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" [/35/] version 5.0 Energy Changes Projektentwicklung GmbH has been contracted by the Austrian Ministry of Environment for calculating the Combined margin emission factor of Ethiopia' electricity system. As per this report[/24/] version 1 dated 11th August 2008 (which is based on Tool to calculate the emission factor for an electricity system), combined margin emission factor = 0.00591 tCO2/MWh. PP has considered it to be negligible. Since it is conservative the validation team has accepted.
Annual production of clinker in the base year ($CLNK_{BSL}$) =1,848,000 tonnes per year (monitored parameter in base year)	The validation of the same is detailed above.
Baseline grid electricity emissions for clinker production per tonne of clinker ($BE_{ele,grid,CLNK}$) =0 tCO2/tonne of clinker	As per step 1.1.3 or equation 6 of the applied methodology, Baseline grid electricity emission for clinker production per tonne of clinker ($BE_{ele,grid,CLNK}$) is calculated as: $BE_{ele,grid,CLNK} = \frac{BELE_{grid,CLNK} \times EF_{grid,BSL}}{CLNK_{BSL}}$ Since $EF_{grid,BSL}$ is 0 tCO2/MWh, $BE_{ele,grid,CLNK}$ = 0 tCO2/tonne of clinker
Baseline emissions from self-generated electricity for clinker production per tonne of clinker ($BE_{ele,sg,CLNK}$)	As per step 1.1.4 or equation 7 of the applied methodology, Baseline emission from self-generated electricity for clinker production per tonne of clinker ($BE_{ele,sg,CLNK}$) is calculated as: $BE_{ele,sg,CLNK} = \frac{BELE_{sg,CLNK} \times EF_{sg,BSL}}{CLNK_{BSL}}$ Where $BELE_{sg,CLNK}$ Self generation of electricity for clinker production in the base year $EF_{sg,BSL}$ Emission factor for self-generated electricity in the base year $CLNK_{BSL}$ Annual production of clinker in the base year
Self generation of electricity for clinker production in the base year ($BELE_{sg,CLNK}$) = 0 MWh	Ex-ante parameter: Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for clinker production. Ex-post monitoring during base year: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.

Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) (monitored parameter in base year)	Ex-ante parameter: As per step 6.3 or equation 26 of the applied methodology, Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in the base year $EF_{sg,BSL} = \frac{\sum_{m,n} F_{m,n,BSL} \times COEF_m}{\sum_n GEN_{n,BSL}}$ Where $F_{m,n,BSL}$ -Amount of fuel *m* consumed by relevant power sources *n* in the base year (mass or volume unit) $COEF_m$ -CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percentage oxidation of the fuel in the base year $GEN_{n,BSL}$ -Electricity generated by the source *n* in year *y*
Amount of fuel *m* consumed by relevant power sources *n* in the base year (mass or volume unit) ($F_{m,n,BSL}$) = 0 tonnes (monitored parameter during base year) m- Diesel n- Diesel power plant of 1701 kW capacity	Ex-ante estimation: As no diesel is used in the diesel power plant, this is taken as zero. The validation team has reviewed the feasibility report where it is stated that rated power requirement of 50 kWh/t-clinker and 88 kWh/t-cement is required which implies the kiln alone will need 25 MW and the cement & additive mills will need 12MW to provide its daily output. But diesel power plant of 1.7 MW is not at all sufficient for clinker production. As observed at the site, DG set is used only during emergency purpose and cannot run any part of plant that requires 45MW. It is only automatically switched on by itself at grid power interruption to prevent abrupt stoppage of kiln and related kiln damage (refractory brick damage). Kiln production stops as soon as power is interrupted. Ex-post monitoring in base year: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using Weight meters/ volume meters. QA/QC procedure: It can be crosschecked with purchase invoices.
CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percentage oxidation of the fuel in the base year ($COEF_m$)	As per equation 27 of the applied methodology, $COEF_m$ is calculated as follows. $COEF_m = NCV_m \times EF_{CO2,m} \times OXID_m$ Where NCV_m -Net calorific value per mass or volume unit of a fuel m $EF_{CO2,m}$ -CO_2 emission factor per unit of energy of the fuel *m* $OXID_m$ -Oxidation factor of the fuel m
Net calorific value per mass or volume unit of a fuel m ($NCV_{m=diesel}$) = 43.3 TJ/Gg (monitored parameter in base year and in year y)	Ex-ante estimation: It is sourced from IPCC report[/34/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC[/34/] Guidelines

CO_2 emission factor per unit of energy of the fuel *m* ($EF_{CO2,m=diesel}$) = 74.1 tCO2/TJ (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
Oxidation factor of the fuel m ($OXID_m$) =1 (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percentage oxidation of the fuel in the base year ($COEF_m$) = 3.208 tCO2/tonne of diesel	As per equation 27 of the applied methodology, $COEF_m$ is calculated as follows. $COEF_m = NCV_m \times EF_{CO2,m} \times OXID_m$ Where NCV_m -Net calorific value per mass or volume unit of a fuel m $EF_{CO2,m}$ -CO_2 emission factor per unit of energy of the fuel *m* $OXID_m$ -Oxidation factor of the fuel m
Electricity generated by the source n in year y ($GEN_{n,BSL}$) = 0 kWh (monitored parameter in base year)	Ex-ante estimation: As no diesel is used in the diesel power plant, no electricity would have been produced and so it is zero Ex-post monitoring in base year: As per the PDD, it is measured using electricity meters every year. QA/QC procedure: The electricity meters will be calibrated every two years.
Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) = 0 tCO2/MWh (monitored parameter in base year)	Ex-ante estimation: As per step 6.3 or equation 26 of the applied methodology, Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in the base year $EF_{sg,BSL} = \frac{\sum_{m,n} F_{m,n,BSL} \times COEF_m}{\sum_n GEN_{n,BSL}}$ As no diesel is used in the base year, $EF_{sg,BSL}$ = 0 tCO2/MWh Ex-post monitoring in base year: It is calculated from the monitored parameters as above. QA/QC procedure: Not applicable as it is calculated from the monitored parameters.
Annual production of clinker in the base year ($CLNK_{BSL}$) =1,848,000 tonnes per year (monitored parameter in base year)	The validation of the same is detailed above.

Baseline emissions from self-generated electricity for clinker production per tonne of clinker (*$BE_{ele,sg,CLNK}$*) =0 tCO2/tonne of clinker	As per step 1.1.4 or equation 7 of the applied methodology, Baseline emission from self-generated electricity for clinker production per tonne of clinker ($BE_{ele,sg,CLNK}$) is calculated as: $$BE_{ele,sg,CLNK} = \frac{BELE_{sg,CLNK} \times EF_{sg,BSL}}{CLNK_{BSL}}$$ Since $EF_{sg,BSL}$ = 0 tCO2/MWh, $BE_{ele,sg,CLNK}$ is also 0 tCO2/tonne of clinker
CO_2 emissions per tonne of clinker in the base year ($BE_{clinker,BSL}$) =0.84 tCO2/tonne of clinker	As per step 1.1 or equation 3 of the applied methodology, $BE_{clinker,BSL}$ is calculated as follows. $$BE_{clinker,BSL} = BE_{calcin} + BE_{fossl\ fuel} + BE_{ele,grid,CLNK} + BE_{ele,sg,CLNK}$$
CO_2 emissions per tonne of clinker in year y ($PE_{clinker,y}$)	As per step 4 or equation 14 of the applied methodology, $PE_{clinker,y}$ is calculated as follows. $$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\ fuel,y} + PE_{ele,grid,CLNK,y} + PE_{ele,sg,CLNK,y}$$ Where $PE_{calcin,y}$- Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y $PE_{fossil\ fuel,y}$- Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y $PE_{ele,grid,CLNK,y}$- Grid electricity emissions for clinker production per tonne of clinker in year y $PE_{ele,sg,CLNK,y}$- emissions from self-generated electricity for clinker production per tonne of clinker in year y The validation of each is detailed below.
Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y ($PE_{calcin,y}$)	As per step 4.1 or equation 15 of the applied methodology, Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y ($PE_{calcin,y}$) is calculated as follows. $$PE_{calcin,y} = \frac{0.785 \times (OutCaO_y - InCaO_y) + 1.092 \times (OutMgO_y - InMgO_y)}{CLNK_y}$$ Where 0.785-Stoichiometric emission factor for CaO $OutCaO_y$- CaO content in the clinker produced in year y $InCaO_y$- Non-carbonated CaO content in the raw material in year y 1.092-Stoichiometric emission factor for MgO $OutMgO_y$- MgO content in the clinker produced in year y $InMgO_y$- Non-carbonated MgO content in the raw material in year y $CLNK_y$-Annual production of clinker in year y
CaO content in the clinker produced ($OutCaO_y$)	Ex-ante estimation: OutCaOy = CaO content in Clinker produced in year y x Annual clinker production in year y
CaO content in Clinker = 64.05%	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
CaO content in the clinker produced ($OutCaO_y$) =1,183,644 tonnes per year (monitored parameter in year y)	Ex-ante estimation: $OutCaO_y$ = CaO content in Clinker x Annual clinker production in year y Ex-post monitoring in year y: As per the applied methodology, this parameter shall be determined every year. As per the PDD, it is calculated as the CaO content (%) of the clinker times clinker produced. CaO content is measured using X-ray Efflorescence apparatus. QA/QC procedure: XRF apparatus will be calibrated every two years.
Non-carbonated CaO content in the raw material ($InCaO_y$) =0 (monitored parameter in year y)	Ex-ante estimation : It is sourced from feasibility report[/7/]. Since all the raw materials are carbonated materials and hence $InCao_y$ is zero. The validation team has reviewed the feasibility report and accepted.

	Ex-post monitoring in year y: As per the applied methodology, this parameter shall be determined every year. Non-carbonated CaO content (%) shall be calculated as the percentage of CaO in the total raw material. As per the PDD, on-site % non-carbonated CaO is measured in XRF records and InCaO calculated as the non-carbonated CaO content (%) of the raw material times total raw material used to produce clinker. QA/QC procedure: XRF apparatus will be calibrated every two years.
MgO content in the clinker produced ($OutMgO_y$)	Ex-ante estimation: OutMgOy = MgO content in Clinker in year y x Annual clinker production in year y
MgO content in Clinker = 3.45%	It is sourced from feasibility report/7/. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
MgO content in the clinker produced ($OutMgO_y$) =63,756 tonnes per year (monitored parameter in year y)	E-ante estimation: OutMgO = MgO content in Clinker x Annual clinker production Ex-post monitoring in year y: As per the applied methodology, this parameter shall be determined based on the monitoring value of the first operational year. As per the PDD, it is calculated as the MgO content (%) of the clinker times clinker produced. MgO content is measured using X-ray Efflorescence apparatus. QA/QC procedure: XRF apparatus will be calibrated every two years.
Non-carbonated MgO content in the raw material ($InMgO_y$) =0 (monitored parameter in year y)	Ex-ante estimation : It is sourced from feasibility report/7/. Since all the raw materials are carbonated materials and hence InMgO is zero. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring in year y: As per the applied methodology, this parameter shall be determined based on the monitoring value of the first operational year. Non-carbonated MgO content (%) shall be calculated as the percentage of MgO in the total raw material. As per the PDD, on-site % non-carbonated MgO is measured in XRF records and InMgO calculated as the non-carbonated MgO content (%) of the raw material times total raw material used to produce clinker. QA/QC procedure: XRF apparatus will be calibrated every two years.
Annual production of clinker in year y ($CLNK_y$) =1,848,000 tonnes per year (monitored parameter during year y)	Ex-ante estimation: The validation of the same already detailed above. Ex-post monitoring in year y: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using Weight meters/ Weighfeeder, the data is connected to control room. The sum of annual clinker tonnage utilized for producing each cement type provides the total clinker utilized to produce cement. QA/QC procedure: The flowmeters/weight feeders will be calibrated every two years.
Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate ($PE_{calcin,y}$) =0.54 tCO2/tonne of clinker	As per step 4.1 or equation 15 of the applied methodology, Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y ($PE_{calcin,y}$) is calculated as follows. $PE_{calcin,y} = \frac{0.785 \times (OutCaO_y - InCaO_y) + 1.092 \times (OutMgO_y - InMgO_y)}{CLNK_y}$

Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y ($PE_{fossil\ fuel,y}$)	As per step 4.2 or equation 16 of the applied methodology, emission per tonne of clinker due to combustion of fossil fuels for clinker production in year y ($PE_{fossil\ fuel,y}$) is calculated as $$PE_{fossil\ fuel,y} = \frac{\sum FF_{l,y} \times EFF_l}{CLNK_y}$$
Fossil fuel of type *i* consumed for clinker production in year y ($FF_{i,y}$) Where i =coal (monitored parameter during year y)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,y}$ $FF_{i,y}$ = tonne of coal used per tonne of clinker in year y x annual production of clinker in year y
tonne of coal used per tonne of clinker =0.118 tonnes of coal/ tonne of clinker	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year (monitored parameter during year y)	The validation of the same is detailed above.
Fossil fuel of type *i* consumed for clinker production in y ($FF_{i,y}$) =218,064 tonnes of coal per year (monitored parameter during year y)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,y}$ $FF_{i,y}$ = tonne of coal used per tonne of clinker x annual production of clinker Ex-post monitoring during year y: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using Weight meters/ Weighfeeder, the data is connected to control room. QA/QC procedure: The flowmeters/weight feeders will be calibrated every two years.
Emission factor for fossil fuel *i* $E_{FF,i=coal}$ (in tCO2/tonne of coal)	$E_{FF,i=coal}$ = Emission factor of coal (in tCO2/TJ)x NCV of coal
Emission factor of coal = 98.3 tCO2/TJ (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
NCV of coal = 6250 kCal/kg of coal or 0.0261625 TJ/tonne of coal Type of coal = South African Anthracite coal (monitored parameter in base year during year y)	Ex-ante parameter: It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines[/34/].
Emission factor for fossil fuel *i* $E_{FF,i=coal}$ (in tCO2/tonne of coal) = 2.57 tCO2/tonne of coal	$E_{FF,i=coal}$ = Emission factor of coal (in tCO2/TJ)x NCV of coal
Fossil fuel of type *i* consumed for clinker production in year y ($FF_{i,y}$) Where i_2=HFO (monitored parameter during year y)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,y}$ $FF_{i,BSL}$ = tonne of HFC used per tonne of clinker x annual production of clinker

	The validation team has confirmed during the onsite visit that, the kiln is designed to utilize both Coal and HFO. It is also understood from the factory manager that coal is convenient than HFO to use for logistical reasons and it is expected that coal only be used in future.
tonne of HFO used per tonne of clinker = 0 tonnes of HFO/ tonne of clinker	It is sourced from feasibility report[/7/]. The validation team has reviewed the feasibility report and accepted.
Annual clinker production = 1,848,000 tonnes per year	The validation of the same is detailed above.
Fossil fuel of type *i* consumed for clinker production in year y ($FF_{i,y}$) = 0 tonnes of HFO per year (monitored parameter in base year and during year y)	Ex-ante estimation: PP has used the following formula for calculating $FF_{i,y}$ $FF_{i,y}$ = tonne of HFO used per tonne of clinker x annual production of clinker Ex-post monitoring during year y: As per the applied methodology, it is to be measured using weight meters. As per the PDD, it is measured using flowmeters, the data is connected to control room. QA/QC procedure: The flowmeters will be calibrated every two years.
Emission factor for fossil fuel *i* $E_{FF,i=HFO}$ (in tCO2/tonne of HFO)	$E_{FF,i=HFO}$ = Emission factor of HFO (in tCO2/TJ)x NCV of HFO
Emission factor of HFO = 77.4 tCO2/TJ (monitored parameter during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
NCV of HFO = 41.7 TJ/Gg of HFO (monitored parameter during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC[/34/] Guidelines

Emission factor for fossil fuel *i* $E_{FF,i=HFO}$ (in tCO2/tonne of HFO) = 3.227 tCO2/tonne of HFO (monitored parameter during year y)	$E_{FF,i=coal}$ = Emission factor of HFO (in tCO2/TJ)x NCV of HFO
Annual production of clinker in year ($CLNK_y$) =1,848,000 tonnes per year (monitored parameter during year y)	The validation of the same is detailed above.
Emissions per tonne of clinker due to combustion of fossil fuels for clinker production ($PE_{fossil\ fuel,y}$) =0.30 tCO_2/ tonne of clinker	As per step 4.2 or equation 16 of the applied methodology, emission per tonne of clinker due to combustion of fossil fuels for clinker production in year y ($PE_{fossil\ fuel,y}$) is calculated as $PE_{fossil\ fuel,y} = \frac{\sum FF_{l,y} \times EFF_l}{CLNK_y}$
Grid electricity emissions for clinker production per tonne of clinker ($PE_{ele,grid,CLNK,y}$)	As per step 4.3 or equation 17 of the applied methodology, grid electricity emission for clinker production per tonne of clinker in year y ($PE_{ele,grid,CLNK,y}$) is calculated as: $PE_{ele,grid,CLNK,y} = \frac{PELE_{grid,CLNK,y} \times EF_{grid,y}}{CLNK_y}$ Where $PELE_{grid,CLNK}$ -Grid electricity consumed for clinker production in base year $EF_{grid,y}$ –Grid emission factor $CLNK_y$ -Annual production of clinker in year y
Grid electricity consumed for clinker production in year y ($PELE_{grid,CLNK,y}$) (monitored parameter in year y)	Ex-ante estimation: It is calculated total electricity demand in kW x no of hours per year
Total electricity demand for clinker = 25 MW	It is taken from feasibility report[/7/]. Hence accepted by the validation team.
No of operating hours = 330 days per year	It is taken from feasibility report[/7/]. Hence accepted by the validation team.
Grid electricity consumed for clinker production in year y ($PELE_{grid,CLNK,y}$) = 8250 MWh/year (monitored parameter in year y)	Ex-ante estimation: It is calculated total electricity demand in MW x no of hours per year Ex-post monitoring during year y: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.
Grid emission factor ($EF_{grid,y}$) =0 tCO2/MWh (ex-ante parameter)	As per step 6.1 of the applied methodology, $EF_{grid,y}$ is shall be calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" version 5.0 Energy Changes Projektentwicklung GmbH has been contracted by the Austrian Ministry of Environment for calculating the Combined margin emission factor of Ethiopia' electricity system. As per this report[/24/] version 1 dated 11th August 2008 (which is based on Tool to calculate the emission factor for an electricity system), combined margin emission factor = 0.00591 tCO2/MWh. PP has considered it to be negligible which is accepted by the validation team.
Annual production of clinker in year ($CLNK_y$) =1,848,000 tonnes per year (monitored parameter during year y)	The validation of the same is detailed above.

Grid electricity emissions for clinker production per tonne of clinker ($PE_{ele,grid,CLNK,\ y}$) = 0 tCO2/tonne of clinker	As per step 4.3 or equation 17 of the applied methodology, grid electricity emission for clinker production per tonne of clinker in year y ($PE_{ele,grid,CLNK,y}$) is calculated as: $$PE_{ele,grid,CLNK,y} = \frac{PELE_{grid,CLNK,y} \times EF_{grid,y}}{CLNK_y}$$ Since $EF_{grid,y}$ is 0 tCO2/MWh, $PE_{ele,grid,CLNK,\ y}$ = 0 tCO2/tonne of clinker
Emissions from self-generated electricity for clinker production per tonne of clinker in year y ($PE_{ele,sg,CLNK,y}$)	As per step 4.4 or equation 18 of the applied methodology, emission from self-generated electricity for clinker production per tonne of clinker production in year y ($PE_{ele,sg,CLNK,y}$) is calculated as: $$PE_{ele,sg,CLNK,y} = \frac{PELE_{sg,CLNK,y} \times EF_{sg,y}}{CLNK_y}$$ Where $PELE_{sg,CLNK,y}$ - Self generation of electricity for clinker production in the year y $EF_{sg,y}$ Emission factor for self-generated electricity in year y $CLNK_y$ - Annual production of clinker in year y
Self generation of electricity for clinker production in the year y ($PELE_{sg,CLNK,y}$) = 0 MWh	Ex-ante parameter: Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for clinker production. Ex-post monitoring during year y: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.
Emission factor for self-generated electricity in year ($EF_{sg,y}$) (monitored parameter during year y)	Ex-ante estimation: As per step 6.2 or equation 24 of the applied methodology, Emission factor for self-generated electricity in year y ($EF_{sg,y}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in year y $$EF_{sg,y} = \frac{\sum_{k,j} F_{k,j,y} \times COEF_k}{\sum_j GEN_{j,y}}$$
Amount of fuel *m* consumed by relevant power sources *n* in year y (mass or volume unit) ($F_{k,j,y}$) = 0 tonnes (monitored parameter during year y) k- Diesel j- Diesel power plant of 1701 kW capacity	Ex-ante estimation: As no diesel is used in the diesel power plant, this is taken as zero. Ex-post monitoring in year y: As per the applied methodology, it is to be measured using weight volume meters. As per the PDD, it is measured using Weight meters/ volume meters. QA/QC procedure: It can be crosschecked with purchase invoices.
CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percentage oxidation of the fuel in the base year ($COEF_k$)	As per equation 25 of the applied methodology, $COEF_k$ is calculated as follows. $$COEF_k = NCV_k \times EF_{CO2,k} \times OXID_k$$ Where NCV_m -Net calorific value per mass or volume unit of a fuel m $EF_{CO2,m}$ -CO_2 emission factor per unit of energy of the fuel *m* $OXID_m$ -Oxidation factor of the fuel m

Net calorific value per mass or volume unit of a fuel m ($NCV_{k=diesel}$) = 43.3 TJ/Gg (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/]. The validation team has reviewed the feasibility report and accepted. Ex-post monitoring during year y: As per the applied methodology, it can be sourced from option a to d with option a is the most preferred order. QA/QC procedure: The value for NCV considered under option a), b) and c) are verified to be within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC[/34/] Guidelines
CO_2 emission factor per unit of energy of the fuel *m* ($EF_{CO2,k=diesel}$) = 74.1 tCO2/TJ (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
Oxidation factor of the fuel m ($OXID_k$) =1 (monitored parameter in base year and during year y)	Ex-ante estimation: It is sourced from IPCC report[/34/] 2006 hence accepted. Ex-post monitoring during base year and during year y: As per the applied methodology, it can be sourced from IPCC report and it monitored annually. QA/QC procedure: The value will be kept constant unless IPCC default value is revised.
CO_2 emission coefficient of fuel *m*, taking into account the carbon content of the fuels used by relevant power sources *n* and the percentage oxidation of the fuel in year y ($COEF_m$) = 3.208 tCO2/tonne of diesel	As per equation 24 of the applied methodology, $COEF_m$ is calculated as follows. $COEF_m = NCV_m \times EF_{CO2,m} \times OXID_m$ Where NCV_m -Net calorific value per mass or volume unit of a fuel m $EF_{CO2,m}$ -CO_2 emission factor per unit of energy of the fuel *m* $OXID_m$ -Oxidation factor of the fuel m
Electricity generated by the source n in year y ($GEN_{n,y}$) = 0 kWh (monitored parameter in year y)	Ex-ante estimation: As no diesel is used in the diesel power plant, no electricity would have been produced and so it is zero Ex-post monitoring in year y: As per the PDD, it is measured using electricity meters every year. QA/QC procedure: The electricity meters will be calibrated every two years.
Emission factor for self-generated electricity in year ($EF_{sg,y}$) = 0 tCO2/MWh (monitored parameter during year y)	Ex-ante estimation: As per step 6.2 or equation 24 of the applied methodology, Emission factor for self-generated electricity in year y ($EF_{sg,y}$) is calculated as the generation-weighted average emissions per electricity unit (t CO_2/MWh) of all self-generating sources in the project boundary serving the system in year y $EF_{sg,y} = \frac{\sum_{k,j} F_{k,j,y} \times COEF_k}{\sum_j GEN_{j,y}}$ Since there is no diesel is used, $EF_{sg,y}$ = 0 tCO2/MWh Ex-post monitoring in year y: It is calculated from the monitored parameters as above.

	QA/QC procedure: Not applicable as it is calculated from monitored parameters
Annual production of clinker in year ($CLNK_y$) =1,848,000 tonnes per year (monitored parameter during year y)	The validation of the same is detailed above.
Emissions from self-generated electricity for clinker production per tonne of clinker in year y ($PE_{ele,sg,CLNK,y}$)=0 tCO2/tonne of clinker	As per step 4.4 or equation 18 of the applied methodology, emission from self-generated electricity for clinker production per tonne of clinker production in year y ($PE_{ele,sg,CLNK,y}$) is calculated as: $PE_{ele,sg,CLNK,y} = \frac{PELE_{sg,CLNK,y} \times EF_{sg,y}}{CLNK_y}$ Since $EF_{sg,y}$ = 0 tCO2/MWh, $PE_{ele,sg,CLNK,y}$ is also 0 tCO2/tonne of clinker
CO_2 emissions per tonne of clinker in the year y ($PE_{clinker,y}$) =0.84 tCO2/tonne of clinker	As per step 4 or equation 14 of the applied methodology, $PE_{clinker,y}$ is calculated as follows. $PE_{clinker,y} = PE_{calcin,y} + PE_{fossil\ fuel,y} + PE_{ele,grid,CLNK,y} + PE_{ele,sg,CLNK,y}$
CO_2 emissions per tonne of clinker in year *y* ($BE_{clinker,y}$) =0.84 tCO2/tonne of clinker	As per step 1 or equation 2 of the applied methodology, it is calculated as follows. $BE_{clinker,y} = \min(BE_{clinker,BSL}, PE_{clinker,y})$
Baseline benchmark of share of clinker per tonne of blended cement updated for year y ($B_{blend,y}$) (ex-ante parameter)	The calculation of $B_{blend,y}$ is described in step 2, step 2.1 through step 2.3. The validation of the same is detailed below.
Region = Ethiopia	PP has selected Ethiopia as applicable region which his accepted as correct. Since default region is selected, conditions prescribed step 2 of the applied methodology need not be proved.
Baseline benchmark of share of clinker per tonne of BC at the start of the project activity ($B_{Blend,1}$)	As per step 2.1 of the applied methodology**,** Baseline benchmark of share of clinker per tonne of blended cement at the start of the project activity ($B_{Blend,1}$) is determined as the lowest value among the following approaches a, b, c. Since the project is greenfield in nature as demonstrated as above approach c shall not be included in the analysis. The validation of the approaches ‘a’ and ‘b’ is detailed below.

<table>
<tr><td>Average (weighted by production) mass fraction of clinker (t clinker/t BC) for the 5 plants producing cement with the highest share of additives</td><td>Approach a:

Average (weighted by production) mass fraction of clinker (t clinker/t BC) for the 5 plants producing cement with the highest share of additives:

(i) Identify the amount of the relevant cement type produced by each plant in the region;

(ii) Determine the average (weighted by production) mass fraction of clinker (t clinker/t BC) for the 5 plants producing cement with the highest share of additives of the relevant cement type in the region;

(iii) If the region comprises of less than 5 plants producing the relevant cement type, the national market should be used as the default region</td></tr>
<tr><td>Identify the amount of the relevant cement type produced by each plant in the region: (in million tonnes)

<table><tr><td>Cement plant</td><td>PPC & %clinker</td></tr><tr><td>National Cement</td><td>0.11 & 75%</td></tr><tr><td>Mugher</td><td>0.66 & 72.86%</td></tr><tr><td>Mossobo</td><td>0.95 & 73.5%</td></tr></table>
Data year = 2008

Start date = 2009</td><td>As per the applied methodology, data concerning average blending ratio, annual production and import of the relevant cement types in the region shall be collected for one year prior to the start date of CDM project activity. The validation team has checked the annual production[20] of cement against each cement plant in the year 2008. The year 2008 was accepted as start date of the CDM project falls on 2009. The validation team has reviewed the annual production sheet[20] against each cement plants & share of clinker and accepted as correct.</td></tr>
<tr><td>Average (weighted by production) mass fraction of clinker =73.3% for PPC
(approach a)</td><td>Average (weighted by production) mass fraction of clinker = $\sum$ (annual cement production x share of clinker)/ $\sum$ (annual cement production</td></tr>
<tr><td>Production weighted average mass fraction of clinker in the top 20% of the total production of the blended cement type = 72.86%</td><td>Approach b:
The validation team has checked the annual production of cement against each cement plant. The validation team has reviewed the annual production sheet against each cement plants & share of clinker and accepted as correct</td></tr>
<tr><td>Baseline benchmark of share of clinker per tonne of BC at the start of the project activity for PPC ($B_{Blend,1}$) =72.86%</td><td>As per step 2.1 of the applied methodology, Baseline benchmark of share of clinker per tonne of blended cement at the start of the project activity ($B_{Blend,1}$) is determined as the lowest value among the approaches a, b.</td></tr>
<tr><td>Baseline benchmark of share of clinker per tonne of BC at the start of the project activity for PLC ($B_{Blend,1}$) =94%</td><td>There is no cement plant that is producing PLC, default value as per national standard[19] is considered which is accepted by the validation team.</td></tr>
<tr><td>Baseline benchmark of share of clinker per tonne of BC at the start of the project activity for PCC ($B_{Blend,1}$) =89%</td><td>There is no cement plant that is producing PC, default value as per national standard[19] is considered which is accepted by the validation team.</td></tr>
</table>

<table>
<tr>
<td>Baseline benchmark of share of clinker per tonne of BC for year y within the crediting period

<table>
<tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr>
<tr><td>1</td><td>72.86%</td><td>NP</td><td>NP</td></tr>
<tr><td>2</td><td>72.42%</td><td>94%</td><td>89%</td></tr>
<tr><td>3</td><td>71.97%</td><td>93.98%</td><td>88.88%</td></tr>
<tr><td>4</td><td>71.51%</td><td>93.96%</td><td>88.76%</td></tr>
<tr><td>5</td><td>71.04%</td><td>93.94%</td><td>88.63%</td></tr>
<tr><td>6</td><td>70.56%</td><td>93.92%</td><td>88.51%</td></tr>
<tr><td>7</td><td>70.07%</td><td>93.90%</td><td>88.38%</td></tr>
<tr><td>8</td><td>69.57%</td><td>93.87%</td><td>88.24%</td></tr>
<tr><td>9</td><td>69.06%</td><td>93.85%</td><td>88.11%</td></tr>
<tr><td>10</td><td>68.54%</td><td>93.83%</td><td>87.97%</td></tr>
</table>
NP- No production

(ex-ante parameter)</td>
<td>As per step 2.2, PP shall recalculate the benchmark value for each crediting year y within the crediting period starting from second year. As per step 2.2.1, PP can choose between two options defined in the applied methodology. PP has chosen option 2.
As per option 2, $B_{blend,y} = B_{blend,1}$ x $(100\%-2\%)^{y}$

Since the clinker share at the end of the crediting period does not go below the corresponding regulatory lower limit of Ethiopia for each of the relevant cement type, the validation team has accepted the $B_{blend,y}$. The lower limits being 65%, 65% and 45% respectively.</td>
</tr>
<tr>
<td>Baseline electricity emissions for BC grinding and preparation of additives ($BE_{ele,ADD,BC}$)</td>
<td>As per step 3 or equation 8 of the applied methodology, Baseline electricity emissions for BC grinding and preparation of additives ($BE_{ele,ADD,BC}$) is calculated as:
$$BE_{ele,ADD,BC} = BE_{ele,grid,BC} + BE_{ele,sg,BC} + BE_{ele,grid,ADD} + BE_{ele,sg,ADD}$$
Where
$BE_{ele,grid,BC}$ Baseline grid electricity emissions for blended cement grinding
$BE_{ele,sg,BC}$ Baseline self-generated electricity emissions for blended cement grinding
$BE_{ele,grid,ADD}$ Baseline grid electricity emissions for additive preparation
$BE_{ele,sg,ADD}$ Baseline self-generated electricity emissions for additive preparation</td>
</tr>
<tr>
<td>Baseline grid electricity emissions for blended cement grinding ($BE_{ele,grid,BC}$)</td>
<td>As per step 3.1 or equation 9 of the applied methodology, Baseline grid electricity emissions for blended cement grinding ($BE_{ele,grid,BC}$) is calculated as
$$BE_{ele,grid,BC} = \frac{BELE_{grid,BC} \times EF_{grid,BSL}}{BC_{BSL}}$$
$BELE_{grid,BC}$ Baseline grid electricity for grinding blended cement
$EF_{grid,BSL}$ Baseline grid emission factor
BC_{BSL} Annual production of blended cement in the base year</td>
</tr>
<tr>
<td>Grid electricity consumed for grinding blended cement in base year ($BELE_{grid,BC}$)

(monitored parameter in base year)</td>
<td>Ex-ante estimation:
It is calculated total electricity demand in kW x no of hours per year</td>
</tr>
<tr>
<td>Total electricity demand for grinding cement = 8 MW</td>
<td>It is taken from feasibility report[7]. Hence accepted by the validation team.</td>
</tr>
<tr>
<td>No of operating hours =330 days per year</td>
<td>It is taken from feasibility report[7]. Hence accepted by the validation team.</td>
</tr>
<tr>
<td>Grid electricity consumed for grinding blended cement in base year ($BELE_{grid,BC}$) = 2,640 MWh/year

(monitored parameter in base year)</td>
<td>Ex-ante estimation:
It is calculated total electricity demand in MW x no of hours per year
Ex-post monitoring during base year:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.

QA/QC procedure:
The electricity meters will be calibrated every 2 years.</td>
</tr>
</table>

<table>
<tr><td>Baseline grid emission factor ($EF_{grid,BSL}$) =0 tCO2e/MWh

(ex-ante parameter)</td><td>The validation of the same is detailed above.</td></tr>
<tr><td>Blended cement produced and sold in the domestic market in base year y (BC_{BSL}) in Million tonnes

PPC: 2.55 / PLC: 0.71 / PC: 0.30

(monitored parameter in base year)</td><td>Ex-ante estimation:
It is calculated as follows. PP has assumed the base year production to be same as that of first year production target for each of the relevant cement type
BC_{BSL} = percentage share of blended cement x annual clinker production /percentage of clinker of corresponding blended cement

The validation of this parameter is already detailed under BC_y

Ex-post monitoring in base year:
As per the applied methodology[2], this parameter is to be monitored annually. As per PDD[3], it will be measured annually using weight meter/weighfeeder. It will be then cross checked with domestic sales record and export in respect of each type of cement classified as per the clinker share in the Ethiopian standard. The total cement produced under each cement type in a given year deducted by the total cement exported under each cement type in a given year, will give the cement domestically sold in each crediting year. Hence the description and the means of monitoring described in the plan comply with the requirements of the methodology.

QA/QC procedure:
Weigh meters will be calibrated as per manufacturer's specification or every 2 years.</td></tr>
<tr><td>Baseline grid electricity emissions for blended cement grinding ($BE_{ele,grid,BC}$) = 0 tCO2e/tonne of blended cement</td><td>As per step 3.1 or equation 9 of the applied methodology, Baseline grid electricity emissions for blended cement grinding ($BE_{ele,grid,BC}$) is calculated as
$$BE_{ele,grid,BC} = \frac{BELE_{grid,BC} \times EF_{grid,BSL}}{BC_{BSL}}$$
Since $EF_{grid,BSL}$ =0 tCO2e/MWh, $BE_{ele,grid,BC}$ =0 tCO2e/tonne of blended cement</td></tr>
<tr><td>Baseline self-generated electricity emissions for BC grinding ($BE_{ele,sg,BC}$)</td><td>As per step 3.2 or equation 10 of the applied methodology, Baseline self generated electricity emissions for BC grinding ($BE_{ele,sg,BC}$) is calculated as:
$$BE_{ele,sg,BC} = \frac{BELE_{sg,BC} \times EF_{sg,BSL}}{BC_{BSL}}$$
Where
$BELE_{sg,BC}$ Baseline self generation electricity for grinding BC
$EF_{sg,BSL}$ Emission factor for self-generated electricity in the base year
BC_{BSL} Annual production of BC in the base year</td></tr>
<tr><td>Self generation of electricity for grinding blended cement in the base year ($BELE_{sg,BC}$) = 0 MWh</td><td>Ex-ante parameter:
Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for cement grinding as it requires 8 MW for cement grinding.

Ex-post monitoring during base year:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.

QA/QC procedure:
The electricity meters will be calibrated every 2 years.</td></tr>
</table>

Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) =0 tCO2/MWh (monitored parameter during base year)	The validation of the same is detailed above.
Blended cement produced and sold in the domestic market in base year y (BC_{BSL}) in Million tonnes PPC: 2.55 / PLC: 0.71 / PC: 0.30 (monitored parameter in base year)	The validation of the same is detailed above.
Baseline self-generated electricity emissions for BC grinding ($BE_{ele,sg,BC}$) =0 tCO2e/tonne of blended cement	As per step 3.2 or equation 10 of the applied methodology, Baseline self-generated electricity emissions for BC grinding ($BE_{ele,sg,BC}$) is calculated as: $BE_{ele,sg,BC} = \frac{BELE_{sg,BC} \times EF_{sg,BSL}}{BC_{BSL}}$ Since $EF_{sg,BSL}$ =0, $BE_{ele,sg,BC}$ =0
Baseline grid electricity emissions for additive preparation ($BE_{ele,grid,ADD}$)	As per step 3.3 or equation 11 of the applied methodology, Baseline grid electricity emissions for additive preparation ($BE_{ele,grid,ADD}$) is calculated as $BE_{ele,grid,ADD} = \frac{BELE_{grid,ADD} \times EF_{grid,BSL}}{BC_{BSL}}$ Where $BELE_{grid,ADD}$ Baseline grid electricity for additive preparation $EF_{grid,BSL}$ Baseline grid emission factor BC_{BSL} Annual production of blended cement in the base year
Grid electricity consumed for preparation of additives in base year ($BELE_{grid,ADD}$) (monitored parameter in base year)	Ex-ante estimation: It is calculated total electricity demand in kW x no of hours per year
Total electricity demand for preparation of additives = 4 MW	It is taken from feasibility report[7]. Hence accepted by the validation team.
No of operating hours =330 days per year	It is taken from feasibility report[7]. Hence accepted by the validation team.
Grid electricity consumed for preparation of additives in base year ($BELE_{grid,ADD}$) = 1,320 MWh/year (monitored parameter in base year)	Ex-ante estimation: It is calculated total electricity demand in MW x no of hours per year Ex-post monitoring during base year: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.

Baseline grid emission factor ($EF_{grid,BSL}$) =0 tCO2e/MWh (ex-ante parameter)	The validation of the same is detailed above.
Blended cement produced and sold in the domestic market in base year y (BC_{BSL}) in Million tonnes PPC: 2.55; PLC: 0.71; PC: 0.30 (monitored parameter in base year)	The validation of the same is detailed above.
Baseline grid electricity emissions for additive preparation ($BE_{ele,grid,ADD}$)= 0 tCO2e/tonne of blended cement	As per step 3.3 or equation 11 of the applied methodology, Baseline grid electricity emissions for additive preparation ($BE_{ele,grid,ADD}$) is calculated as $BE_{ele,grid,ADD} = \frac{BELE_{grid,ADD} \times EF_{grid,BSL}}{BC_{BSL}}$ Since $EF_{grid,BSL}$ =0 tCO2e/MWh, $BE_{ele,grid,ADD}$ =0 tCO2e/tonne of blended cement
Baseline self-generated electricity emissions for additive preparation ($BE_{ele,sg,ADD}$)	As per step 3.4 or equation 12 of the applied methodology, Baseline self generated electricity emissions for additive preparation ($BE_{ele,sg,ADD}$) is calculated as: $BE_{ele,sg,ADD} = \frac{BELE_{sg,ADD} \times EF_{sg,BSL}}{BC_{BSL}}$ Where $BELE_{sg,ADD}$ Baseline self generation electricity for additive preparation $EF_{sg,BSL}$ Emission factor for self-generated electricity in the base year BC_{BSL} Annual production of BC in the base year
Self generation of electricity for preparation of additives in the base year ($BELE_{sg,ADD}$) = 0 MWh	Ex-ante parameter: Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for cement additives as it requires 4 MW for preparation of additives. Ex-post monitoring during base year: As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually. QA/QC procedure: The electricity meters will be calibrated every 2 years.

<table>
<tr><td>Emission factor for self-generated electricity in the base year ($EF_{sg,BSL}$) =0 tCO2/MWh

(monitored parameter during base year)</td><td>The validation of the same is detailed above.</td></tr>
<tr><td>Baseline self-generated electricity emissions for additive preparation ($BE_{ele,sg,ADD}$) =0 tCO2e/tonne of blended cement</td><td>As per step 3.4 or equation 12 of the applied methodology, Baseline self-generated electricity emissions for additive preparation ($BE_{ele,sg,ADD}$) is calculated as:
$$BE_{ele,sg,ADD} = \frac{BELE_{sg,ADD} \times EF_{sg,BSL}}{BC_{BSL}}$$
Since $EF_{sg,BSL}$ is zero, $BE_{ele,sg,ADD}$ =0 tCO2e/tonne of blended cement</td></tr>
<tr><td>Baseline electricity emissions for BC grinding and preparation of additives ($BE_{ele,ADD,BC}$) = 0 tCO2e/tonne of blended cement</td><td>As per step 3 or equation 8 of the applied methodology, Baseline electricity emissions for BC grinding and preparation of additives ($BE_{ele,ADD,BC}$) is calculated as:
$$BE_{ele,ADD,BC} = BE_{ele,grid,BC} + BE_{ele,sg,BC} + BE_{ele,grid,ADD} + BE_{ele,sg,ADD}$$</td></tr>
<tr><td>Baseline emissions (BE_y)
<table><tr><th>Year</th><th>BE_y</th></tr><tr><td>1</td><td>1,573,415.80 tCO2e/year</td></tr><tr><td>2</td><td>1,747,089.27 tCO2e/year</td></tr><tr><td>3</td><td>1,740,702.81 tCO2e/year</td></tr><tr><td>4</td><td>1,734,188.63 tCO2e/year</td></tr><tr><td>5</td><td>1,752,265.06 tCO2e/year</td></tr><tr><td>6</td><td>1,754,922.68 tCO2e/year</td></tr><tr><td>7</td><td>1,758,157.93 tCO2e/year</td></tr><tr><td>8</td><td>1,756,437.34 tCO2e/year</td></tr><tr><td>9</td><td>1,760,620.18 tCO2e/year</td></tr><tr><td>10</td><td>1,772,243.91 tCO2e/year</td></tr></table></td><td>As per equation 1 of applied methodology, Baseline emissions are calculated as follows:
$$BE_y = BC_y \times \left(BE_{clinker,y} \times B_{Blend,y} + BE_{ele,ADD,BC}\right)$$</td></tr>
<tr><td>Project emissions (PE_y)</td><td>As per the applied methodology[2], In the project activity plant emissions are determined per unit of clinker or per unit of BC accounting for:
(i) Emissions from calcinations of limestone;
(ii) Emissions from combustion of fossil fuel and electricity for clinker production and processing of raw material;
(iii) Emissions from electricity used for additives preparation and grinding of cement.
As per equation 13 of the applied methodology, the project emissions are calculated as:
$$PE_y = BC_y \times \left(PE_{clinker,y} \times P_{Blend,y} + PE_{ele,ADD,BC,y}\right)$$
Where
BC_y Blended cement produced and sold in the domestic market in year *y*
$PE_{clinker,y}$ CO_2 emissions per tonne of clinker in the project activity plant in year *y*
$P_{Blend,y}$ Share of clinker per tonne of blended cement in year *y*
$PE_{ele,ADD,BC,y}$ Electricity emissions for blended cement grinding and preparation of additives in year *y*</td></tr>
<tr><td>Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes

(monitored parameter during year y)

<table><tr><th>Year</th><th>PPC</th><th>PLC</th><th>PC</th></tr><tr><td>1</td><td>2.55</td><td>0</td><td>0</td></tr><tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr></table></td><td>The validation of the same is detailed above.</td></tr>
</table>

<table>
<tr>
<td>
<table>
<tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>CO_2 emissions per tonne of clinker in the project activity plant in year *y* ($PE_{clinker,y}$) = 0.84 tCO2/tonne of clinker</td>
<td>The validation of the same is detailed above.</td>
</tr>
<tr>
<td>Share of clinker per tonne of blended cement in year *y* ($P_{Blend,y}$)
<table>
<tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr>
<tr><td>1</td><td>65%</td><td>NP</td><td>NP</td></tr>
<tr><td>2</td><td>65%</td><td>65%</td><td>61%</td></tr>
<tr><td>3</td><td>65%</td><td>65%</td><td>61%</td></tr>
<tr><td>4</td><td>65%</td><td>65%</td><td>55%</td></tr>
<tr><td>5</td><td>65%</td><td>65%</td><td>53%</td></tr>
<tr><td>6</td><td>65%</td><td>65%</td><td>51%</td></tr>
<tr><td>7</td><td>65%</td><td>65%</td><td>50%</td></tr>
<tr><td>8</td><td>65%</td><td>65%</td><td>48%</td></tr>
<tr><td>9</td><td>65%</td><td>65%</td><td>45%</td></tr>
<tr><td>10</td><td>65%</td><td>65%</td><td>45%</td></tr>
</table>

(monitored parameter during year y)</td>
<td>Ex-ante estimation:
As per Derba' board meeting decision[/18/] dated 28th November 2011, Tentative targeted clinker share is proposed against each of the blended cement produced. The validation team has reviewed the report and accepted.

Ex-post monitoring during year y:
As per the applied methodology, it is to be measured annually. As per the PDD, it will be sourced from plant records. The data will be captured in control room. The share of clinker per tonne of each type of blended cement (PBlend, y), share of additives utilized in each type of blended cement will be obtained from the computer in the Central Control Room (CCR) connected to the weigh feeders installed where additives and/or clinker flow into the cement grinding process and cement exits from the process.

QA/QC procedure:
The monitored equipment will be calibrated every 2 years.</td>
</tr>
<tr>
<td>Electricity emissions for blended cement grinding and preparation of additives in year y ($PE_{ele,ADD,BC,y}$)</td>
<td>As per step 5 or equation 19 of the applied methodology, Project electricity emissions for blended cement grinding and preparation of additives in year y ($PE_{ele,ADD,BC,y}$) is calculated as:
$$PE_{ele,ADD,BC,y} = PE_{ele,grid,BC,y} + PE_{ele,sg,BC,y} + PE_{ele,grid,ADD,y} + PE_{ele,sg,ADD,y}$$
Where
$PE_{ele,grid,B,y}$ Project grid electricity emissions for blended cement grinding in year y
$PE_{ele,sg,BC,y}$ Project self-generated electricity emissions for blended cement grinding in year y
$PE_{ele,grid,ADD,y}$ Project grid electricity emissions for additive preparation in year y
$PE_{ele,sg,ADD,y}$ Project self-generated electricity emissions for additive preparation in year y</td>
</tr>
<tr>
<td>Project grid electricity emissions for blended cement grinding in year y ($PE_{ele,grid,BC,y}$)</td>
<td>As per step 5.1 or equation 20 of the applied methodology, project grid electricity emissions for blended cement grinding in year y ($PE_{ele,grid,BC,y}$) is calculated as
$$PE_{ele,grid,BC,y} = \frac{PELE_{grid,BC,y} \times EF_{grid,y}}{BC_y}$$
Where
$PELE_{grid,BC,y}$ Project grid electricity for grinding blended cement in year y
$EF_{grid,y}$ Grid emission factor in year y
BC_y Annual production of blended cement in the year y</td>
</tr>
<tr>
<td>Project grid electricity for grinding blended cement in year y ($PELE_{grid,BC,y}$)

(monitored parameter in year y)</td>
<td>Ex-ante estimation:
It is calculated total electricity demand in kW x no of hours per year</td>
</tr>
<tr>
<td>Total electricity demand for grinding cement = 8 MW</td>
<td>It is taken from feasibility report[/7/]. Hence accepted by the validation team.</td>
</tr>
<tr>
<td>No of operating hours =330 days per year</td>
<td>It is taken from feasibility report[/7/]. Hence accepted by the validation team.</td>
</tr>
</table>

<table>
<tr>
<td>Project grid electricity for grinding blended cement in year y ($PELE_{grid,BC,y}$) = 2,640 MWh/year

(monitored parameter in year y)</td>
<td>Ex-ante estimation:
It is calculated total electricity demand in MW x no of hours per year
Ex-post monitoring during base year:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.

QA/QC procedure:
The electricity meters will be calibrated every 2 years.</td>
</tr>
<tr>
<td>Grid emission factor ($EF_{grid,y}$) =0 tCO2e/MWh

(ex-ante parameter)</td>
<td>The validation of the same is detailed above.</td>
</tr>
<tr>
<td>Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes

(monitored parameter during year y)

<table>
<tr><th>Year</th><th>PPC</th><th>PLC</th><th>PC</th></tr>
<tr><td>1</td><td>2.55</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
</table>
</td>
<td>The validation of the same is detailed above.</td>
</tr>
<tr>
<td>Project grid electricity emissions for blended cement grinding in year y ($PE_{ele,grid,BC,y}$) = 0 tCO2e/tonne of blended cement</td>
<td>As per step 5.1 or equation 20 of the applied methodology, Project grid electricity emissions for blended cement grinding in year y ($PE_{ele,grid,BC,y}$) is calculated as
$$PE_{ele,grid,BC,y} = \frac{PELE_{grid,BC,y} \times EF_{grid,y}}{BC_y}$$
Since $EF_{grid,y}$ =0 tCO2e/MWh, $PE_{ele,grid,BC,y}$ =0 tCO2e/tonne of blended cement</td>
</tr>
<tr>
<td>Project self-generated electricity emissions for blended cement grinding in year y ($PE_{ele,sg,BC,y}$)</td>
<td>As per step 5.2 or equation 21 of the applied methodology, Project self generated electricity emissions for BC grinding in year y ($PE_{ele,sg,BC,y}$) is calculated as:
$$PE_{ele,sg,BC,y} = \frac{PELE_{sg,BC,y} \times EF_{sg,y}}{BC_y}$$
Where
$PELE_{sg,BC,y}$ Project self generation electricity for grinding blended cement in year y
$EF_{sg,y}$ Emission factor for self-generated electricity in year y
BC_y Annual production of blended cement in the year y</td>
</tr>
<tr>
<td>Self generation of electricity for grinding blended cement in year y ($PELE_{sg,BC,y}$) = 0 MWh/year</td>
<td>Ex-ante parameter:
Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for cement grinding as it requires 8 MW for cement grinding.

Ex-post monitoring during year y:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.</td>
</tr>
</table>

	QA/QC procedure: The electricity meters will be calibrated every 2 years.
Emission factor for self-generated electricity in year y ($EF_{sg,y}$) =0 tCO2/MWh (monitored parameter during year y)	The validation of the same is detailed above.
Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes (monitored parameter during year y) <table><tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr><tr><td>1</td><td>2.55</td><td>0</td><td>0</td></tr><tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr><tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr></table>	The validation of the same is detailed above.
Project self-generated electricity emissions for blended cement grinding in year y ($PE_{ele,sg,BC,y}$) =0 tCO2e/tonne of blended cement	As per step 5.2 or equation 21 of the applied methodology, Project self-generated electricity emissions for blended cement grinding ($PE_{ele,sg,BC,y}$) is calculated as: $$PE_{ele,sg,BC,y} = \frac{PELE_{sg,BC,y} \times EF_{sg,y}}{BC_y}$$ Since $EF_{sg,y}$ =0, $PE_{ele,sg,BC,y}$ =0
Project grid electricity emissions for additive preparation in year y ($PE_{ele,grid,ADD,y}$)	As per step 5.3 or equation 22 of the applied methodology, Project grid electricity emissions for additive preparation in year y ($PE_{ele,grid,ADD,y}$) is calculated as $$PE_{ele,grid,ADD,y} = \frac{PELE_{grid,ADD,y} \times EF_{grid,y}}{BC_y}$$ Where $PELE_{grid,ADD,y}$ Project grid electricity for additive preparation in year y $EF_{grid,y}$ Grid emission factor BC_y Annual production of blended cement in year y
Project grid electricity for additive preparation in year y ($PELE_{grid,ADD}$) (monitored parameter in year y)	Ex-ante estimation: It is calculated total electricity demand in kW x no of hours per year
Total electricity demand for preparation of additives = 4 MW	It is taken from feasibility report[/7/]. Hence accepted by the validation team.
No of operating hours =330 days per year	It is taken from feasibility report[/7/]. Hence accepted by the validation team.

<table>
<tr><td>Project grid electricity for additive preparation in year y ($PELE_{grid,ADD}$) = 1,320 MWh/year

(monitored parameter in base year)</td><td>Ex-ante estimation:
It is calculated total electricity demand in MW x no of hours per year
Ex-post monitoring during year y:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.

QA/QC procedure:
The electricity meters will be calibrated every 2 years.</td></tr>
<tr><td>Grid emission factor ($EF_{grid,y}$) =0 tCO2e/MWh

(ex-ante parameter)</td><td>The validation of the same is detailed above.</td></tr>
<tr><td>Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes

(monitored parameter during year y)
<table>
<tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr>
<tr><td>1</td><td>2.55</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
</table></td><td>The validation of the same is detailed above.</td></tr>
<tr><td>Project grid electricity emissions for additive preparation ($PE_{ele,grid,ADD,y}$)= 0 tCO2e/tonne of blended cement</td><td>As per step 5.3 or equation 22 of the applied methodology, Project grid electricity emissions for additive preparation in year y ($PE_{ele,grid,ADD,y}$) is calculated as
$$PE_{ele,grid,ADD,y} = \frac{PELE_{grid,ADD,y} \times EF_{grid,y}}{BC_y}$$
Since $EF_{grid,y}$ =0 tCO2e/MWh, $PE_{ele,grid,ADD}$ =0 tCO2e/tonne of blended cement</td></tr>
<tr><td>Project self-generated electricity emissions for additive preparation in year y ($PE_{ele,sg,ADD,y}$)</td><td>As per step 5.4 or equation 23 of the applied methodology, Project self generated electricity emissions for additive preparation in year y ($PE_{ele,sg,ADD,y}$) is calculated as:
$$PE_{ele,sg,ADD,y} = \frac{PELE_{sg,ADD,y} \times EF_{sg,y}}{BC_y}$$
Where
$PELE_{sg,ADD,y}$ Project self generation electricity for additive preparation in year y
$EF_{sg,y}$ Emission factor for self-generated electricity in year y
BC_y Annual production of BC in year y</td></tr>
<tr><td>Self generation of electricity for preparation of additives in year y ($PELE_{sg,ADD,y}$) = 0 MWh</td><td>Ex-ante parameter:
Since no diesel is used in the diesel power plant, self-electricity is generated is zero. Diesel power plant is only used for emergency purpose and not capable for cement additives as it requires 4 MW for preparation of additives.

Ex-post monitoring during year y:
As per the applied methodology, it is to be measured from electricity meters. As per the PDD, it is monitored by electricity meters annually.

QA/QC procedure:
The electricity meters will be calibrated every 2 years.</td></tr>
</table>

Emission factor for self-generated electricity in year y ($EF_{sg,y}$) =0 tCO2/MWh (monitored parameter during year y)	The validation of the same is detailed above.
Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes (monitored parameter during year y) Year / PPC / PLC / PC 1 / 2.55 / 0 / 0 2 / 1.56 / 0.71 / 0.30 3 / 1.56 / 0.71 / 0.30 4 / 1.56 / 0.71 / 0.30 5 / 1.56 / 0.71 / 0.30 6 / 1.56 / 0.71 / 0.30 7 / 1.56 / 0.71 / 0.30 8 / 1.56 / 0.71 / 0.30 9 / 1.56 / 0.71 / 0.30 10 / 1.56 / 0.71 / 0.30	The validation of the same is detailed above.
Project self-generated electricity emissions for additive preparation in year y ($PE_{ele,sg,ADD,y}$) =0 tCO2e/tonne of blended cement	As per step 5.4 or equation 23 of the applied methodology, Project self-generated electricity emissions for additive preparation in year y ($PE_{ele,sg,ADD}$) is calculated as: $PE_{ele,sg,ADD,y} = \frac{PELE_{sg,ADD,y} \times EF_{sg,y}}{BC_y}$ Since $EF_{sg,y}$ =0, $PE_{ele,sg,ADD,y}$ =0 tCO2e/tonne of blended cement
Project electricity emissions for blended cement grinding and preparation of additives in year y ($PE_{ele,ADD,BC,y}$) = 0 tCO2e/tonne of blended cement	As per step 5 or equation 19 of the applied methodology, Project electricity emissions for blended cement grinding and preparation of additives ($PE_{ele,ADD,BC,y}$) is calculated as: $PE_{ele,ADD,BC,y} = PE_{ele,grid,BC,y} + PE_{ele,sg,BC,y} + PE_{ele,grid,ADD,y} + PE_{ele,sg,ADD,y}$
Project emissions (PE_y) Year / PE_y 1 / 1,403,634.03 tCO2e/year 2 / 1,403,634.03 tCO2e/year 3 / 1,403,634.03 tCO2e/year 4 / 1,388,293.76 tCO2e/year 5 / 1,397,962.78 tCO2e/year 6 / 1,397,748.77 tCO2e/year 7 / 1,400,576.00 tCO2e/year 8 / 1,397,395.65 tCO2e/year 9 / 1,393,886.57 tCO2e/year 10 / 1,403,634.03 tCO2e/year	As per equation 13 of the applied methodology, the project emissions are calculated as: $PE_y = BC_y \times \left(PE_{clinker,y} \times P_{Blend,y} + PE_{ele,ADD,BC,y}\right)$
Leakage emissions (LE_y)	As per the applied methodology, leakage emissions consist of: • Leakage emissions due to transport of additional additives; and • Leakage emissions due to the diversion of additives from existing uses As per equation 28 of the applied methodology, $LE_y = LE_{TR,y} + LE_{ADD,y}$ where $LE_{TR,y}$ Leakage emissions due to transport of additional additives in year y $LE_{ADD,y}$ Leakage emissions due to the diversion of additives from existing uses in year *y*

Leakage emissions due to transport of additional additives ($LE_{TR,y}$)	As per step 7 of applied methodology, Leakage emissions due to transport of additional additives in year *y* ($LE_{TR,y}$) are calculated applying the latest approved version of the methodological tool "Project and leakage emissions from road transportation of freight"/36/ version 1.1.0 As per para 20 of the tool, $LE_{TR,y} = \sum D_{f,m} X Q_{ADD,y} X EF_{CO2}$ $D_{f,m}$ -Return trip distance between the origin and destination of freight transportation activity f in monitoring period $Q_{ADD,y}$ -Total mass of freight transported in freight transportation activity f in monitoring period EF_{CO2} -Default CO2 emission factor for freight transportation activity
Return trip distance between the origin and destination of freight transportation activity f in monitoring period ($D_{f,m}$) =250 km (monitored parameter during year y)	Ex-ante estimation: As raw material is sourced from AlemTena which is 250 km away from the project site, this value is accepted. Ex-post monitoring during year y: As per the PDD, it is monitored annually. QA/QC procedure: Data monitored annually will be compared with the records of the previous year.
Total mass of freight transported in freight transportation activity f in monitoring period ($Q_{ADD,y}$)	Ex-ante estimation: As per step 7.1 or equation 29 of the applied methodology, $Q_{ADD,y}$ is calculated as follows $Q_{ADD,y} = \left(A_{PJ,blend,y} - A_{BSL,blend,y}\right) \times BC_y$ where $A_{PJ,blend,y}$ Share of additives per tonne of BC in year y $A_{BSL,blend,y}$ Baseline share of additives per tonne of BC updated for year y BC_y Blended cement produced and sold in the domestic market in year y Since this leakage corresponds to additional additives used in the project activity, $Q_{ADD,y}$ = ($P_{Blend,y}$- $B_{blend,y}$) x BC_y which is accepted by the validation team.
Share of additives per tonne of BC in year y ($A_{PJ,blend,y}$) (monitored parameter during year y)	Ex-ante estimation: Since percentage of Gypsum used is 5%, Share of additives per tonne of BC in year y is calculated from $P_{blend,y}$. Ex-post monitoring during year y: As per the applied methodology, it is to be measured annually. As per the PDD, it will be sourced from plant records. The data will be captured in control room. The share of additives utilized in each type of blended cement will be obtained from the computer in the Central Control Room (CCR) connected to the weigh feeders installed where additives and/or clinker flow into the cement grinding process and cement exits from the process. QA/QC procedure: The monitored equipment will be calibrated every 2 years.
Baseline share of additives per tonne of BC updated for year y ($A_{BSL,blend,y}$) (monitored parameter during year y)	Ex-ante estimation: Since percentage of Gypsum used is 5%, baseline share of additives per tonne of BC in year y is calculated from $B_{blend,y}$. Ex-post monitoring during year y: As per the applied methodology, it is to be measured annually. As per the PDD, it will be sourced from plant records. The data will be

<table>
<tr><td></td><td>captured in control room. The share of additives utilized in each type of blended cement will be obtained from the computer in the Central Control Room (CCR) connected to the weigh feeders installed where additives and/or clinker flow into the cement grinding process and cement exits from the process.

QA/QC procedure:
The monitored equipment will be calibrated every 2 years.</td></tr>
<tr><td>Blended cement produced and sold in the domestic market in year y (BC_y) in Million tonnes

(monitored parameter during year y)

<table>
<tr><td>Year</td><td>PPC</td><td>PLC</td><td>PC</td></tr>
<tr><td>1</td><td>2.55</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>3</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>4</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>5</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>6</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>7</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>8</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>9</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
<tr><td>10</td><td>1.56</td><td>0.71</td><td>0.30</td></tr>
</table></td><td>The validation of the same is detailed above.</td></tr>
<tr><td>Total mass of freight transported in freight transportation activity f in monitoring period ($Q_{ADD,y}$)
<table>
<tr><td>Year</td><td>$Q_{ADD,y}$</td></tr>
<tr><td>1</td><td>201,178.54 tonnes per year</td></tr>
<tr><td>2</td><td>200,845.37 tonnes per year</td></tr>
<tr><td>3</td><td>193,420.05 tonnes per year</td></tr>
<tr><td>4</td><td>204,023.28 tonnes per year</td></tr>
<tr><td>5</td><td>214,133.34 tonnes per year</td></tr>
<tr><td>6</td><td>217,686.85 tonnes per year</td></tr>
<tr><td>7</td><td>218,324.20 tonnes per year</td></tr>
<tr><td>8</td><td>220,210.85 tonnes per year</td></tr>
<tr><td>9</td><td>229,485.29 tonnes per year</td></tr>
<tr><td>10</td><td>231,871.82 tonnes per year</td></tr>
</table>
(monitored parameter during year y)</td><td>Ex-ante estimation:
As per step 7.1 or equation 29 of the applied methodology, $Q_{ADD,y}$ is calculated as follows
$$Q_{ADD,y} = \left(A_{PJ,blend,y} - A_{BSL,blend,y}\right) \times BC_y$$
where
$A_{PJ,blend,y}$ Share of additives per tonne of BC in year y
$A_{BSL,blend,y}$ Baseline share of additives per tonne of BC updated for year y
BC_y Blended cement produced and sold in the domestic market in year y

Since this leakage corresponds to additional additives used in the project activity, $Q_{ADD,y}$ = ($P_{Blend,y}$- $B_{blend,y}$) x BC_y which is accepted by the validation team.

Ex-post monitoring during year y:
It is calculated from monitored parameters, the validation details of which is already detailed above.</td></tr>
<tr><td>Default CO2 emission factor for freight transportation activity (EF_{CO2}) =129

(ex-ante parameter)</td><td>It is sourced from Tool" Project and leakage emissions from road transportation of freight"[/36/] version 1.1.0 which corresponds to heavy vehicles. Hence accepted by the validation team.</td></tr>
<tr><td>Leakage emissions due to transport of additional additives ($LE_{TR,y}$)
<table>
<tr><td>Year</td><td>$LE_{TR,y}$</td></tr>
<tr><td>1</td><td>6,488.01 tCO2e/year</td></tr>
<tr><td>2</td><td>6,477.26 tCO2e/year</td></tr>
<tr><td>3</td><td>6,237.80 tCO2e/year</td></tr>
<tr><td>4</td><td>6,579.75 tCO2e/year</td></tr>
<tr><td>5</td><td>6,905.80 tCO2e/year</td></tr>
<tr><td>6</td><td>7,020.40 tCO2e/year</td></tr>
<tr><td>7</td><td>7,040.96 tCO2e/year</td></tr>
<tr><td>8</td><td>7,101.80 tCO2e/year</td></tr>
<tr><td>9</td><td>7,400.90 tCO2e/year</td></tr>
<tr><td>10</td><td>7,477.87 tCO2e/year</td></tr>
</table></td><td>As per step 7 of applied methodology, Leakage emissions due to transport of additional additives in year *y* ($LE_{TR,y}$) are calculated applying the latest approved version of the methodological tool "Project and leakage emissions from road transportation of freight"[/36/]version 1.1.0

As per para 20 of the tool,
$LE_{TR,y} = \sum D_{f,m} \times Q_{ADD,y} \times EF_{CO2}$</td></tr>
</table>

Leakage emissions due to the diversion of additives from existing uses ($LE_{ADD,y}$)	Ex-ante estimation: The leakage is due to the diversion of additives from existing uses. As per the applied methodology, there are two options (L1 and L2) for the PP to demonstrate that additives used in the project activity did not increase emissions elsewhere. PP has chosen L1. Since Pumice is quarried from volcanic mountains and limestone from quarries, both surplus and under concession of Proponent. There would be no need of diversion of additives from existing uses. The validation team has reviewed the mining licence[/8/] for quarry granted on 27th May 2008 under captive concession and mining licence[/8/] for pumice (dated 25th November 2009 and expires on 24th November 2029) from Alemtena reserve. During the crediting period, the additives would be sourced from the same sites as above. The feasibility report demonstrated that the deposit life of the quarry is 60 years with reserve of 165 Million tonnes of limestone whereas annual requirement is 2.76 Million tonne only. The feasibility report has also demonstrated that the quarry was not ever excavated before the implementation of the project activity. The status would be the same in the absence of the project activity. In case of pumice, there is no significant other purpose requiring use of pumice. Since L1 is satisfied $LE_{ADD,y}$ = 0 tCO2e/year Ex-post monitoring during year y: If L1 is not satisfied in the year y, as per the applied methodology equation 30, $LE_{ADD,y} = \left(BE_y - PE_y\right) \times \alpha_y$ Where BE_y- Baseline emissions in year y PE_y -Project emissions in year y α_y -Leakage penalty factor in year y
Baseline emissions in year y (BE_y)	It is already validated as above
Project emissions in year y (PE_y)	It is already validated as above
Leakage penalty factor in year y (α_y) (monitored parameter in year y)	Ex-ante estimation: As per step 8.1 or equation 31 of the applied methodology, α_y is calculated as follows. $\alpha_y = \frac{ADD_{NS,y}}{ADD_y}$ Where $ADD_{NS,y}$ -Amount of additives used for BC production in project plant for which the project participants could not substantiate that they are surplus in year y ADD_y -Amount of additives used for BC production in project plant in year y

Amount of additives used for BC production in project plant for which the project participants could not substantiate that they are surplus in year y ($ADD_{NS,y}$) =0 tonne	Ex-ante estimation: Since L1 is satisfied and additives are surplus, it is considered to be zero. Ex-post monitoring during year y: As per the PDD, it will be monitored annually. QA/QC procedure: The monitored equipment for additives will be calibrated every 2 years.
Amount of additives used for BC production in project plant in year y (ADD_y)	Ex-ante estimation: Since percentage of Gypsum used is 5%, Share of additives per tonne of BC in year y is calculated from $P_{blend,y}$. Ex-post monitoring during year y: As per the applied methodology, it is to be measured annually. As per the PDD, it will be sourced from plant records. The data will be captured in control room. The share of additives utilized in each type of blended cement will be obtained from the computer in the Central Control Room (CCR) connected to the weigh feeders installed where additives and/or clinker flow into the cement grinding process and cement exits from the process. QA/QC procedure: The monitored equipment will be calibrated every 2 years.
Leakage penalty factor in year y (α_y) = 0 (monitored parameter in year y)	Ex-ante estimation: As per step 8.1 or equation 31 of the applied methodology, α_y is calculated as follows. $\alpha_y = \frac{ADD_{NS,y}}{ADD_y}$
Leakage emissions due to the diversion of additives from existing uses ($LE_{ADD,y}$) =0 tCO2e/year	As per the applied methodology equation 30, $LE_{ADD,y} = (BE_y - PE_y) \times \alpha_y$

<table>
<tr>
<td>Leakage emissions (LE_y)

Year	LE_y
1	6,488.01 tCO2e/year
2	6,477.26 tCO2e/year
3	6,237.80 tCO2e/year
4	6,579.75 tCO2e/year
5	6,905.80 tCO2e/year
6	7,020.40 tCO2e/year
7	7,040.96 tCO2e/year
8	7,101.80 tCO2e/year
9	7,400.90 tCO2e/year
10	7,477.87 tCO2e/year

</td>
<td>As per equation 28 of the applied methodology,
$LE_y = LE_{TR,y} + LE_{ADD,y}$</td>
</tr>
<tr>
<td>Emission reduction by the project activity (ER_y)

Year	ER_y
1	163,293.76 tCO2e/year
2	336,977.98 tCO2e/year
3	330,830.99 tCO2e/year
4	339,315.11 tCO2e/year
5	347,396.48 tCO2e/year
6	350,153.51 tCO2e/year
7	350,540.98 tCO2e/year
8	351,939.89 tCO2e/year
9	359,332.71 tCO2e/year
10	361,132.02 tCO2e/year
Ave	329,091 tCO2e/year (rounded down)

</td>
<td>As per equation 32 of the applied methodology, ER_y is calculated as $ER_y = BE_y – PE_y – LE_y$</td>
</tr>
</table>

Document information

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Document Type: Form
Business Function: Registration
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