Verification and certification report form for CDM project activities

(Version 03.0)

BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	Title: Boiler Second Economizer in Yansab, Kingdom of Saudi Arabia UNFCCC Reference Number: 10114
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the verification and certification report	2.0
Completion date of the verification and certification report	01/03/2021
Monitoring period number and duration of this monitoring period	Monitoring Period No.: 01 Duration: 01/01/2017 – 09/12/2019 (first and last days included)
Version number of the monitoring report to which this report applies	3.0
Crediting period of the project activity corresponding to this monitoring period	01/01/2017 – 31/12/2026 (Fixed)
Project participants	Yanbu National Petrochemicals Company (Yansab)
Host Party	Kingdom of Saudi Arabia
Applied methodologies and standardized baselines	Methodology: AMS-II.D. ver. 13 - Energy efficiency and fuel switching measures for industrial facilities Standardized Baseline: N/A
Mandatory sectoral scopes	3: Energy demand 4: Manufacturing industries
Conditional sectoral scopes, if applicable	N/A
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	67,666 tCO_2e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	35,827 tCO_2e
Name and UNFCCC reference number of the DOE	Earthood Services Private Limited E-0066

Name, position and signature of the approver of the verification and certification report	 Ashok Kumar Gautam Director

SECTION A. Executive summary

The CDM project activity titled “Boiler Second Economizer in YANSAB, Kingdom of Saudi Arabia” is the installation of a secondary economizer in five boilers of the plant operated by YANSAB, Yanbu National Petrochemicals Company. In the pre-existing setup, there was only one economizer for flue gas recovery. The secondary economizer is installed between the already existing economizer and the stack. The installation of a second economizer ensured that there is less waste of heat. This waste heat is recovered and then utilized for the boilers. The whole process reduces the loss of heat waste and ensures that lesser fuel is used for boilers. When the secondary economizer is resulting in a reduction of heat loss, the heat thus saved leads to improvement in the boiler efficiency, which ultimately results in the lowering of fossil fuel dependence for steam generation.
The baseline efficiency of the boilers was 91.5% at 49.47% of load, which increased to around 95% during project activity implementation.
The verification team confirms that the total emission reduction achieved under this monitoring period 01/01/2017 – 09/12/2019 (first and last days included) are 35,827 tCO_2e.

Scope of verification:

The verification is an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the DOE. The verification includes the implementation and operation of the PA as set out in the C.P. renewed PDD in the monitoring period.

The verification tests the data and assertions set out in the monitoring report prepared for this monitoring period by the PP and is based on the following:

i. The approved methodology AMS-II.D. Energy efficiency and fuel switching measure for industrial facilities, version 13.0.
ii. The registered PDD and monitoring plan /5/
iii. UNFCCC criteria referred to in the Kyoto Protocol criteria and the CDM modalities and procedures as agreed in the Bonn Agreement and the Marrakech Accords.
iv. The CDM Validation and Verification Standard (VVS) for PA version 2.0 /3/.
v. The CDM Project Standard (PS), version 2.0 /1/, and Project Cycle Procedure (PCP) for Project Activities, version 2.0 /2/
vi. Relevant decisions, guidance and clarifications of the CMP and CDM Executive Board and any other information and references relevant to the project activity’s reported emission reductions.

The verification has considered both quantitative and qualitative aspects on stated/reported emission reductions. The monitoring report (all versions) and corresponding supporting documentation was assessed in accordance with the rules defined by UNFCCC, as appropriate to the PA. The verification is not meant to provide any consulting or recommendations to the PP/others. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

Verification Process:

The verification process is conducted as per internal CDM Quality Manual, which includes the following steps;

- Contract with Yanbu National Petrochemicals Company (Yansab) and appointment of verification team and technical review team (refer Section B.1 and B.2 of this report)
- Completeness check of Monitoring Report
- Publication of Monitoring Report at UNFCCC website
- Desk review (refer Section D.1 of this report) of Monitoring Report/7/ and corresponding ER sheet /9/ by verification team
- Follow up activities e.g., interviews (refer Section D.3 of this report)
- Reporting and closure of findings (CARs/CLs/FARs) and preparation of draft verification report (refer Section D.5 of this report)
- Independent technical review (refer Section F of this report) of the draft verification report and final/revised documentation (e.g., Monitoring Report, corresponding ER sheet and evidences)
- Reporting and closure of TR comments/findings (refer Section D.5 of this report) (CARs/CLs/FARs) and final approval for the decision made (refer Section G and H of this report).

- Issuance of final verification report to contracted PP (or authorized representatives) and submission of request for issuance, as appropriate.

Verification Conclusion:

Based on the outcome of the verification process of the registered PA UN#10114 “Boiler Second Economizer in YANSAB, Kingdom of Saudi Arabia” for the monitoring period 01/01/2017 – 09/12/2019 (including both dates) we confirm that the implementation of referenced registered project activity is complying with applicable CDM rules and regulations as stated in CDM standards and the methodology AMS-II.D. Energy efficiency and fuel switching measure for industrial facilities, version 13.0 /8/. The GHG emission reductions were calculated correctly based on the approved baseline and applied methodology and the monitoring plan contained in the registered PDD.

Earthood Services Private Limited is able to certify that the emission reductions from the registered CDM PA UN#10114 “Boiler Second Economizer in YANSAB, Kingdom of Saudi Arabia” for the monitoring period 01/01/2017 – 09/12/2019 (including both dates) amount to 35,827 tCO2e. Therefore, this is being submitted for request for issuance, as per UNFCCC procedures.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Team Leader	IR	Gupta	Anshika	Central Office	Y	N*	Y	Y
2.	Verifier	IR	Kumar	Ajay	Central Office	Y	N	Y	Y
3.	TA Expert (TA 3.1, TA 4.1)	IR	Kumar	Sanjeev	Central Office	Y	N	N	Y
4.	Methodological Expert	IR	Kumar	Sanjeev	Central Office	Y	N	N	Y
5.	Local Expert	EI	Ahmad	Parvaiz	Central Office	Y	N	N	N
6.	Observer	IR	Singh	Kaviraj	Central Office	N	N	Y	N

B.2. Technical reviewer and approver of the verification and certification 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	Gautam	Ashok Kumar	Central Office
2.	TE to TR	IR	Gautam	Ashok Kumar	Central Office
3.	Approver	IR	Gautam	Ashok Kumar	Central Office

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human error in recording the readings	Low	Recording of readings for most of the parameters is automated and electronic and there is limited human intervention. Therefore, chances of possible human errors in recording and archiving the readings are minimised.	Electronic records are maintained with the help of SAP which are transferred for ER calculations. The assessment team checked the SAP system during remote interviews with the PP.
2.	Error in transferring the data to ER sheet	High	Transfer of data from source to ER calculation involve human intervention and might lead to some readings being copy and pasted inconsistently in the ER sheet from the source data.	The values reported in ER sheet were checked with their respective source data. The first value, last value and the total of the columns for all parameters reported was verified from the source data.
3.	Error in applying the formulae in the emission reduction calculation sheet	High	The calculation method has been prescribed in the applied methodologies and further detailed in the registered PDD. The project involves large data and the final emission reduction are a result of certain mathematical equations.	The emission reduction calculation sheet has been reviewed in detail by the assessment team. Each step for the calculation has been thoroughly checked to confirm the final numbers.

C.2. Consideration of materiality in conducting the verification

In accordance with the CDM VVS Version 02/3/ para 326, the thresholds for materiality for CDM PAs are under:

Emission Reductions (tCO2e)/year	500,000 or more	300,001 to 499,999	300,000 or Less	Small Scale CDM PAs	Micro Scale CDM PAs
Materiality Threshold (para 326)	0.5%	1.0%	2.0%	5.0%	10.0%

The applicable materiality threshold is 5.0 % as project activity is a small scale CDM PA.

Particulars / Monitoring Report	MR Version (Public)	MR Version (Revised/Final)
Emission Reductions Achieved (tCO2e) in this monitoring period	28,743 tCO_2	35,827 tCO_2
Applicable Threshold (%) as per para 326 of CDM VVS Version 2	5.0%	5.0%

There is a difference between the emission reduction in the final documentation/7/ compared to published MR/6/. The change in the ERs are a consequence of the corrections in the emission reduction calculations in the excel sheet/09/.

Monitored Parameter (Symbol / Description)	Reporting Frequency	Number of Discrete Data (Total) Total (100%)	Sample selected for verification Sample(%)	Type of error identified	Impact on ERs	
					ERs impacted (Sample)	ERs impacted (Population based on extrapolation)
$P_{PJ,steam,y}$ Total quantity of output (steam) in project activity	Continuous monitoring – real time	10,365 (100%)	Please read the comment below*	No error identified	No impact	No impact
T_{steam} Temperature of output steam in project activity	Continuous monitoring – real time, monthly recorded, yearly reporting	10,365 (100%)	Please read the comment below*	No error identified	No impact	No impact
P_{steam} Pressure of the output steam in project activity	Continuous monitoring – real time, monthly recorded, yearly reporting	1073 (100%)	Please read the comment below*	No error identified	No impact	No impact
$T_{feedwater}$ Temperature of feed water going to the boilers	Continuous monitoring – real time, monthly recorded, yearly reporting	1073 (100%)	Please read the comment below*	No error identified	No impact	No impact
$FC_{,fuels,j,y}$ Quantity of fuel type "fuels" combusted in process j	Continuous monitoring in real time using monitoring equipment and facilities in Distribution Control Station	2017-18: 365 2018-19: 365 (100%)	Please read the comment below*	No error identified	No impact	No impact

$NCV_{fuels,y}$ Weighted average net calorific value of the "fuels"	Monthly sample of fuel gas for composition analysis performed internally. Calibration are done frequently according to SABIC instrument calibration standards.	1 (100%)	1	No error identified	No impact	No impact
$EF_{CO2,fuels,y}$ Weighted average CO2 emission factor for aggregated fuels	Monitoring is performed and documented for each delivery.	1 (100%)	1	No error identified	No impact	No impact

*These values are recorded in the project database on a continuous basis. These values have been transferred to ER sheet and reported in the parameter specific columns. The first, random middle values (for verification of any inconsistency or lack of continuity in data), and last values reported in the column were checked from the available data log sheets (as provided in the ER Sheet /18/). When no error was found then a summation of all the values was checked which was found consistent. Errors of editorial nature were made in the calculation performed in the ER Sheet, and this resulted in difference in the ER values between the published MR/6/ and the final version of MR/7/.

Based on the above table, it can be confirmed that the materiality threshold is not breached for the registered PA, in line with CDM VVS /3/.

SECTION D. Means of verification

D.1. Desk/document review

A desk review was conducted by the verification team that included:

a) A review of the data and information presented to verify their completeness;
b) A review of the monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;
c) An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions;

In addition to the monitoring document ESPL has reviewed:

- The registered PDD version 1.7 dated 26/09/2016 /5/ and monitoring plan, including any approved revised monitoring plan, and the corresponding validation opinion;
- The applied monitoring methodology (AMS-II.D. Energy efficiency and fuel switching measure for industrial facilities, version 13.0) /8/;
- The monitoring report (all versions)/6/,/7/, to verify that it is as per format;
- Any other information and references relevant to the project activity's emission reductions (IPCC reports, data on electricity generation in the national grid or laboratory analysis and national regulations).

The complete list of documents reviewed during the verification process is included under Appendix 3 of VCR.

D.2. On-site inspection

Duration of on-site inspection: DD/MM/YYYY*				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	-	-	-	-

* No site visit was conducted for this batched issuance due to outbreak of global pandemic Covid-19 and increased risk of exposure and contraction due to travel.

UN EB decision on Mandatory DOE on-site visits:
UN EB-106 report agenda item 4.1 (Para 26) mentions the decision EB took on 20th March, in relation to DOE on-site visit which was applicable from 23rd March 2020 to 23rd June 2020/48/. The Executive Board of the Clean Development Mechanism (CDM) agreed on 23 June 2020, on an exceptional basis considering the COVID-19 pandemic, to extend the period in which CDM Designated Operational Entities (DOEs) may apply alternative measures of validation/verification to mandatory on-site inspections until 31 December 2020, based on UN EB-107 report agenda item 4.1 (Para 30) /49/. Since the situation hasn't improved as significantly as was anticipated, this decision of UN was further extended to 30/06/2021, and this was agreed under UN EB-108 meeting report, agenda item 4.1 (Para 28) /50/.

The requirements that are expected of a DOE to check for conducting the mandatory on-site visit are reiterated under the Section 9.1.3 of the CDM VVS-PA /3/, as below:
It is mandatory for the DOE to conduct an on-site inspection at verification for the registered CDM project activity if:

a) It is the first verification for the DOE with regard to this project activity;
b) More than three years have elapsed since the last on-site inspection conducted for verification for the project activity; or
c) *The project activity has achieved more than 300,000 tCO2 eq of GHG emission reductions or net anthropogenic GHG removals since the last verification when an on-site inspection was conducted*.

The applicability with respect to the project activity:

The project activity is undergoing its first verification (see requirement 'a' above), and therefore, it is mandatory for the project activity to have a verification on-site visit by the DOE verification team. But the ongoing global pandemic of outbreak of COVID-19 virus contraction has led to safe practices such as social distancing, and travel restrictions /45/ across international boundaries, but now travel is being resumed by several nations in a staggered manner. In the case of India, country where DOE office (verification team specific to this project activity) is based, the travel is resumed (see Vande Bharat Mission /46/) but the new strain of virus that is found in the UK /47/ has put the risk of re-emergence of pandemic contraction.

This was discussed with the PP team during remote interviews (skype video calls /52/), and appropriately, CL04 was raised during the assessment findings rounds in this regard. Appropriate to the finding, PP team provided their reasons on why the on-site visit and consequently the verification cannot be postponed. PP stated that their business objectives /32/ are set at the beginning of every financial year, and each objective under this plan has its own financial significance. Since top management of the PP carefully and diligently chalks out each objective, the revenue realization from CDM was referenced under Objective 4 "Sustainability and Energy", point 4.5 SEEC & CDM, subpoint 4.5.4.1 "Complete CDM documentation for UN certification". This was also obligated to the DOE through the contract /51/ signed between DOE and the PP, which has certain timelines for the delivery of DOE services, and these also relate to the DOE's earnings. If the contract agreement is not adhered to, DOE's revenue stream would be impacted.

DOE approach to on-site inspection:

Therefore, for reasons provided above, and in line with UN EB requirements, the assessment team conducted the verification for this project activity batch using alternative means as defined in the CDM VVS-PA, ver. 2.0/3/.

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Ahmed	Shaikh	Yansab	24/12/2020	Monitoring plan, Monitoring frequency, ER calculation	Anshika Gupta, Ajay Kumar
2.	Barayan	Fahad A	Yansab	24/12/2020	Project activity (Technology, Location and Implementation)	Anshika Gupta, Ajay Kumar
3.	Ahmad	Khalid	Yansab	24/12/2020	Monitoring schedule and Data archiving	Anshika Gupta, Ajay Kumar
4.	Ateeq	Moteb	Yansab	24/12/2020	Project site maintenance, QA/QC procedures, data management	Anshika Gupta, Ajay Kumar

D.4. Sampling approach

Sampling plan is not applied since all of the project data was reviewed.

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

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	-	-	-
Compliance of the project implementation and operation with the registered PDD	-	-	-
Post-registration changes	-	-	-
Compliance of the registered monitoring plan with the methodologies including applicable tools and	-	-	-

standardized baselines			
Compliance of monitoring activities with the registered monitoring plan	-	CL02, CL06, CL07	-
Compliance with the calibration frequency requirements for measuring instruments	-	CL03	FAR01
Assessment of data and calculation of emission reductions or net removals	CAR05	-	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (UN verification on-site visit requirement – UN EB-108 meeting report, agenda item 4.1 (Para 28))	-	CL04	-
Total	1	5	1

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	The monitoring report form used is CDM-MR-FORM version 07.0/4/ which was the appropriate form and the latest version available at the time of verification. All the sections of the form were filled as per the guidelines and gave all the relevant details.
Findings	None.
Conclusion	The final monitoring report/7/ is found to be in-line with the latest CDM-MR-FORM/4/ available and the instructions therein.

E.2. Remaining forward action requests from validation and/or previous verifications

This is the first verification for the project activity in its first crediting period /9/. There was 1 FAR raised at the time of project validation which is closed during this verification. This has been checked and reconfirmed from the project validation report /9/.

E.3. Compliance of the project implementation and operation with the registered project design document

Means of verification

The implementation and operation of the project activity has been verified in the table below:

S. No.	Technology/Process /requirement as mentioned in the PDD	Means of Verification by DOE verification assessment team
1.	Boiler system (BO-7101A, BO-7101B, BO-7101C, BO-7101D, and BO-7101E)	The boiler system has a lifetime of 25 years, and was commissioned on 08/07/2009, which is evident from the project validation and commissioning certificate. The boiler system consists of a total of 5 boilers. The general arrangement of boiler system before /27/ the installation of secondary economizers and after /28/ the installation of secondary economizers were shared by PP. Apart from the arrangement, boiler SOP was shared by PP, to demonstrate that there's a defined system to operate the boilers. All the 5 boilers were operational during the current monitoring period, which was verified by the assessment team through review of data logs of various monitored data points such as steam production /39/, and fuel gas consumption in boilers /43/. The assessment team has obtained the

			boiler photographs /35/ to verify that they are installed at the project site as stated in the PDD. During the verification, CL02 was raised to confirm the statement provided by PP on the boiler output. PP has provided a satisfactory response to the CL raised, and therefore, boiler operation was found to be operating with all the defined measures and protocols set in the project monitoring plan.	
	2.	Fuel consumed in the project activity	The fuel consumed (i.e. combusted) in all the 5 boilers during the monitoring period was verified from the fuel consumption readings recorded in the YANSAB electronic records RTIMS . The fuel gas consumption data log sheet /43/ is provided in the ER Sheet /9/.	
	3.	Flow meters (71-FT-301, 71-FT-401, 71-FT-501, 71-FT-601, 71-FT-701)	Flow meters used to monitor the steam flow were found operational and within their calibration validity for the whole monitoring period. The operation of flow meters was verified with the steam production data (recorded through flow meter) available in the ER Sheet /9/ and calibration certificates /10/. The calibration frequency for the flow meters were found in-line with the monitoring period as well as the Yansab internal calibration standard /31/.	
	4.	Temperature Gauge (71-TT-310, 71-TT-410, 71-TT-510, 71-TT-610, and 71-TT-710)	The thermocouples used for the project's monitoring are temperature transmitters with RTD element. The thermocouples are used to continuously monitor the temperature data (in real time) of the steam produced within the system. The thermocouple data recorded by the RTIMS is compiled in excel sheets. The thermocouple data in the data log sheets /40/ was verified to confirm that these were operational during the monitoring period. Calibration records /12/ were used to verify that all the thermocouples were within their calibration validity throughout the monitoring period. The thermocouples were found to be following the calibration frequency defined for them, which was verified with the monitoring period as well as the Yansab internal calibration standard /31/.	
	5.	Pressure Gauge (69-PT-013A)	The readings for steam pressure were measured during the monitoring period on a continuous basis. The pressure readings provided in the ER Sheet, worksheet "Monitoring Data T,P" /9/ verify that the monitoring equipment was in use during the monitoring period. The calibration of pressure gauge (tag 69-PT-013A) /14/ was checked with the calibration certificate, and its calibration validity was in conformity with the monitoring period /7/.	
	6.	Secondary Economizers (BO-	The secondary economizers were installed at the project site, and was found	

	7101-1, BO-7101-2, BO-7101-3, BO-7101-4, and BO-7101-5)	operational during the monitoring period. The economizer operation could be confirmed through the steam production data (specific to each boiler) available in the ER Sheet /9/. From the steam data available, it is observed that the fuel gas losses are reduced. The trapping of fuel gases in the system keeps the heat retained for prolonged periods, which leads to a reduction in the fuel use (as compared to the baseline). Since there is no other intervention installed at the project boilers which could result in an increase in the boiler efficiency, it leads to an inference that the secondary economizer is operating during the monitoring period. The installation of secondary economizers at each of the boiler site is evident from the photographs /35/ shared.
7.	Project activity operation days	During the current monitoring period, the project operation is observed for a specific duration in the monitoring period covered. The duration 10/12/2018 to 09/12/2019 (both dates included) is the period for which project was in operation. Prior to that, secondary economizer was in operation to boiler E only. The PP's consideration of a period shorter than the whole monitoring period is conservative, and therefore deemed acceptable by the verification team. This was verified with the data log sheets shared in the ER Sheet /9/, and found appropriate & valid.
8.	QA/QC procedures implementation during the monitoring period	During the current monitoring period, PP was adhering to the QA/QC procedures in line with the requirements set in the PDD /5/. During the monitoring period, PP performed various internal audits and delivers trainings on equipment handling, maintenance, preventive maintenance, and calibration which are performed during the monitoring period on a regular basis. This was verified with the training records shared by PP /26/. During interviews with PP /52/, it was verified that PP is implementing all the applicable QA/QC procedures for data accuracy, monitoring frequency of parameters, and acquisition, storage, and retrieval of data. The quality assurance and quality control requirements are fulfilled in-line with the registered monitoring plan /5/, hence found appropriate and valid by the assessment team.
9.	Project Activity crediting period	The crediting period mentioned in the monitoring report /6/,/7/ is 10 years fixed duration, from 01/01/2017 to 31/12/2026 (including first and last days). The information provided in the MR is checked

			as correct and valid. This was verified with the crediting period defined in the registered PDD /5/, and cross checked with the project CDM webpage /38/.
	10.	Location	The GPS coordinates of the project activity are 23º58'54.7''N and 38º15'23.5''E, which is mentioned in the monitoring report /7/. The assessment team confirmed project activity location through Google Maps /37/.
	The CDM project activity implementation was found consistent with the description provided in the PDD /5/.		
Findings	CL02 was raised and resolved..		
Conclusion	a) The project activity was found to be implemented as per the description given in the registered PDD, ver. 1.7 /5/. All physical features (technology, project equipment, and monitoring & metering equipment) of the registered CDM project activity were in place. b) The actual operation conforms to the description in the registered PDD /5/. c) No operational parameter was found to be deviating from the registered PDD /5/. The emission reductions achieved during the current monitoring period are 35,827 tCO_2e. The same has been assessed in further sections of the report.		

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents[1]

Not applicable for this verification.

E.4.2. Corrections

Not applicable for this verification as there are no corrections being sought under the monitoring period.

E.4.3. Changes to the start date of the crediting period

There is no change to the start date of the crediting period during this crediting period (CP1). The crediting period start date is 01/01/2017 /5/,/38/.

E.4.4. Inclusion of a monitoring plan

Not applicable.

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

No permanent changes sought alongwith this verification.

E.4.6. Changes to the project design

No changes to the project design are requested alongwith this verification.

E.4.7. Changes specific to afforestation and reforestation project activities

Not applicable.

E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

Means of verification	The monitoring plan as contained in the Monitoring report was reviewed against the monitoring requirements of the applied methodology /8/ as well as registered

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

	PDD/5/ with reference to the technologies involved. Based on this review, it was found that the monitoring plan contained in the Monitoring report includes all the required parameters to be monitored in the context of the project design & description, and allows proper determination of emission reductions in accordance with registered PDD /5/ and applied methodology /8/.
Findings	None.
Conclusion	The monitoring plan is in accordance with the approved methodology /8/ and correctly applied in the CDM project activity. This is found in-line with the registered PDD /5/.

E.6. Compliance of monitoring activities with the registered monitoring plan

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Average annual baseline fossil fuel consumption for fuel type "fuels", $FC_{BL,fuels,j}$, Tonnes/year

Means of verification	The value for $FC_{BL,fuels,j}$ is 230,909.24 tonnes/year, which was found to be consistent with the source of data i.e. YANSAB electronic records (RTIMS) /5/.
Findings	No findings were raised.
Conclusion	The value for $FC_{BL,fuels,j}$ is found to be correct and justified.

Average net calorific value of fuel type "fuels" combusted, $NCV_{CO2,fuels}$, MWh/tonne

Means of verification	The applied value for $NCV_{CO2,fuels}$ is 13.8239583 MWh/tonne which is ex-ante, based on monthly samples taken of the fuel gas.
Findings	No findings were raised.
Conclusion	The value for parameter is found to be correct and justified.

Average annual quantity of output (steam) in baseline, P_{Hy}, Tonne / year

Means of verification	The applied value for P_{Hy} is 3,253,288 Tonnes/year, which is ex-ante value based on internal records YANSAB electronic records (RTIMS) /5/.
Findings	No findings were raised.
Conclusion	The parameter value is found to be correct and justified.

Weighted average CO2 emission factor of fuel type "fuels", $EF_{CO2,fuels,y}$, tCO_2/GJ

Means of verification	The parameter value for $EF_{CO2,fuels,y}$ is 0.051104527 tCO_2/GJ, which is calculated, and is based on fuels used to fire boilers.
Findings	No findings were raised.
Conclusion	The parameter value is found to be correct and in-line with the registered PDD.

E.6.2. Data and parameters monitored

Total quantity of output (steam) in project activity, $P_{PJ,steam,y}$, Ton

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	Continuously monitored in real time.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	Yes
	Monitoring equipment	Parameter is monitored with flow meters of Yokogawa make (type – DP Flow transmitter), with model being EJA110. Following tag numbers were labelled to each of the flow meters installed to the 5 distinct boilers:

		<table><tr><th>Boiler Tag No.</th><th>Monitoring Equipment tag no.</th></tr><tr><td>BO-7101-A</td><td>71-FT-301</td></tr><tr><td>BO-7101-B</td><td>71-FT-401</td></tr><tr><td>BO-7101-C</td><td>71-FT-501</td></tr><tr><td>BO-7101-D</td><td>71-FT-601</td></tr><tr><td>BO-7101-E</td><td>71-FT-701</td></tr></table> The serial number of flow meters was reviewed with the instrument photographs shared by PP, and was found consistent. The QA/QC of the monitoring equipments was checked through supporting documents such as meter calibration reports/12/, photographs of the meters alongwith their serial number /19/, and interview conducted with the PP /52/. Calibration for the instrument is performed internally and the calibration scale varies across the whole measuring range of the instrument, which is evident from the calibration report shared by PP. The calibration details of the equipment is provided in the Appendix-6 of this report. The calibration results obtained during the calibration are provided in Appendix-7 of this report.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Accuracy range of all the equipment installed is checked by the verification team and found in-line with the information available in the flow meter manufacturer's specifications/37/, and consistent with the calibration report details/12/. The accuracy value mentioned in the MR/7/ for the flowmeter is 1% of reading value, which is in-line with the manufacturing specifications/37/.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The meters are operated and calibrated in accordance with the Yansab internal calibration standards, and are in-line with the manufacturer's specifications.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes
	Is the calibration of measuring equipment carried out by an	Calibration of equipments /12/,/13/ has been conducted internally. The

	accredited person or institution?	instruments installed have instructions specified in its manual on performing calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for each of the equipment installed for all the 5 boilers are checked, and found valid for the whole monitoring period.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	The consolidated values applied for the monitoring period, as verified with plant records (data logs made available in the ER Sheet) are: i. 2017-18: 780,550 tons (Boiler E only, from 10/12/17 to 09/12/2018) ii. 2018-19: 3,279,695 tons (all boilers sum from 10/12/18 to 09/12/2019). The values applied were found to be consistently reported in MR/7/ and ER sheet/09/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	None	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Temperature of output steam in project activity, T_{steam}, ^0C (Degree centigrade)

<table>
<tr><td rowspan="4">Means of verification</td><td>Criteria/Requirements</td><td>Assessment/Observation</td></tr>
<tr><td>Measuring /Reading /Recording frequency</td><td>Continuously monitored and recorded monthly.</td></tr>
<tr><td>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)</td><td>Yes</td></tr>
<tr><td>Monitoring equipment</td><td>Parameter is monitored with temperature transmitter of Yokogawa make, with model being YTA320, and with distinct tag numbers for each of the transmitters attached to the 5 boilers. The tag numbers are provided below:
<table><tr><th>Boiler Tag No.</th><th>Monitoring Equipment tag no.</th></tr><tr><td>BO-7101-A</td><td>71-FT-310</td></tr><tr><td>BO-7101-B</td><td>71-FT-410</td></tr><tr><td>BO-7101-C</td><td>71-FT-510</td></tr><tr><td>BO-7101-D</td><td>71-FT-610</td></tr><tr><td>BO-7101-E</td><td>71-FT-710</td></tr></table>
The temperature transmitters (thermocouple) use RTD element, and are calibrated on a periodic basis.
The serial numbers of temperature transmitters were found consistent with the supporting documents (transmitter photographs /35/) shared by PP.

The meter were checked for their accuracy using meter calibration report /12/, photographs of the meter /19/, meter calibration SOP /12/, and interview conducted with the PP /12/.

Calibration for the instrument is performed internally and the calibration scale varies across the whole measuring range of the instrument, which is evident from the calibration report shared by PP. The calibration details of the equipment is provided in the Appendix-6 of this report. The calibration results obtained during the calibration are provided in Appendix-7 of this report.</td></tr>
<tr><td></td><td>Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer’s specification?</td><td>Accuracy range of the equipment is inline with the information available in the temperature transmitter manufacturer’s specifications/37/, and consistent with the calibration report details/12/.

The accuracy value mentioned in the manufacturing specifications /7/ for the</td></tr>
</table>

		temperature transmitter is ±0.2% of reading or ±0.2°C (whichever is greater at 23±2°C.), which is in-line with the calibration reports /37/ shared by PP.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The meters are operated and calibrated in accordance with the Yansab internal calibration standards, and are in-line with the manufacturer's specifications.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Calibration of equipments /12/,/13/ has been conducted internally. The instruments installed have instructions specified in its manual on performing calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for each of the equipment installed for all the 5 boilers are checked, and found valid for the whole monitoring period.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	The values applied values for each of the boilers are provided below: **Boiler Serial No.** / **01/01/2017 to 09/12/2018 (ºC)** / **10/12/2018 to 09/12/2019 (ºC)** Boiler A / NA / 485.635 Boiler B / NA / 486.05 Boiler C / NA / 493.934 Boiler D / NA / 501.514 Boiler E / 492.845 / 498.731 These values were verified with plant records (data logs) provided in the ER Sheet /18/. The values were found to be consistently reported in MR/7/ and ER sheet/11/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure	Data management system was found

	correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	CL07 raised and resolved.	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Pressure of the output steam in project activity, P_{steam}, Bar g

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	Continuously monitored and recorded monthly.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	Yes
	Monitoring equipment	Parameter is monitored using pressure gauge of Yokogawa make, with model being EJA430A, and tag number 69-PT-013A. The pressure gauge is gauge pressure transmitter type. The serial number of pressure gauge was checked with the meter photographs shared, and found consistent with the details shared. The gauge was checked against the supporting documents such as meter calibration report/12/, photographs of the monitoring equipment installed /19/, and interview conducted with the PP /52/. The measurement range for the pressure gauge is 0.14 to 14 MPa (for the project site installed equipment, as it is a Capsule B installation). Any details specific to calibration of the pressure gauge may be found in the Appendix-6 and Appendix-7 of this report.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not	Accuracy range of the equipment is inline with the information available in the pressure gauge manufacturer's

	specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	specifications/37/, and consistent with the calibration report details/12/. The accuracy value mentioned in the manufacturing specifications /7/ for the pressure gauge is 0.065 % of Span (here, span is the measurement range itself, i.e. between '0.14 to 14 MPa'), which is in-line with the calibration reports /37/ shared by PP.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The meters are operated and calibrated in accordance with the Yansab internal calibration standards, and are in-line with the manufacturer's specifications.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Calibration of equipments /12/,/13/ has been conducted internally. The instruments installed have instructions specified in its manual on performing calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for the equipment installed for all the 5 boilers are checked, and found valid for the whole monitoring period. For the pressure gauge, the calibration reports are fulfilling the 5 years calibration requirements. The first calibration was performed on 15/03/2017, followed by second calibration in 10/01/2019.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	The yearly average values for the pressure are identified as below: **01/01/2017 to 09/12/2018**: 100.88 Bar, and **10/12/2018 to 09/12/2019**: 100.74 Bar. These were the consolidated values of the parameter for the monitoring period, and were verified with data logs provided in the ER Sheet /18/. The values were found to be consistently reported in MR/7/ and ER

		sheet/11/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	CL07 raised and resolved.	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Temperature of feed water going to the boilers, $T_{feedwater}$, (Degree centigrade)

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	Continuously monitored and recorded daily.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	Yes
	Monitoring equipment	Parameter is monitored with temperature transmitter of Yokogawa make, with model being YTA320. The temperature transmitters use TC element, and are calibrated on annual basis. The serial number of temperature transmitter weas found consistent with the supporting documents (transmitter photograph /36/) shared by PP. The meter was checked for its accuracy with the help of meter calibration reports /12/, photographs of the meter /19/, meter calibration SOP /12/, and interview conducted with the PP /12/. Calibration for the instrument is performed internally. The calibration details of the equipment is provided in the Appendix-6 of this report. The calibration results obtained during the

		calibration are provided in Appendix-7 of this report.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Accuracy range of the equipment is inline with the information available in the temperature transmitter manufacturer's specifications/37/, and consistent with the calibration report details/12/. The accuracy value mentioned in the manufacturing specifications /7/ for the temperature transmitter is ±0.2% of reading or ±0.2°C (whichever is greater at 23±2°C.), which is in-line with the calibration reports /37/ shared by PP.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The temperature transmitters are operated and calibrated in accordance with the Yansab internal calibration standards, and are in-line with the manufacturer's specifications. This specific temperature transmitter is calibrated on an annual basis, and all the calibration reports for the equipment are shared by PP. The calibration reports have been reviewed, and it is found that the equipment is not failing the manufacturer's specified accuracy requirements.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Calibration of equipment /12/,/13/ has been conducted internally. The TC element transmitter installed has instructions specified in its manual on performing calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for the equipment installed for all the 5 boilers are checked, and found valid for the whole monitoring period.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	The yearly average values applied are provided as below: **01/01/2017 to 09/12/2018**: 105.328 ^{o}C, and **10/12/2018 to 09/12/2019**:

		105.475 °C. These values were verified with plant records (data logs) provided in the ER Sheet /18/. The values were found to be consistently reported in MR/7/ and ER sheet/11/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	None	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Quantity of fuel type "fuels" combusted in process j, $FC_{fuels,j,y}$, Ton/year

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	Continuously monitored and recorded daily.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	Yes
	Monitoring equipment	Parameter is monitored with flow meters of Yokogawa make (type – DP Flow transmitter), with model being EJA110A. Following tag numbers were labelled to each of the flow meters installed to the 5 distinct boilers:

Boiler Tag No.	**Monitoring Equipment tag no.**
BO-7101-A	71-FT-308
BO-7101-B	71-FT-408
BO-7101-C	71-FT-508
BO-7101-D	71-FT-608
BO-7101-E	71-FT-708

		The serial number of flow meters was reviewed with the instrument photographs shared by PP, and was found consistent. The QA/QC of the monitoring equipments was checked through supporting documents such as meter calibration reports/12/, photographs of the meters alongwith their serial number /19/, and interview conducted with the PP /52/. Calibration for the instrument is performed internally and the calibration scale varies across the whole measuring range of the instrument, which is evident from the calibration report shared by PP. The calibration details of the equipment is provided in the Appendix-6 of this report. The calibration results obtained during the calibration are provided in Appendix-7 of this report.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Accuracy range of all the equipment installed is checked by the verification team and found in-line with the information available in the flow meter manufacturer's specifications/37/, and consistent with the calibration report details/12/. The accuracy value mentioned in the MR/7/ for the flowmeter is 1% of reading value, which is in-line with the manufacturing specifications/37/.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The meters are operated and calibrated in accordance with the Yansab internal calibration standards, and are in-line with the manufacturer's specifications.
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Calibration of equipments /12/,/13/ has been conducted internally. The instruments installed have instructions specified in its manual on performing calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for each of the equipment installed for al the 5 boilers are

		checked, and found valid for the whole monitoring period.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	The consolidated values applied for the monitoring period, as verified with plant records (data logs made available in the ER Sheet) are: iii. 2017-18: 53,954.87 tons (Boiler E only, from 10/12/17 to 09/12/2018) iv. 2018-19: 224,386,85 tons (all boilers sum from 10/12/18 to 09/12/2019). The values applied were found to be consistently reported in MR/7/ and ER sheet/11/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	CL07 raised and resolved.	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Weighted average net calorific value of the "fuels", $NCV_{fuels,y}$, GJ/t

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	Monthly sampling for fuel gas composition analysis.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	Yes
	Monitoring equipment	Parameter is monitored with specific gravity analyzer of Solartron make, with model 3098C, and signal converter 7950A. The tag number of

		the specific gravity analyzer is 74-AT-001B. The serial number of flow meter was found consistent with the Calibration Certificate /10/. The analyzer was checked with the help of supporting documents such as calibration report/12/, analyzer maintenance and calibration SOP /22 - 25/, and interview conducted with the PP /52/. The measuring range for the specific gravity meter is 0 to 60 normal cc/s, and its accuracy is upto ±0.1% of reading. Calibration for the instrument is performed internally and the calibration scale varies across the whole measuring range of the instrument, which is evident from the calibration report shared by PP. The calibration details of the equipment is provided in the Appendix-6 of this report. The calibration results obtained during the calibration are provided in Appendix-7 of this report.
	Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification?	Accuracy range of the equipment is inline with the information available in the equipment's user manual /37/, and consistent with the calibration report details /12/. The accuracy value obtained for the analyzer is within the limits specified in the user manual (i.e. upto ±0.1% of reading value), and has been verified with the calibration reports /37/ shared by PP.
	Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges?	Accuracy class is valid for entire range.
	Calibration frequency /interval:	The meter is operated and calibrated in accordance with the analyzer user manual, and is calibrated periodically with a calibration frequency of 1 year. There is no specific frequency defined in the user manual, but instruction is provided therein, which specifically states that the analyzer must be periodically calibrated with the specific reference gases (in-line with the recommendations and instructions).
	Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications?	Yes, PP has performed periodic calibration for the specific gravity analyzer, and the last calibration date is 29/10/2019, which is evident from the calibration certificate /20/ shared.
	Is the calibration of measuring equipment carried out by an accredited person or institution?	Calibration of equipments /12/,/13/ has been conducted internally. The instruments installed have instructions specified in its manual on performing

		calibration. The competence of the internal resources performing calibration is provided in the form of instrument handling, maintenance, and calibration trainings /26/ provided during the monitoring period.
	Is(are) calibration(s) valid for the whole reporting period?	Calibration/12/,/13/ is a periodic activity, and the relevant calibration reports for the analyzer are checked, and found valid for the whole monitoring period.
	Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?	Yes
	How were the values in the monitoring report verified?	A value of 46.33933 GJ/t was the consolidated weighted average net calorific value of the fuels used, for the monitoring period. This has been verified with plant records (provided as "Fuel gas analysis 18-19" datasheet within the ER Sheet /9/). The value was found to be consistently reported in MR/7/ and ER sheet/11/.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	None	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

Weighted average CO2 emission factor for aggregated fuels, $EF_{CO2,fuels,y}$, tCO_2e / GJ

Means of verification	**Criteria/Requirements**	**Assessment/Observation**
	Measuring /Reading /Recording frequency	This is a calculated parameter, so measuring frequency is not applicable.
	Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes/No)	N/A
	Monitoring equipment	N/A

	How were the values in the monitoring report verified?	The CO_2 weighted average emission factor for aggregated fuels is calculated upon taking the net calorific value as the denominator of the CO2 emission factor value. This results in the conversion of emission factor from "tCO2e/per ton of fuel" to "tCO2e/GJ", which is appropriate. The values applied were verified, where the $NCV_{Fuels,y}$ is already verified (as provided right above this parameter), and the CO_2 emission factor is calculated using the molar mass of the CO_2 gas, and the amount of fuel used. The CO_2 emission factor comes out to be 2.4 tons CO_2/ton fuel, which has been verified from the ER Sheet worksheet "Fuel gas analysis 18-19" /9/. In the parameter unit, the value comes as 0.0518594810 tCO_{2e}/GJ. Subsequent calculations and the factors and constants considered for arriving at the parameter value are duly stated in the worksheet, hence verified.
	If applicable, has the reported data been cross- checked with other available data?	-
	Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Data management system was found to be reliable and appropriate.
	In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard?	No such issues.
Findings	None	
Conclusion	The DOE confirms that: a) The registered monitoring plan has been properly implemented and followed by the project participants b) Monitoring of parameter is implemented in accordance with registered monitoring plan. c) The equipment used for monitoring the parameter is controlled and calibrated in accordance with registered monitoring plan and applied methodology. Where there is a gap in calibration, an appropriate error factor has been applied inline to para 369 and 370 of VVS Version 02/3/. d) Monitoring results are consistently recorded as per approved frequency e) Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.	

E.6.3. Implementation of sampling plan

Means of verification	Not applicable, since no sampling plan was implemented.
Findings	Not applicable.
Conclusion	Not applicable.

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	The measuring instruments as mentioned for the parameters are in compliance with the Calibration requirements of the respective instruments, and followed the

	frequency requirements during the monitoring period. The calibration frequency, accuracy considerations, and the results of calibration for the instruments calibrated are compiled in the form of tables in Appendix – 6 and Appendix – 7 of this report. During the interview with PP, it was observed that the calibration of instruments is done through a pre-defined internal standard, and the events are recorded in the SAP system /31/. The screenshot of SAP system, calibration instructions /31/ for various instruments, and calibration reports for the various frequency timelines specific to instruments were verified during the desk review. There were no major issues found in the instrument calibration and maintenance for the current monitoring period.
Findings	FAR01 was raised during project's validation and, CL03 & CL06 were raised during current verification. All these findings were closed upon receipt of satisfactory responses alongwith evidence from PP.
Conclusion	The calibration for equipment is conducted at the defined frequency, as specified by their respective manufacturers /8/, and the monitoring plan/05/.

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification

For the project activity, the secondary economizer for boiler E was commissioned in 2017, and became operational since 10/12/2017.
All the five economizers serving as part of the project activity were operational since 10/12/2018 and for the same reason, PP has only considered baseline emission calculations from 10/12/2018.

PP has calculated baseline emissions using the below equations:

			Reference/Source/Description
BE_y	$\Sigma (SEC_i * PP_{J,I,y}) * EF_{CO2,y}$		Simplified equation
SEC_i	0.94341485	MWh/ton of steam	Energy consumption per ton of steam in baseline.
$PP_{J,I,y}$	4,060,245	T	Quantity of steam in base year
$EF_{CO2,y}$	0.183976297	tCO_2/MWH	Emission Factor. Tab "Fuel Gas Analysis in Base Line". Value in tCO_2/ton of fuel is converted to tCO2/MWH
BE_y	704,720	**tCO_2e**	Calculated

Equation used for the specific energy consumption are provided below:

			Reference/Source
SEC_{BL}	$(\Sigma FC_{BL,I,fuels} * NCV_{CO2,fuels})/PH_y$		
$FC_{BL,I,fuels}$	277,091.09	t	Average annual baseline fossil fuel consumption for 3 years period.
$NCV_{CO2,fuels}$	13.8239583	MWh/t	Average NCV of fuel combusted. Tab "Fuel Gas Analysis Baseline". Value in GJ/ton is converted to MWH/ton
PH_y	4,060,245	t/yr	Average annual quantity of output (steam) in baseline for 3 years period.
SEC_{BL}	0.94341485	MWh/ton of steam	Energy consumption per ton of steam

For the project activity, the baseline emissions came out to be 704,720 tCO_{2e}.
The method of baseline emission calculation used by PP has been verified from the applied methodology AMS-II.D /8/ and found consistent as per the registered PDD, ver. 1.7 /5/.

Findings	None
Conclusion	Calculation of baseline GHG emissions was found to be satisfactory. The verification team confirms that: a) The monitored data was available in accordance with the registered monitoring plan; b) The monthly reported data was cross-checked, as prescribed in the C.P. renewed PDD, with the relevant supporting and was found consistent; c) Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals have been followed; d) The assumptions, emission factors and default values that were applied in the calculations have been justified; The first day in which CERs are being claimed has been correctly specified, where applicable.

E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification

PP has only considered project emission calculations from 10/12/2018, which is based on the fact that the commissioning of all 5 economizers, alongwith the actual monitoring for the project activity is from 10/12/2018.

Following equations were used to calculate the project emissions:
$PE_y = PE_{FF,y}$ (Simplified equation)

$PE_{FF,y}$	$\Sigma FC_{fuels,j,y} * COEF_{fuels,y}$		Equation from "Tool to Calculate Project or Leakage CO_2 / Emissions from Fossil Fuel Combustion" version 02
$FC_{fuels,j,y}$	277,091.09	tonne	Total fuel gas consumption after project implementation and fuel consumption in base year minus estimated fuel savings, please refer ER sheet
$COEF_{fuels,y}$	2.4031335	tCO_2/t	see below
$PE_{FF,y}$	668,892.30	tCO_2	Calculated

Option B, under "Tool to Calculate Project or Leakage CO_2 / Emissions from Fossil Fuel Combustion", version 02.0, was used to calculate the equation for CO_2 emission factor of the fuels used in the project activity. The equation is provided as below:

Option B: $COEF_{fuels,y}$	$NCV_{fuels,y} * EF_{CO2,y}$		Equation from "Tool to Calculate Project or Leakage CO_2 / Emissions from Fossil Fuel Combustion" version 02
$NCV_{fuels,y}$	46.33932740	GJ/t	Based on average composition and SABIC Standard for footprint for period 10/12/2018 to 09/12/2018, please refer ER sheet
$EF_{CO2,y}$	0.051859481	tCO_2/t	Average for period 10/12/2018 to 09/12/2018 as per analysis stack emissions, please refer ER sheet
$COEF_{fuels,y}$	2.4031335	tCO_2/ GJ	Calculated

For the project activity, the project emissions came out to be 668,893 tCO_{2e}.

Findings	None.
Conclusion	Calculation of project emissions was found to be satisfactory. The verification team confirms that:

	a) The monitored data was available in accordance with the registered monitoring plan; b) The monthly reported data was cross-checked, as prescribed in the C.P. renewed PDD/5/, with the relevant supporting and was found consistent; c) Appropriate methods and formulae for calculating project emissions have been followed; d) The assumptions, emission factors and default values that were applied in the calculations have been justified; The first day in which CERs are being claimed has been correctly specified, where applicable.

E.8.3. Calculation of leakage GHG emissions

Means of verification	The monitoring plan/5/ and applied methodology/8/ do not prescribe any leakage emission calculations, since the technology is not transferred from or to another activity. It was concluded through discussions with the PP representative that there were no potential sources of leakages.
Findings	None
Conclusion	Not applicable

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	The applied methodology provisions the emission reduction calculations as follows: $ER_y = BE_y - PE_y - LE_y$ Where: ER_y = Emission reductions in year y (t CO_2e) BE_y = Baseline emissions in year y (t CO_2e) PE_y = Project emissions in year y (t CO_2e) LE_y = Leakage emissions in year y (t CO_2e) The baseline emissions were calculated using the formula described in the section E.8.1 of this report and the project emissions were calculated from the formula described in the section E.8.2 of this report. Since no source of GHG emission leakages were found, the leakage emission are zero for the project activity. Therefore, the total emission reductions achieved for the monitoring period arrived at 35,827 tCO_{2e}.
Findings	None
Conclusion	The verification team confirms that appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals, project GHG emissions or actual net GHG removals and leakage GHG emissions have been followed. The assumptions, emission factors and default values that were applied in the calculations have been justified.

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	Actual emission reductions achieved for the monitoring period are lower than the comparable ex-ante estimates for the whole monitoring period covered. However, the ERs were found to be surpassing the ex-ante estimates for the monitoring period considered for ER calculations. A CL (CL02) was raised to understand the reason behind that, and it was found that during the monitoring period, the fuel used is of higher emission factor than the ex-ante estimates. This accounted for a higher volume of steam generation, which is one of the underlying reasons for an increase in the ERs achieved for the current monitoring period. The plant load during the baseline assessment was lower (at 49%) due to lower demand. The slight increase in the plant load also is one of the reasons why the ERs achieved are higher than those estimated ex-ante for the comparable duration of monitoring period considered.

Findings	CAR05 was raised and resolved.
Conclusion	Emission reduction achieved is lower than the estimated for the monitoring period duration. The estimated emission reductions for the project activity for comparable period is 67,666 tCO_2e while the actual emission reductions achieved during the monitoring period are 35,827 tCO_2e.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	As discussed in Section E.8.5 above, the actual emission reductions for the monitoring period considered for ER calculations (i.e. from 10/12/2018) results in a decrease in 47.05% from the ex-ante estimates of the emissions. However, these are higher than for the period that is being considered for ex-ante calculations. This higher number of ERs obtained than ex-ante estimates for comparable period is accounted on behalf of the increased boiler load, which resulted in increased boiler efficiency. This increased boiler efficiency led to an increase in the ERs achieved for the monitoring period duration for which project was implemented in-line with the registered PDD /5/.
Findings	CL02 was raised and resolved.
Conclusion	An decrease in 47.05% for the emission reductions achieved by the project activity is acceptable. Notwithstanding, the verification team raised findings to understand the reason behind the increase in ERs for the comparable duration of monitoring period. This increase in ERs is due to increased boiler load, consequently higher boiler efficiency, and the variation in the chemical composition of fuels used. The fuels used in the project scenario are of higher carbon content, which is evident from their higher than the ex-ante CO_2 emission factor. Therefore, it can be concluded that the increase in the ERs achieved for the monitoring period are higher than the ex-ante estimates because of reasons beyond PP's control. This has been verified and found acceptable.

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The emission reductions from the CDM project activity 10114 "Boiler Second Economizer in YANSAB, Kingdom of Saudi Arabia" in Saudi Arabia, for the monitoring period 01/01/2017 – 09/12/2019 (including both days) amount to 35,827 tCO_2. **Verified and certified emission reductions as per commitment period:** **Commitment period** — **Amount** Upto 31/12/2012 (1st commitment period) — 0 tCO_2e From 01/01/2013 — 35,827 tCO_2
Findings	None
Conclusion	Actual GHG emission reductions in the commitment period (01/01/2013 onwards) for the current monitoring period were found to be 35,827 tCO_2

E.9. Assessment of reported sustainable development co-benefits

Means of verification	Not applicable
Findings	Not applicable
Conclusion	Not applicable

E.10. Global stakeholder consultation

Means of verification	Not applicable
Findings	Not applicable
Conclusion	Not applicable

SECTION F. Internal quality control

The draft verification report that is prepared by verification team is reviewed by an independent technical review team (one or more members) to confirm if the internal procedures established and implemented by Earthood were duly complied with and such opinion/conclusion is reached in an objective manner that

complies with the applicable CDM rules/requirements. The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the verification team.

During the technical review process additional findings may be identified or the closed-out findings may be opened, which needs to be satisfactorily resolved before the request for issuance is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same in such case providing the comments/findings/issues that needs to be resolved by the verification team. The decision taken by the Technical Reviewer is final and is authorized on behalf of Earthood Services Private Limited.

SECTION G. Verification opinion

Earthood Services Private Limited (Earthood), contracted by Yanbu National Petrochemical Company (Yansab), has performed the independent verification of the emission reductions for the CDM project activity 10114 "Boiler Second Economizer in Yansab, Kingdom of Saudi Arabia" for the monitoring period 01/01/2017 – 09/12/2019 (including both days) as reported in the Monitoring Report (public) Version 1.0 dated 07/11/2020.

Yanbu National Petrochemical Company (Yansab) is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity. Earthood commenced the verification on the basis of the baseline and monitoring methodology AMS-II.D. ver. 13 /8/, the monitoring plan contained in the registered PDD version 1.7, dated 26/09/2016 /5/, Monitoring Report (public) Version 1.0 dated 07/11/2020 /6/.

ESPL confirms that the monitoring system is in place and the emission reductions are calculated without material misstatements. This verification report has been prepared using the latest available template specified by UNFCCC and complies with the instructions to follow of CDM VVS-PA Version 02.0 /3/.

The verification activities were conducted in accordance with ESPL's CDM Quality Manual System as per the steps indicated under Section A of this report. The verification process has resulted in conclusion that the PA comply with applicable CDM rules and regulations and in accordance with applied monitoring methodology /8/.

As a result, it is confirmed that the emission reductions from the registered CDM project activity 10114 "Boiler Second Economizer in Yansab, Kingdom of Saudi Arabia" for its first monitoring period 01/01/2017 – 09/12/2019 (including both days) are correctly reported in the **Monitoring Report Version 03 (Final) dated 11/02/2021 /7/** and corresponding ER sheet for the monitoring period 01/01/2017 – 09/12/2019 (including both days) amount to 35,827 tCO_2e. Therefore, this will be submitted as part of request for issuance as per CDM PCP Version 02.0 /2/.

SECTION H. Certification statement

The verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the PA for the monitoring period 01/01/2017 – 09/12/2019 (including both days) are fairly stated in the **Monitoring Report Version 03 (Final) dated 11/02/2021 /7/**

ESPL, based on outcome of verification activities, certifies that, during the monitoring period 01/01/2017 – 09/12/2019 (including both days), the registered CDM project activity 10114 "Boiler Second Economizer in Yansab, Kingdom of Saudi Arabia" achieved the verified amount of **35,827** tCO_{2e} reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the project activity.

Appendix 1. Abbreviations

Abbreviations	Full texts
AM	Approved Methodology
BE	Baseline Emission
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH4	Methane
CL	Clarification Request
CM	Combined Margin
CO2	Carbon di oxide
CP	Crediting Period
DNA	Designated National Authority
DR	Desk Review
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
ERP	Enterprise Resource Planning
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Green House Gas
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LoA	Letter of Approval/Authorization
LSC	Local Stakeholder Consultation Process
MoC	Modalities of Communication
MP	Monitoring Plan
MR	Monitoring Report
N2O	Nitrous Oxide
OM	Operating Margin
PA	Project Activity
PCP	Project Cycle Procedure
PDD	Project Design Document
PE	Project Emission
PP	Project Participant
PRC	Post Registration Change
PS	Project Standard
QA/QC	Quality Assurance and Quality Control
SAP	System Analysis Program
tCO2e	tonnes of Carbon di Oxide equivalent
TR	Technical Review
UNFCCC	United Nations Framework Convention on Climate Change
V (or ver.)	Version
VCR	Verification and Certification Report
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Competence Statement	
Name	Anshika Gupta
Country	India

Education	M.Sc. (Climate Science & Policy), TERI University		
Experience	4 Years +		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS-I.A., AMS-II.G., ACM0002, AMS-III.A.V.		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	Yes (TA 1.2, TA 3.1)		
Reviewed by	Shreya Garg	**Date**	12/03/2019
Approved by	Kaviraj Singh	**Date**	12/03/2019

Competence Statement			
Name	Ajay Kumar		
Country	India		
Education	Master's in Environmental Sciences		
Experience	3 Years+		
Field	Climate Change		
Approved Roles			
Team Leader	NO		
Validator	Yes		
Verifier	Yes		
Methodology Expert	NO		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert	NO		
Trainee	NO		
Reviewed by	Shreya Garg	**Date**	17/11/2020
Approved by	Ashok K Gautam	**Date**	17/11/2020

Competence Statement	
Name	Sanjeev Kumar
Country	India
Education	B. Tech. (Chemical Engineering) M.Tech. (Energy Management)
Experience	13.5 years +
Field	Climate Change, Environment, Energy
Approved Roles	
Team Leader	YES
Validator	YES
Verifier	YES
Methodology Expert	YES (ACM0002, ACM0006, ACM0004, ACM0009, ACM0012, ACM0001, AMS I.D, AMS I.F, AMS I.C, AMS I.A, AMS II.C, AMS II.D, AMS II.E, AMS

	III.H, AM0009, AM0013, AM0025, AM0056, AM0028, AM0029, AM0008, AMS III.R, ACM0003)		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.1, TA 1.2, 4.1, 13.1)		
Reviewed by	Shreya Garg	**Date**	16/01/2020
Approved by	Anshika Gupta	**Date**	16/01/2020

Competence Statement			
Name	Shreya Garg		
Country	India		
Education	M.Sc. (Climate Science & Policy), TERI University		
Experience	6 Years +		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., ACM0002, ACM0012		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.2, TA 3.1)		
Reviewed by	Abhishek Mahawar	**Date**	01/03/2018
Approved by	Ashok Gautam	**Date**	01/03/2018

Competence Statement	
Name	Ashok Gautam
Country	India
Education	M. Sc. (Environmental Sciences) M. Tech. (Energy & Environmental Management)
Experience	16 Years +
Field	Energy, Climate Change & Environment
Approved Roles	
Team Leader	YES
Validator	YES
Verifier	YES
Methodology Expert	AMS-I.D., AMS-I.A., AMS-I.C., AMS-I.E, AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Q, AMS-III.Z., AMS-III.AV., AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0009, AM0034, AMS.I.B
Local expert	YES (India)
Financial Expert	YES
Technical Reviewer	YES
TA Expert	YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1)

Reviewed by	Shreya Garg	**Date**	25/01/2019
Approved by	Anshika Gupta	**Date**	25/01/2019

Competence Statement			
Name	Parvaiz Ahmad		
Country	Saudi Arabia		
Education	M.Sc. Environmental Botany		
Experience	+1 year		
Field	Environmental Botany		
Approved Roles			
Team Leader	NO		
Validator	NO		
Verifier	NO		
Methodology Expert	NO		
Local expert	YES (Saudi Arabia)		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert	NO		
Trainee	NO		
Reviewed by	Abhishek Mahawar	**Date**	01/03/2018
Approved by	Ashok Kumar Gautam	**Date**	01/03/2018

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	UNFCCC	Standard: CDM PS for PA	ver. 2.0	Others
2.	UNFCCC	Standard: CDM PCP for PA	ver. 2.0	Others
3.	UNFCCC	Standard: CDM VVS for PA	ver. 2.0	Others
4.	UNFCCC	Form: CDM-MR-FORM	ver. 07.0	Others
5.	Yansab	Registered PDD	Ver. 01.7; Dated 26/09/2016	PP
6.	Yansab	MR version 01 (Public)	07/11/2020	PP
7.	Yansab	MR Version 03 (Final)	11/02/2021	PP
8.	UNFCCC	Methodology: AMS-II.D. Energy efficiency and fuel switching measure for industrial facilities	Version 13.0	Others
9.	Yansab	ER Sheet	Corresponding to the Monitoring Report	PP
10.	Yansab	DP flow transmitters calibration certificates: 71-FT-301; 71-FT-401; 71-FT-501; 71-FT-601; 71-FT-701	Various dates	PP
11.	Yokogawa	Manufacturer's specifications of DP flow transmitters	-	Others
12.	Yansab	Temperature transmitters (with RTD	Various dates	PP

		element) calibration certificates: 71-TT-310; 71-TT-410; 71-TT-510; 71-TT-610; 71-TT-710		
13.	Yokogawa	Manufacturer's specifications of temperature transmitters with RTD element	-	Others
14.	PP	Gauge pressure transmitters calibration certificates: 69-PT-013A; 69-PT-013B; 69-PT-013C;	-	PP
15.	Yokogawa	Manufacturer's specifications of gauge pressure transmitters	-	Others
16.	Yansab	Temperature transmitters (with TC element) calibration certificates: 71-TT-003	Various dates	PP
17.	Yokogawa	Manufacturer's specifications of temperature transmitters with TC element	-	Others
18.	Yansab	DP flow transmitters calibration certificates: 71-FT-308; 71-FT-408; 71-FT-508; 71-FT-608; 71-FT-708	Various dates	PP
19.	Yokogawa	Manufacturer's specifications of DP flow transmitters	-	Others
20.	Yansab	Calibration certificate for Specific Gravity Analyzer	Various	PP
21.	Solartron	Manufacturer's specifications for Specific Gravity Analyzer	-	Others
22.	Yansab	Maintenance and calibration SOP for temperature transmitter	-	PP
23.	Yansab	Maintenance and calibration SOP for gauge pressure transmitter	-	PP
24.	Yansab	Maintenance and calibration SOP for DP flow transmitter	-	PP
25.	Yansab	Maintenance and calibration SOP for specific gravity analyzer	-	PP
26.	Yansab	Training Records for job qualification on the monitoring instrumentation: • temperature transmitter • DP flow transmitter • gauge pressure transmitter • specific gravity analyzer	-	PP
27.	Machhi	Boiler general arrangement – before 2nd economizer installation	Version 3.0, dated 28/02/2007	PP
28.	Machhi	Boiler general arrangement – after 2nd economizer installation	Version 1.0, dated 16/11/2017	PP
29.	Machhi	Big block parts – never changed	Version 2.0, dated 30/11/2006	PP
30.	Yansab	Boiler SOP	Version 3.0, dated 19/09/2019	PP
31.	Yansab	PM frequency for utility boiler transmitters – SAP snapshots attached	-	PP
32.	Yansab	Business Objective 2020 screenshots	Pertaining to FY 2020	PP
33.	UNFCCC	Standard for "Sampling and surveys for	version 7.0	Others

		CDM project activities and programmes of activities"		
34.	UNFCCC	Guideline for "Sampling and surveys for CDM project activities and programmes of activities"	version 4.0	Others
35.	Yansab	Project site photographs	-	Others
36.	Yansab	Project monitoring equipment photographs	-	Others
37.	Google Maps	Verification of coordinates using Google Maps Software: Screenshot taken from the website for confirmation	Confirmed	Others
38.	UNFCCC	Project Activity webpage: CDM: Boiler Second Economizer in Yansab, Kingdom of Saudi Arabia (unfccc.int)	-	Others
39.	Yansab	Data log for DP Flow Transmitter	Corresponding to reference 10 above	PP
40.	Yansab	Data log for temperature transmitter (RTD element)	Corresponding to reference 12 above	PP
41.	Yansab	Data log for gauge pressure transmitter	Corresponding to reference 14 above	PP
42.	Yansab	Data log for temperature transmitter (TC element)	Corresponding to reference 16 above	PP
43.	Yansab	Data log for DP Flow Transmitter	Corresponding to reference 18 above	PP
44.	Yansab	Data log for specific gravity analyzer	Corresponding to reference 20 above	PP
45.	Financial Express	Travel restrictions due to COVID-19 outbreak: International Flights status: India extends restrictions; check date - The Financial Express	-	Others
46.	MEA, GoI	Air bubble arrangement (Vande Bharat Mission): Phase 9 (mea.gov.in)	-	Others
47.	WHO	UK CVOID-19 strain: WHO | SARS-CoV-2 Variant – United Kingdom of Great Britain and Northern Ireland	-	Others
48.	UNFCCC	UN EB-106 Meeting Report URL: CDM: UOTJ9DN2736GFQE (unfccc.int)	-	Others
49.	UNFCCC	UN EB-107 Meeting Report URL: CDM: EB 107 (unfccc.int)	-	Others
50.	UNFCCC	UN EB-108 Meeting Report URL: CDM: RP47A8YIBLO9TD3 (unfccc.int)	-	Others
51.	ESPL	Contractual agreement signed between ESPL and Yansab	Dated 23/02/2020	Others
52.	ESPL	Skype interview calls with PP	Various	Others

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

Table 1. Remaining FAR from validation and/or previous verification

FAR ID	01	**Section no.**	E.7	**Date :** 31/08/2016
Description of FAR				
FAR from validation of PA The calibration frequency shall in be in accordance with either the national standard or manufacturer recommendation and if both are not available these can be as per international standard. Therefore, PP shall provide one of these basis for aforesaid calibration interval and same will be checked during the verification. Thus a FAR#01 is raised.				
Project participant response				**Date :** 08/12/2020
YASNAB have shared the Calibration frequency from SAP System				
Documentation provided by project participant				
DOE assessment				**Date:** 14/12/2020
PP is requested to share the manufacturing specifications of the monitoring equipment as an evidence (meters used in the project monitoring). FAR01 is open.				
Project participant response				**Date :** 12/12/2020
YANSAB have shared all Calibration transmitter procedure.				
Documentation provided by project participant				
DOE assessment				**Date:** 31/12/2020
PP has shared the equipment maintenance and calibration SOPs for all the monitoring equipment installed at the project site. This is justified since the calibration frequencies for the equipment are in line with the manufacturer's specified calibration interval, and the calibration certificates ensured that these equipment were fulfilling their accuracy requirements. FAR01 is closed.				

Table 2. CL from this verification

CL ID	02	**Section no.**	E.3	**Date :** 27/11/2020
Description of CL				
1. In Section B.1 of the MR, it is mentioned that the output of boiler between the baseline and project scenario remains the same. PP is requested to substantiate this with a supporting evidence. 2. The ERs achieved by the project activity are higher than the ex-ante estimates. PP is requested to justify the increase in the achieved ERs than those estimated ex-ante.				
Project participant response				**Date :** 08//12/2020
1. FG Chemical composition from supplier ARAMCO was not sustained the CO2 factor after the project higher than CO2 factor before the project. *The steam generated during current monitoring period is found to be marginally higher compared to the baseline scenario due to increased demand from the plant. However, the project has operated within small scale threshold, which is appropriate.* *2. During baseline assessment the boiler load was recorded around 49% due to lower steam demand in plant, however during current monitoring period the steam generation was slightly higher than baseline as its dependent on plant demand. Due to increase in boiler load the fuel efficiency of boiler has also increased, resulting slightly higher saving, which has resulted around 10% more emission reduction that estimated in registered PDD. However, this has no impact on scale of the project activity, baseline or additionality.*				
Documentation provided by project participant				
MR Version-02 *ER Version-02*				

DOE assessment	Date: 14/12/2020

1. During verification team's discussions with PP representatives, it was found that the ex-ante CO_2 emission factor of the fuel gas is lower than the ex-post monitored value. This was mainly because of the chemical composition of fuel gas, which had higher carbon content that the ex-ante scenario. Also, the change in chemical composition of fuel gas is beyond PP's control, which PP stated during the discussion. This is substantiated through provisioning of two different CO_2 emission factors. However, the baseline ERs calculated are based on the steam quantity. Therefore, PP has applied the steam quantity capped at the ex-ante level in order to maintain the degree of conservativeness. Finding is closed.

2. The boiler load was lower in the project's baseline scenario, when compared with the boiler load during current monitoring period. Therefore, the increase in load eventually resulted in an increase of the efficiency of the boiler. This increased efficiency of the boiler resulted in a higher Emission Reductions (ERs) than ex-ante estimates. This is acceptable since it is not impacting the project activity's scale, its additionality or the baseline. This finding is closed.

CL02 is closed.

CL ID	03	Section no.	E.7	Date : 27/11/2020

Description of CL

1. For the instruments used at the time of project's monitoring (i.e. Flow Meters, Temperature Gauges, Pressure Gauges, gas flow meters), PP is requested to share these:
   -Calibration Certificates/reports for the instruments used (for the whole monitoring period)
   -Manufacturer's/technical specifications of the monitoring equipments used
   -Geo-tagged & time stamped Photographs of the project activity, instruments alongwith their respective labels

2. In Section C of the MR, PP has discussed about the SOPs and online instrumentation, Distributed Control System and Emergency Shutdown System. PP is requested to share the suitable evidences for verification.

3. In the PDD, the parameter $EF_{CO2,fuels,y}$ is using the value 0.051859481 tCO_2/t (Page 21). On the other hand in the MR, $COEF_{fuels,y}$ value, i.e. 2.4031335 is being used for the monitored parameter $EF_{CO2,fuels,y}$(Page 11). PP is requested to clarify.

Project participant response	Date : 08/12/2020

1. *The relevant details required provided along with this response.*
2. *The relevant details shared along with this response.*
3. *The value of $EF_{CO2,fuel,y}$ in the PDD is 0.051104527 tCO_2/GJ which is used for calculation of baseline emission. However, the same was also considered as a monitoring parameter for calculation of project emission which resulted a value 0.051859481 tCO_2/GJ. Also, there was a typo error in the MR which is has been corrected in the revised MR.*

Documentation provided by project participant

MR Version-02
ER Version-02

DOE assessment	Date: 14/12/2020

1. PP has provided the supporting documents requested, which includes the calibration certificates, SAP calibration records of previous calibrations that took place, and the photographs of the project activity. However, photographs of the meters installed at the project site, alongwith their tag number labels are not shared. Finding is open.

2. Applicable SOP is shared by PP. Therefore, this finding is closed.

3. The typographic error has been rectified by PP in the revised MR version 2.0. Therefore, this finding is closed.

CL03 is open.

Project participant response	Date : 12/12/2020

YANSAB have shared the Boiler SOP and Utilities transmitter procedure boiler plate number photo and plate number of some transmitter photo.

Documentation provided by project participant

DOE assessment	Date: 31/12/2020

PP has provided the photographs of some of the monitoring equipment installed at the project site as per the monitoring plan. During interview discussion with the PP, it was found that there are certain equipment for which photographs cannot be captured because of their installation location. This was further checked with the installation location of such instruments defined in the manufacturer's specifications, and found as correct.

Therefore, CL03 is closed.

CL ID	04	**Section no.**	D.2	**Date :** 27/11/2020
Description of CL				
The verification of implementation of project activity is not possible for some more time in future owing to the restricted air travel due to global pandemic currently. The stakes of postponing the verification (to a point where site visit shall be possible) are not clear.				
Project participant response				**Date :** 08/12/2020
The PP is in process to finalise ERPA, however the same is not yet closed. Moreover, as per CDM EB has given flexibility on selecting alternate method to conduct site visit • *If the site visits cannot be postponed, a proper justification should be provided by the DOE why the site visits cannot be postponed, including the demonstration of a significant impact of delaying the site visits on the DOE, or project participants or coordinating/ managing entity (e.g. commitment/ timeline as per the validation or verification contract, CER delivery commitment by project participants) reliance on applicable force majeure provisions in the validation or verification contracts, if needed.* • *If the site visit cannot be postponed but are not conducted due to the COVID-19 pandemic, the DOE may use other standard auditing techniques for validation or verification, as referred to in sections 7.1.3 and 9.1.3 of the VVS-PA and sections 7.1.3 and 10.1.3 of the VVS-PoA. In the above regard, to deviate from the requirements in paragraphs 30 and 339 of the VVS-PA and paragraphs 183 and 321 of the VVS-POA. Where the DOE relies on this temporary measure, it shall describe in the validation/ verification report the alternative means used and justify that they are credible and sufficient for the purpose of validation or verification.* *Given the total emission reduction achieved during current monitoring period very less, we would request you chose alternate method to conduct site visit, as its necessary for us submit the request for issuance in month of December 2020 only.*				
Documentation provided by project participant				
Yansab B.O. 2020 screenshots.				
DOE assessment				**Date:** 14/12/2020
The Business Objective for 2020, which was planned by PP top management earlier in 2020, included the objectives on issuance of CDM project activity by the end of 2020. The project's 2020 objectives, under objective 4.0 "Sustainability & Energy", within 4.5 SEEC & CDM, point 4.5.4.1 "Complete CDM documentation requirement for United Nation certification", state that the project activity seeks to achieve 100% progress for this specific objective. The submission of issuance request before the end of 2020 is what PP is seeking, and since it has been furnished through suitable evidence, postponement of verification would lead to unforeseeable implications to the PP. Therefore, PP is planning to go ahead with the verification, with taking UN relaxations on mandatory site visit (considering the risks associated with the COVID-19 pandemic). This is stated in para 26 of CDM EB 106 report, where relaxation was initially provided until 23rd of June 2020, but further extended to 31st December 2020 via statement[2] that followed. Based on UN decision, and the supporting evidence shared by PP, alternatives to the site visit shall be explored and worked upon for the verification request. CL04 is closed.				

CL ID	06	**Section no.**	E.7	**Date :** 14/12/2020
Description of CL				

[2] CDM: 2020 (unfccc.int)

1. The calibration certificate shared for the Specific Gravity Analyzer with Tag No. 74-AT-001B provides the calibration date inconsistent with that provided in the MR (ver. 2.0) – 'Page – 11 of the MR, monitoring parameter table for $NCV_{fuels,y}$, row Monitoring equipment. In the calibration certificate, date of calibration is provided as 23/01/2020, whereas in the MR, the date of calibration is 16/04/2020. PP is requested to clarify on the inconsistency.

2. PP is requested to share all the applicable calibration certificates or the logs of calibrations for all the monitoring equipments installed at the project site. The calibration certificates or calibration details for the whole of monitoring period must be made available to ensure that the equipment were duly calibrated throughout the monitoring period. This is a requirement under Section 9.2.6 "Compliance with the calibration frequency requirements for measuring instruments" Para – 365 of the CDM Validation and Verification Standard for Project Activities, version 2.0. In cases there is a delay observed for the calibration of monitoring equipment during the monitoring period, requirements stated under Para 366 of the CDM Validation and Verification Standard for Project Activities, version 2.0 shall apply.

3. PP is requested to establish with supporting document(s) that the Instrument and Analyzer Maintenance Supervisors, who are responsible for the checking and calibration of the meters and analyzers (as stated in the Section B.7.3, heading "Management structure and responsibility", Page 27 of the MR, ver. 2.0), are accredited for the calibration of such instruments. This is a requirement as stated in the Section 7.5.6. "Monitoring Plan" Para – 79 (d) of CDM Project Standard for Project Activities, ver. 2.0.

Project participant response	**Date :** 12/12/2020

YANSAB have shared the calibration record and the PM frequency for density Analyzer.
YANSAB have update the MR with right date of Density Calibration record

Documentation provided by project participant

DOE assessment	**Date:** 31/12/2020

1. PP has revised the calibration date for the monitoring equipment Specific Gravity Analyzer. The calibration date provided in the MR is now consistent with the certificate. Since PP was unable to share all the calibration certificates applicable to the monitoring equipment, screenshot of SAP maintenance schedule records is shared for the analyzer, for verification purposes. Therefore, this finding is closed.

2. The calibration certificates for the monitoring equipment have been shared, which were applicable for the whole monitoring period. In cases where multiple calibration certificates could not be shared, SAP maintenance schedule and a calibration certificate is shared for such equipment. This finding is closed.

3. PP has shared the monitoring job trainings for the PP's team members responsible for monitoring, maintenance, and calibration of the project's monitoring equipments. The trainings are specific to the equipments, and are incorporating all the requirements that are to be fulfilled for the effective operation of those instruments. Finding is closed.

CL06 is closed.

CL ID	07	**Section no.**		**Date :** 19/01/2021
Description of CL				

1. ER Sheet worksheet "Baseline emissions" cell D8 mentions the parameter $P_{PJ,i,y}$ value as 31,03,709 t/year, whereas MR table for parameter (Section D.2, Page – 8) contains the values 2017-18:780,550 tons (Boiler E only from 10/12/17 to 09/12/2018)
   2018-19:3,279,695 tons (all boilers sum from 10/12/18 to 09/12/2019).
   PP is requested to discuss the approach and the values applied (alongwith the reason as to why some values are not applied) in the additional comments row in the parameter table in the MR Section D.2.

2. In the PDD, the estimated value for monitored parameter Tsteam value was 510° C. PP is requested to explain the lowering of parameter values, since during the monitoring period, these are in the range 485 – 501° C as provided in the MR.

3. For the parameter $FC_{Fuels,j,y}$, PP has provided the following values in the MR: 2017-18:53,955 (Boiler E only from 10/12/17 to 09/12/2018) & 2018-19: 224,387 (all boilers sum from 10/12/18 to 09/12/2019). These values are inconsistent with the one provided in the ER Sheet for ER calculations. ER Sheet worksheet "Project emission" cell D11 is applying a value of 2,22,580.2 tons. PP is requested to clarify the inconsistency, and state the approach and the values applied (alongwith the reason as to why some values are not applied) in the additional comments row in the parameter table in the MR Section D.2.

4. For project emissions calculation, PP has incorporated emissions for the period 10/12/2018 to 09/12/2019 only. Since monitoring period is from 01/01/2017 to 09/12/2019, PP must explain on why project emissions from Boiler E (for the whole monitoring period) are not included.

5. PP is requested to add the calibration dates applicable for each parameter, instrument, applicable for the whole monitoring period in the MR.

6. For parameter Psteam, the unit of pressure measurement is Barg. The calibration for the monitoring equipment is done in KPa units. Also, in the ER Sheet, the last worksheet "Monitoring Data T,P", column B has daily records of steam pressure data, which are in the range of 9865 – 10244, but there is no unit provided to verify the data. Also, when we compare these values with the ex-ante PDD value, it was 100 Barg.
   PP shall explain the significant drop in Psteam value from 100 Barg to around 10 Barg.
   PP is requested to share the correlation between the values recorded (as provided in the worksheet "Monitoring Data T,P") and the values applied in the MR, since these are inconsistent.

7. For the monitored parameter Tsteam, the monitoring equipments (tags 71-TT-310, 71-TT-410, …, 71-TT-710) are mentioned as Temperature transmitter with RTD element (See parameter table for Tsteam, Page – 9, Section – D.2 of the MR). In the same table, within row "Calculation method", the monitoring instrument is mentioned as temperature transmitter (thermocouple). PP is requested to maintain consistency for the information shared.

Project participant response | **Date :** 04/02/2021

1. *The economizer on boiler E was commissioned in 2017, while for other 4 boilers, the same was commissioned and became operational on 10/12/2018, PP has considered emission reduction from 10/12/2017 onwards in revised ER/MR. Further as steam generation depends on steam demand of the plant, the steam demand during current monitoring period was marginally higher than used for baseline assessment, however the project activity has operated within small scale threshold of 180GW energy saving. The values used for calculation of baseline emission and project emission is now corrected and is consistently used.*
2. *The value used in PDD is standard operating temperature/pressure of the boiler as per manufacturer specification, however the actual temperature may vary during the operation. The recorded temperature during current monitoring period is as per actual output of the boiler steam and is appropriate as it may range within permissible limit as per requirement or as per actual operating conditions.*
3. *The values now corrected in revised MR/ER and consistently used.*
4. *In revised ER/MR the project emission for entire monitoring period is considered for boiler operating with economizer, which is appropriate.*
5. *The calibration dates covering monitoring period is incorporated in revised MR*
6. *There was error in value reported in PDD for pressure of steam, as per manufacturer specification of boiler the standard operating pressure is 100 Bar g, during current monitoring period the actual values monitored in Kpa and being converted to Bar g, which is appropriate.*
7. *There was typo error the same has been corrected in revised MR.*

Documentation provided by project participant

ER Version-03 *MR Version-03*
DOE assessment **Date:** DD/MM/YYYY

Table 3. CAR from this verification

CAR ID	05	**Section no.**	E.8.5	**Date :** 27/11/2020
Description of CAR				
In Section E.5.1 of the MR, the calculations made for arriving at the ex-ante estimate of ERs for the current monitoring period is not aligning with rest of the information provided within the MR. PP is requested to incorporate revisions, thus maintaining the consistency within the values and calculations in the MR.				
Project participant response				**Date :** 08/12/2020
There was a typo error which has been corrected in the revised MR.				
Documentation provided by project participant				
MR, version 2.0.				
DOE assessment				**Date:** 14/12/2020
1. Section E.5.1 of the MR is revised now, and the ex-ante estimates of the ERs for the current monitoring period are consistent with the rest of information provided within the MR. This finding is closed. 2. On the cover page of the ER Sheet (Cell C7), the monitoring period is mentioned as 01/01/2017 – 31/12/2019, which is inconsistent with that provided in the MR, ver. 2.0. 3. For the monitored parameter $EF_{CO2,fuels,y}$, the value and unit provided in the ER Sheet (0.183976297 tCO2/MWh) is inconsistent with that provided in the MR, ver. 2.0 (0.051104527 tCO_2/GJ). PP may provide the unit conversion (from tCO_2/GJ to tCO_2/MWh) in the ER Sheet to avoid any inconsistency. Therefore, CAR04 is open.				
Project participant response				**Date :** 21/12/2020
YANSAB have update the ER cover page and update the EFco2 value and unit.				
Documentation provided by project participant				
DOE assessment				**Date:** 31/12/2020
2. The editorial error has been rectified by PP. Finding is closed. 3. PP has provided the conversion for the parameter, thus there is no inconsistency regarding the parameter and its units used. Finding is closed. CAR05 is closed.				

Table 4. FAR from this verification
There is no FAR from this verification.

Appendix 5. List of instruments calibrated

Tag#	Make	Type	Serial Number	Accuracy	Last Calibration Date	Calibration Validity	Last Calibration Certificate
71-FT-301	Yokogawa	DP Flow Transmitter	91F818183	(- +)1%	7/5/2020	As per SAP cycle	Available
71-FT-401	Yokogawa	DP Flow Transmitter	91F818184	(- +)1%	2/5/2019	As per SAP cycle	Available

71-FT-501	Yokogawa	DP Flow Transmitter	91F818185	(- +)1%	1/2/2018	As per SAP cycle	Available
71-FT-601	Yokogawa	DP Flow Transmitter	91F818186	(- +)1%	7/26/2017	As per SAP cycle	Available
71-FT-701	Yokogawa	DP Flow Transmitter	91F818187	(- +)1%	3/19/2018	As per SAP cycle	Available
71-TT-310	Yokogawa	Temperature Transmitter with RTD Element	C2F810984	(- +)1%	10/5/2017	As per SAP cycle	Available
71-TT-410	Yokogawa	Temperature Transmitter with RTD Element	C2F810985	(- +)1%	1/21/2017	As per SAP cycle	Available
71-TT-510	Yokogawa	Temperature Transmitter with RTD Element	C2F810986	(- +)1%	1/1/2020	As per SAP cycle	Available
71-TT-610	Yokogawa	Temperature Transmitter with RTD Element	C2F810987	(- +)1%	7/17/2019	As per SAP cycle	Available
71-TT-710	Yokogawa	Temperature Transmitter with RTD Element	C2F810988	(- +)1%	3/9/2020	As per SAP cycle	Available
69-PT-013A	Yokogawa	Gauge Pressure Transmitter	91G401356	(- +)1%	1/10/2019	As per SAP cycle	Available
69-PT-013B	Yokogawa	Gauge Pressure Transmitter	91G401357	(- +)1%	1/10/2019	As per SAP cycle	Available
69-PT-013C	Yokogawa	Gauge Pressure Transmitter	91G401358	(- +)1%	1/10/2019	As per SAP cycle	Available
71-TT-003	Yokogawa	Temperature Transmitter with TC Element	C2G318218	(- +)1%	7/28/2020	As per SAP cycle	Available
71-FT-308	Yokogawa	DP Flow Transmitter	91F818188	(- +)1%	10/4/2016	As per SAP cycle	Available
71-FT-408	Yokogawa	DP Flow Transmitter	91F818189	(- +)1%	2/4/2019	As per SAP cycle	Available
71-FT-508	Yokogawa	DP Flow Transmitter	91F818190	(- +)1%	12/30/2019	As per SAP cycle	Available
71-FT-608	Yokogawa	DP Flow Transmitter	91F818191	(- +)1%	7/15/2019	As per SAP cycle	Available
71-FT-708	Yokogawa	DP Flow Transmitter	91F818192	(- +)1%	3/9/2020	As per SAP cycle	Available

Appendix 6. Calibration Details for the monitoring equipments used during the monitoring period

a) Flow transmitter for measurement of quantity of Steam in the boilers (Specific to parameter $P_{PJ,steam,y}$)

Boiler S. No.	S. No.	Instrument Tag	Output Range	Calibration Scale (%)	Output (as per range)	Error (%)	Calibration Status (Pass/Fail)
BO-7101-A	91F818183	71-FT-301	0 - 170,000 KG/Hr	0	0	0	Pass
				25	2500	0	Pass
				50	5000	-0.0107	Pass
				75	7500	-0.0025	Pass
				100	10000	0	Pass
BO-7101-B	91F818184	71-FT-401	0 - 160 KG/Hr	0	0.00	0	Pass
				25	80.00	0	Pass
				50	113.13	-0.0044	Pass
				75	138.56	-0.0025	Pass
				100	160.00	0	Pass
BO-7101-C	91F818185	71-FT-501	0 - 170 KG/Hr	0	0.00	0	Pass
				25	85.00	0	Pass
				50	120.19	-0.0107	Pass
				75	147.22	-0.0025	Pass
				100	170.00	0	Pass
BO-7101-D	91F818186	71-FT-601	0 - 10000 mm H20	0	0	0	Pass
				25	2500	0	Pass
				50	5000	0	Pass
				75	7500	0	Pass
				100	10000	0	Pass
BO-7101-E	91F818187	71-FT-701	0 - 170,000 KG/Hr	0	0	0	Pass
				25	85000	0	Pass
				50	120190	-0.0107	Pass
				75	147220	-0.0025	Pass
				100	170000	0	Pass

b) Temperature transmitter for measurement of temperature of Steam in the boilers (Specific to parameter T_{Steam})

Boiler S. No.	S. No.	Instrument Tag	Output Range	Calibration Scale (%)	Output (as per range)	Error (%)	Calibration Status (Pass/Fail)
BO-7101-A	C2F810984	71-FT-310	0 - 600 °C	0	0.00	0	Pass
				25	150.00	0	Pass

				50	300.00	0	Pass
				75	450.00	0	Pass
				100	600.00	0	Pass
BO-7101-B	C2F810985	71-FT-410	0 - 600 °C	0	0.00	0	Pass
				25	150.00	0	Pass
				50	300.00	0	Pass
				75	450.00	0	Pass
				100	600.00	0	Pass
BO-7101-C	C2F810986	71-FT-510	0 - 600 °C	0	0.00	0	Pass
				25	150.00	0	Pass
				50	300.00	0	Pass
				75	450.00	0	Pass
				100	600.00	0	Pass
BO-7101-D	C2F810987	71-FT-610	0 - 600 °C	0	0.00	0	Pass
				25	150.00	0	Pass
				50	300.00	0	Pass
				75	450.00	0	Pass
				100	600.00	0	Pass
BO-7101-E	C2F810988	71-FT-710	0 - 600 °C	0	0.00	0	Pass
				25	150.00	0.0167	Pass
				50	300.00	-0.0167	Pass
				75	450.00	-0.0333	Pass
				100	600.00	-0.0167	Pass

c) Pressure transmitter for measurement of temperature of Steam in the boilers (Specific to parameter P_{Steam})

S. No.	Instrument Tag	Output Range	Calibration Scale (%)	Output (as per range)	Error (%)	Calibration Status (Pass/Fail)
91G401356	69-PT-013A	0 - 14000 KPA	0	0.00	0	Pass
			25	3500.00	0.0143	Pass
			50	7000.00	0.0143	Pass
			75	10500.00	0.0143	Pass
			100	14000.00	0.0143	Pass

d) Temperature transmitter for measurement of feedwater temperature going to the boilers (Specific to parameter $T_{Feedwater}$)

Year	S. No.	Instrument Tag	Output Range	Calibration Scale (%)	Output (as per range)	Error (%)	Calibration Status (Pass/Fail)
2017	C2G318218	71-TT-003	0 - 300 °C	0	0.00	0	Pass

				25	75.00	-0.1667	Pass
				50	150.00	-0.1333	Pass
				75	225.00	-0.1833	Pass
				100	300.00	-0.1467	Pass
2018	C2G318218	71-TT-003	0 - 300 °C	0	0.00	0.0003	Pass
				25	75.00	0.0007	Pass
				50	150.00	0.001	Pass
				75	225.00	0.0003	Pass
				100	300.00	0.0003	Pass
2019	C2G318218	71-TT-003	0 - 300 °C	0	0.00	0	Pass
				25	75.00	0	Pass
				50	150.00	0	Pass
				75	225.00	0	Pass
				100	300.00	0	Pass
2020	C2G318218	71-TT-003	0 - 300 °C	0	0.00	0	Pass
				25	75.00	0	Pass
				50	150.00	0	Pass
				75	225.00	0	Pass
				100	300.00	0	Pass

e) Monitoring of Quantity of fuel type "fuels" combusted in process j (Specific to parameter $FC_{,fuels,j,y}$)

Boiler S. No.	S. No.	Instrument Tag	Output Range	Calibration Scale (%)	Output (as per range)	Error (%)	Calibration Status (Pass/Fail)
BO-7101-A	91F818188	71-FT-308	0 - 26 N/M	0	0	0	Pass
				25	13	0	Pass
				50	18.38	-0.0184	Pass
				75	22.51	-0.0256	Pass
				100	26	0	Pass
BO-7101-B	91F818189	71-FT-408	0 - 26 N/M	0	0.00	0	Pass
				25	13.00	0	Pass
				50	18.38	-0.0184	Pass
				75	22.51	-0.0256	Pass
				100	26.00	0	Pass
BO-7101-C	91F818190	71-FT-508	0 - 26000 m3/h	0	0.00	0	Pass
				25	13000.00	0	Pass
				50	18382.00	-0.0107	Pass
				75	22516.00	-0.0025	Pass
				100	147.22	0	Pass
BO-7101-D	91F818191	71-FT-608	0 - 26	0	0.00	0	Pass

			m3/h	25	13.00	0	Pass
				50	18.38	-0.0107	Pass
				75	22.51	-0.0025	Pass
				100	26.00	0	Pass
BO-7101-E	91F818192	71-FT-708	0 - 26 m3/h	0	0.00	0	Pass
				25	13.00	0	Pass
				50	18.38	-0.0184	Pass
				75	22.51	-0.0256	Pass
				100	26.00	0	Pass

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Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN); • Make structural and editorial improvements.
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
02.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
01.0	23 March 2015	Initial publication.

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