BATICIM BATI ANADOLU CIMENTO SANAYII A.S. 9 MW CEMENT WHR PROJECT

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Project Title	BATICIM BATI ANADOLU CIMENTO SANAYII A.S. 9 MW Cement WHR Project
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CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project shall be staged at BATICIM-IZMIR cement plant which started clinker production in 1966.

The project shall implement a 9 MW waste heat recovery solution at BATICIM-IZMIR cement plant. It entails the installation of

- One 9MW turbine
- One 9MW generator
- Two AQC boilers
- Two SP boilers

AQC boiler is installed between the middle cooler outlet and filter, produce superheated steam and hot water; a dedusting chamber is installed before the AQC2 boiler to alleviate the boiler abrasion. The AQC1 boiler has little space for installation, thus the chamber and the boiler are combined. The heat-receiving surface of the boiler is divided into two stages:

The first stage is high pressure superheated steam stage; the second stage is hot water stage. SP boiler will be connected to the preheater exit, produce superheated steam. Deaerated water is pumped to AQC boiler as supply of the hot water stage, outgoing water from the stage is used as feed water of SP boilers and AQC boiler steam stage.

The superheated steam produced in the AQC boilers and SP boilers merges and is introduced to the turbine for on-site utilization. Exhaust steam of turbine after work condensed to water, and then pumped to a deaerator.

In the PDD report it was confirmed that the indicated total amount of annual verified emission reductions of 25,180 tones CO2e represents a conservative estimation using the assumptions given by the project documents. For a 10-year crediting period, the emission reductions correspond to 251,800 tones CO2e. For this Monitoring Period, the project activity achieved an actual reduction of 148,337 tones of CO2e and annual reduction of 24,761 tones of CO2e.

Table 1 below shows the relevant implementation dates of the project activity:

Table 1. Milestones of BATICIM BATI ANADOLU CIMENTO SANAYII A.S. 9 MW Cement WHR Project

No.	Date	Milestone	Reference
1	01.04.2010	Technical Proposal of Whr Power Generation Project for Baticim Bati Anadolu Cemento Co. Limited	Prepared by Sinoma Energy Conservation Ltd.
2	29.07.2010	EIA exemption certificate of the project	Official Correspondence with MoEU

No.	Date	Milestone	Reference
3	24.04.2012	Validation Approval by VCS	https://registry.verra.org/app/projectDetail/VCS/822
4	12.10.2013	Project start date	Provisional Acceptance Document
5	12.10.2013	Start Date of the First Crediting Period	
6	12.10.2013	Start Date of First Monitoring Period	Provisional Acceptance Document
7	12.10.2013	Provisional Acceptance Date	Initial acceptance protocol with Ministry of Energy and Natural Resources
8	17.04.2014	Current Otoproduction License	License number EÜ/4969-148/2848
9	07.07.2020	Capacity Report	The Union of Chambers and Commodity Exchanges of Turkey Capacity Report
10	11.10.2023	End Date of the First Crediting Period	

Audit Type	Period	Program	VVB Name	Number of years
Validation	24/04/2012	VCS	TÜV SÜD Industrie Service GmbH	The project crediting period is 10 years: 12/10/2013-11/10/2023 (both days inclusive). The crediting period is renewable once
First Verification	12/10/2013 - 11/10/2019	VCS	Rina	6 Years
Total	24/04/2012-11/10/2019	VCS	-	6 Years MP

1.2 Sectoral Scope and Project Type

Sectoral Scope 1: Energy Industries

Sectoral Scope 4: Manufacturing Industries

Project Type: Waste heat recovery from cement factory

The project is not a grouped project.

1.3 Project Proponent

Organization name	Batıcim Batı Anadolu Cimento Sanayii A.Ş.
Contact person	Burak Demirörs
Title	Environment Specialist
Address	Ankara Cad. No:335 35050 Bornova/İzmir
Telephone	+90-232-4784400
Email	burakdemirors@baticim.com.tr

1.4 Other Entities Involved in the Project

Organization name	Life İklim ve Enerji Ltd. Şti.
Role in the Project	Consultant for Carbon Certification
Contact person	Mr. Ramazan Aslan
Title	General Manager
Address	Oğuzlar Mah. 1377. Sk. No:19/9 06520, Balgat, Çankaya/Ankara
Telephone	+90 312 481 2142 Dahili:19
Email	ramazan.aslan@lifeenerji.com

1.5 Project Start Date

The project start date is 12.10.2013.

1.6 Project Crediting Period

First Crediting Period Start Date: 12.10.2013.

First Crediting Period End Date: 11.10.2023

Length of crediting period: 10 years, once renewable, for a total of 20 years.

1.7 Project Location

The cement production plant BATICIM-IZMIR of BATICIM BATI ANADOLU CIMENTO CO. Ltd. is located in Bornova district of Izmir province.

The exact address is:

Ankara Asfalti Uzeri, Naldoken Koyu No. 335, Bornova

Izmir, 35050

Turkey

The coordinates of the plant are given in Table 2.

Table 2: Coordinates of the Project Location[1]

Latitude	Longitude
38° 27' 25'' N	27° 15' 45'' E

The following figures give an overview of the location on different levels (national, municipal, plant level).

Figure 1 Location of the plant in Turkey

[1] Please see PDD document.

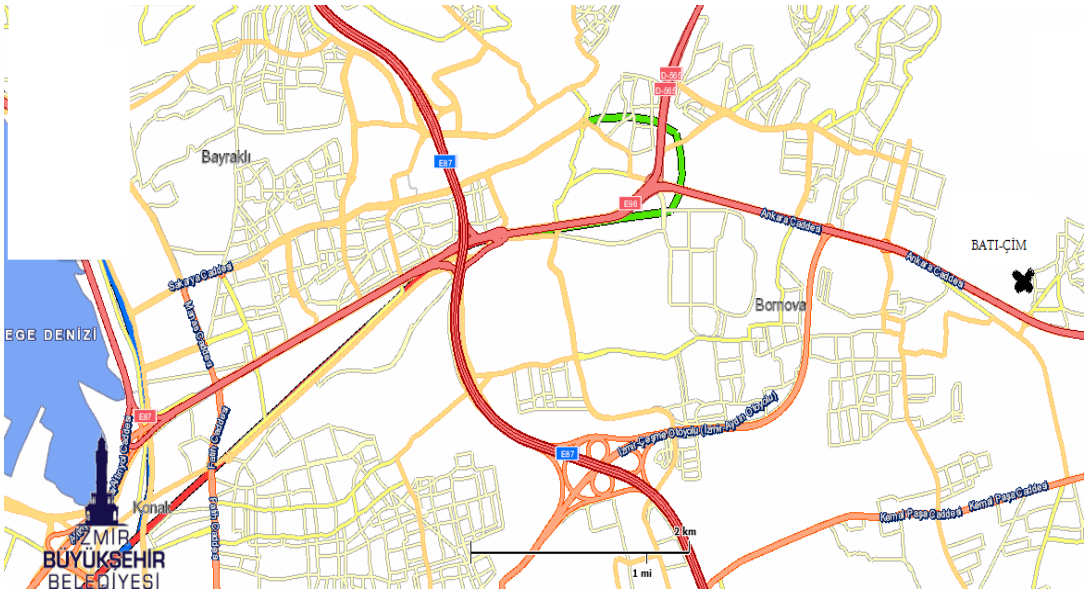

Figure 2 Location of the plant in Bornova (marked: BATICIM)

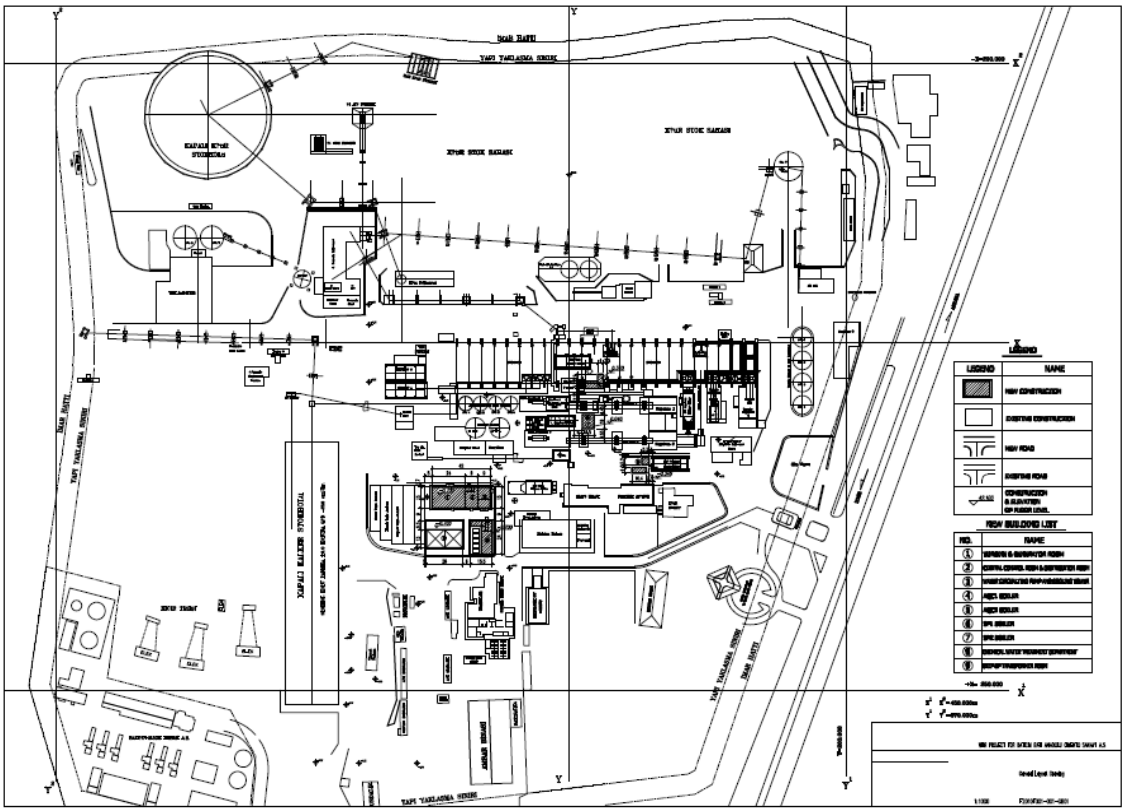

Figure 3 Overview of the plant

1.8 Title and Reference of Methodology

The project at hand applies CDM-EB approved consolidated baseline and monitoring methodology ACM0012, Version 04.0.0, "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects".

Also along ACM0012 requirements, five CDM EB-approved methodological tools shall be applied. As per project design, three of those are relevant to the project at hand, i.e.

- "Tool to calculate the emission factor for an electricity system", Version 02.1.0;
- "Tool for demonstration and assessment of additionality", Version 05.2;
- "Tool to determine the remaining lifetime of equipment, Version 01.

1.9 Participation under other GHG Programs

The project does not participate/has not participated under any other GHG program.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

- The project has not created any form of other credit. Batıcim does not obtain any public funding

1.11 Sustainable Development Contributions

Batıçim WHR is located in İzmir Province, Turkey. The proposed WHR system will efficiently utilize the waste heat from the clinker production process to generate electricity. The generated electricity will be consumed within the plant only, thereby substituting electricity for cement production that would otherwise be purchased from the Turkish power grid. The project will thus lead to indirect reduction of CO_2 emission from plant electricity consumption.

The project 282,202.77 MWh renewable electricity generation, 148,337 tCO_2e during this monitoring period.

Considering regional development efforts, the project owner has employed 9 workers.

Table 3: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.3	13.3.1 Air Quality	Electricity generation from waste heat to decrease CO_2 emission	148,337 tCO2 emission reduction during this MP	251,800 tCO2 estimated emission reduction over the project lifetime (10 years crediting period)
2)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Electricity generation from waste heat	282,202.77 MWh during this MP	478,020 MWh estimated electricity generation over the project lifetime (10 years crediting period)
3)	8.8	8.8.2 Quantitative employment and income generation	Increase in the number of employments with the help of waste heat recovery project	There are 9 employees have been working at the Plant.	There are 9 employees have been working at the Plant.

2 SAFEGUARDS

2.1 No Net Harm

According to the relevant Environmental Impact Assessment Regulation for BATICIM WHR Project, Project is exempt from Environmental Impact Assessment on 29/07/2010 with subject no 22003. The official letter from Environment and Forestry Ministry confirming non-applicability of this regulation has been shared with DOE.

As the project boundary is in the border of the plant, project does not have any impact on environment. Also in the project waste heat which already exists in the plant will be used for electricity generation and the generated electricity will be used in the plant. So all the project activities take place within the boundary of the plant.

2.2 Local Stakeholder Consultation

As the project boundary is in the border of the plant, project does not have any impact on environment and local people. Also in the project waste heat which already exists in the plant will be used for electricity generation and the generated electricity will be used in the plant. So all the project activities take place within the boundary of the plant.

In addition, there is no national requirement to conducting any local stakeholder meetings. With no external parties being affected by any effects from the project, no meeting is conducted.

Ongoing communication with the stakeholders is the responsibility of the corporate communication manager at the factory. The headman of Naldöken village has the contact details of the corporate communication manager. Stakeholders can reach the project owner through the mukhtar when they have any complaints or suggestions. So far there has been no feedback from stakeholders.

2.3 AFOLU-Specific Safeguards

N/A

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project shall implement a 9 MW waste heat recovery solution at BATICIM cement plant. For this Monitoring Period, the project activity achieved an actual reduction of 148,337 tons of CO2e. The anticipated project start date is 12.10.2013.

During this Monitoring Period, the Project is operated and implemented in accordance with the registered Project Description. Neither emergencies (including of overhaul times, downtimes of

equipment, exchange of equipment, etc.) happened to the monitoring system in this Monitoring Period, nor did events or situations occur during the Monitoring Period, which may impact the applicability of the methodology.

The key technology parameter of the boiler, steam turbine and generator can be found in the below Table 4. The table is up to date and there have been no revisions for these technical components of the project during this Monitoring Period.

Table 4: Key technical components of the project

No.	GENERAL INFORMATION ABOUT THE PROJECT		Reference
1	Province	İzmir	Production license, EIA PD File
2	District	Bornova	
3	Number of Units	1 Steam Turbine	
4	Installed Capacity	9 MWe / 9 MWm	
5	Annual Estimated Gross Electricity Generation	51,289 MWh	
8	Annual Operating Hours	8160	
9	Annual Clinker Production	1,377,000 tonnes	Capacity Report
	SP1-2 BOILER SPECIFICATIONS		
10	Boiler Type	Vertical type natural circulation	Technical Study of Sinoma
11	Number of Units	2	
12	Manufacturer	Nantong Wanda Boiler Co.,Ltd	
13	Rated Steam Output	18.7 t/h(Hp)	
14	Rated Steam Pressure	1.8 Mpa (Hp)	
15	Rated Steam Temperature	350 ^{0}C (Hp)	
16	Average Lifetime	25 years	Methodological Tool: Tool to determine the remaining lifetime of equipment (Version 01), Page 4.[2]
17	Manufacture year	2011	
18	AQC1-2 BOILER SPECIFICATIONS		
19	Boiler Type	Vertical type natural circulation	Technical Study of Sinoma
20	Number of Units	2	
21	Manufacturer	Nantong Wanda Boiler Co.,Ltd	
22	Rated Steam Output	9 t/h(Hp)	
23	Rated Steam Pressure	1.8 Mpa (Hp)	
24	Rated Steam Temperature	360 ^{0}C (Hp)	
25	Average Lifetime	25 years	Methodological Tool: Tool to determine the remaining lifetime of equipment (Version 01), Page 4.[3]
	STEAM TURBINE SPECIFICATIONS		
26	Manufacturer	Qingdao Jieneng Steam Turbine Group Co.,Ltd	Technical Study of Sinoma
27	Number of Units	1	

[2] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf
[3] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

28	Rated Output	9000 kW	
29	Rated Pressure of Main Steam	1.25 MPa	
30	Rated Temperature of Main Steam	345°C	
31	Rated Flux of Main Steam	55.2 t/h	
32	Average Lifetime	25 years	Methodological Tool: Tool to determine the remaining lifetime of equipment (Version 01), Page 4.
	GENERATOR SPECIFICATIONS		
33	Manufacturer	Shandong Jinan Power Equipment Factory	Technical Study of Sinoma
34	Number of Units	1	
35	Rated Output	9000 kVA	
36	Rated Voltage	6300 V	
37	Rated Rotating Speed	3000 rev/min	
38	Average Lifetime	30 years	Methodological Tool: Tool to determine the remaining lifetime of equipment (Version 01), Page 4.[4]

Equipment supplier of the project is Sinoma Energy Conservation Ltd. This is located in P.R. China.

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviation is involved.

3.2.2 Project Description Deviations

Deviations from Project Description can be seen below Table.

Information in PD	Deviation from PD in MR
Two meters will be placed (one main and one reserve) at the power plant.	There are 3 electricity meters.(to see net electricity generation, gross electricity generation and auxiliary consumption)
Start date of the Project is 20/05/2012. Crediting period is between 20/05/2012 and 19/05/2022.	Start date of the Project is 12/10/2013. Crediting period is between 12/10/2013 and 11/10/2023.
Electricity meters are sealed by TEIAS. Meters are read by TEIAS staff monthly.	The electricity produced at the facility is not for sale, all of the electricity produced is used for the facility's own electricity needs. Therefore, it is not obligatory for the meters in the facility to be sealed and controlled by the state (TEIAS). Technicians in BATICIM

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf

	conduct daily meters readings and keep records for electricity generation amount and reports to management. These records can be used for monitoring in case of any problem will arise in meters.
Monthly meter reading records will be taken from PMUM (Market Financial Settlement Centre). Measurement results will be crosschecked with records for sold electricity.	Daily gross, net electricity data will be monitored. Gross, net electricity and auxiliary consumption data will be compared among themselves as a crosscheck (meter data showing auxiliary consumption will be subtracted from meter data showing gross production, and a crosscheck will be made between the result and meter data showing net production). In addition to these data, TEIAS records (monthly net and gross electricity generation data) are also available for cross check.

In addition, for the parameters of "f_{wcm}" and "$Q_{oE,y}$" source of data is different from PD. There is no information for gross electricity production of project in capacity report/feasibility report as specified in PD. Gross electricity production can be seen from data by project owner that is got from electricity meter as specified in monitoring plan section of MR. Capacity report had been prepared as feasibility report and related information for "f_{wcm}" parameter can be found in capacity report of the Project, page 5, section B.

3.3 Grouped Projects

The Project is not a grouped project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$Q_{OE,BL}$
Data unit	MWh
Description	Output/intermediate energy that can be theoretically produced (in appropriate unit), to be determined on the basis of maximum recoverable energy from the WECM, which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of VCS project activity.
Source of data	Calculated on the basis of a test report and equipment specifications
Value applied	73,660
Justification of choice of data or description of	The value has been calculated on the best data available which includes a test report of the available waste heat which provides

measurement methods and procedures applied	an accurate estimate of total usable waste heat and the specifications of the waste heat recovery equipment.
Purpose of Data	-
Comments	-

Data / Parameter	Gross electricity generation
Data unit	MWh
Description	Gross Electricity supplied to the grid by relevant sources (2007-2009)
Source of data	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (1940-2009) TEİAŞ, see http://www.teias.gov.tr/istatistik2009/32(75-09).xls
Value applied	Values applied were given in registered PD: Table A1-3. Gross electricity production by fossil energy sources
Justification of choice of data or description of measurement methods and procedures applied	As there is no publicly available plant specific generation and consumption data, the statistics of TEIAS was used. TEIAS is a public company and publishes the statistical data about the Turkish Grid annually.
Purpose of Data	-
Comments	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter	$EF_{elec\ i,j,y}$
Data unit	tCO2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data	As per "Tool to calculate the emission factor for an electricity system"
Value applied	0.5267 tCO2/MWh
Justification of choice of data or description of measurement methods and procedures applied	As per "Tool to calculate the emission factor for an electricity system" Calculated from data provided by the TEIAS for Turkish Power Sector; Operating Margin = 0.6532 KgCO2e/KWh Build Margin = 0.4003 KgCO2e/KWh Combined Margin = 0.5267 KgCO2/KWh

	Calculated as weighted sum of OM and BM emission factor
Purpose of Data	-
Comments	Emission Factor is fixed at ex-ante calculation.

Data / Parameter	Net electricity generation
Data unit	MWh
Description	Net electricity fed into the grid. Used for the calculation of the net/gross relation (Including Import and Export figures)
Source of data	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Electricity Generation-Consumption and Losses in Turkey (1984-2009) TEİAŞ, see http://www.teias.gov.tr/istatistik2009/30(84-09).xls
Value applied	Values applied were given in registered PD in Table A1-4
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	This data is used to find relation between the gross and net electricity delivered to the grid by fossil fuel fired power plants. Import and Export data is used to identify total net electricity fed into the grid in the years of 2007, 2008 and 2009 TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter	EFi
Data unit	tCO_2/GJ
Description	Emission factor for fuel type i
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the IPCC Guidelines on National GHG Inventories. See http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value applied	Values applied were given in the registered PD in Table A1-8 and Table See Table A1-13.
Justification of choice of data or description of	-

measurement methods and procedures applied	
Purpose of Data	-
Comments	No plant specific and national emission factor data is available in Turkey. So, IPCC default data is used. For Fuel Oil Power Plants: 'Gas/Diesel Oil' data is used for conservativeness. For Coal Power Plants: In the 205th page of official document given in the link below, it is stated that Çolakoğlu and İçdaş utilizes 'Taşkomürü' (Hardcoal). And at the Table-2 in page 157 of the same document, Taşkomürü is dived in two groups: Bituminous and Antharcite. Since Sub-Bituminous Coal is under Brown Coal in the same table and since Other Bituminous Coal has lower EF than Anthracite in 1.4 of IPCC Guidelines, EF for 'Other Bituminous Coal' is used. See: http://www.dpt.gov.tr/DocObjects/Icerik/4225/Enerji_Hammaddeleri_(Linyit_Taskomuru-Jeotermal)

Data / Parameter	Sample Group for BM emission factor
Data unit	Name of the plants, MW capacities, fuel types, annual electricity generations and dates of commissioning.
Description	Most recent power plants which compromise 20% of total generation
Source of data	Annual Development of Fuels Consumed in Thermal Power Plants in Turkey by the Electric Utilities, TEIAS: For plants in 2005: http://www.teias.gov.tr/istatistik2005/7.xls For plants in 2006: http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu.pdf (page 76 and 77 for installed power of new plants, page 67-75 for generation amounts. For capacity additions, interpolation method is used for generation amounts) For plants in 2007: http://www.epdk.org.tr/yayin_rapor/elektrik/yayin/uretimKapasiteProjeksiyonu2008_2017.pdf (page 121 and 122 for installed power of new plants, page 111-120 for generation amounts. For capacity additions, interpolation method is used for generation amounts) For plants in 2008: http://www.teias.gov.tr/projeksiyon/KAPASITEPROJEKSIYONU2009.pdf (page 95 for plants and pages 82-94 for generation

	amounts. For capacity additions, interpolation method is used for generation amounts) For Plants in 2009: http://www.teias.gov.tr/projeksiyon/KAPASITE%20PROJEKSIYONU%202010.pdf (page 98-100 for plants and pages 85-97 for generation amounts. For capacity additions, interpolation method is used for generation amounts)
Value applied	Values applied were given in the registered PD in Table A1-7.
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	-

Data / Parameter	$\eta_{i,y}$
Data unit	-
Description	Average energy conversion efficiency of power unit m in year y
Source of data	Annex I the "Tool to calculate the emission factor for an electricity system"
Value applied	Values applied were given in Table A1-8 of the registered PD.**Error! Reference source not found.**
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	For Lignite and Coal power plants, plants specific values are applied. There are two lignite power plant in Sample Group. These are Çan and Elbistan PPs. For efficiency factor of Çan PP is taken form presentation of Mr. Sefer Bütün (General Manager of EUAS, state production company) which is 'Thermal Power Plants and Environment'. This presentation is submitted to DOE. In page 18 of the presentation, it is stated that the for pulverized lignite power plants the highest achieved electrical efficiency rate is 38%. So this rate is applied also for Elbistan-B PP. Weighted average of these efficiency rates which turns to be 38.63% is used for lignite power plants.

	For coal power plants, the highest efficiency rate for 'fluidized bed' technology which is 41.5% for PFBS is applied as coal PPs in the sample group (Çolakoğlu (Capacity Increment) and Çan Gr I-II) are utilizing fluidized bed type technology. For reference see: http://www.mimag-samko.com.tr/akiskan_yatakli_kazanlar.pdf (last paragraph of page 6) For Natural Gas and Oil plants efficiencies, default value given in the tool is applied: http://cdm.unfccc.int/methodologies/Tools/EB35_repan12_Tool_grid_emission.pdf

Data / Parameter	$HV_{i,y}$
Data unit	Mass or volume unit
Description	Heating Values of fuels consumed for electricity generation in the years of 2006, 2007 and 2008
Source of data	Heating Values Of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/istatistik2008/46.xls
Value applied	Values applied are given in Table A1-9 of the registered PD.
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	There is no national NVC data in Turkey. However, TEİAŞ announces Heating values of fuels. This data is used to calculate annual NCVs for each fuel type TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter	$FC_{i,y}$
Data unit	Mass or volume unit
Description	Fuels consumed for electricity generation in the years of 2007, 2008 and 2009
Source of data	Annual Development of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEİAŞ. See: http://www.teias.gov.tr/istatistik2009/44.xls

Value applied	Values applied are given in Table A1-10 of the registered PD.
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	TEİAŞ is the national electricity transmission company, which makes available the official data of all power plants in Turkey.

Data / Parameter	NCVi,y
Data unit	TJ/kton, TJ/million m^3
Description	Fuels consumed for electricity generation in the years of 2007, 2008 and 2009
Source of data	Calculated by using HVi,y to FCi,y as Net Calorific Values of fuel types are not directly available in Turkey. Calculation of NCVs from national HVi,y and FCi,y data, Table A1-9 (in registered PD) and Table A1-10 (in registered PD), is preferred to default IPCC data as these are more reliable.
Value applied	Values applied are given in Table A1-11 of the registered PD.
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	TEİAŞ is the national electricity transmission company, which makes available the official data of power plants in Turkey..

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{i,j,y}$
Data unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant/unit in year y
Source of data	Electricity meter
Description of measurement methods	$EG_{i,j,y}$ is measured by electric meter with accuracy of 0.2S continuously. The measurement of $EG_{i,j,y}$ is undertaken by the project proponent.

and procedures to be applied	
Frequency of monitoring/recording	Monthly
Value monitored	In 2013 (12/10/2013-31/12/2013); 11,045 MWh In 2014; 52,023 MWh In 2015; 51,080 MWh In 2016; 33,965MWh In 2017; 49,610 MWh In 2018; 49,881 MWh In 2019(01/01/2019-11/10/2019); 34,599 MWh Total during Monitoring Period; 282,202.77 MWh Annual Average; 47,012 MWh/y
Monitoring equipment	Electricity meter's information is as below: Model: DSSD331 Serial Code: 1108079381000002 Accuracy: 0.2 s Manufacturer: Wasion Group Limited
QA/QC procedures to be applied	Net electricity generation of the plant recorded by Batıçim personnel. Meter data showing auxiliary consumption will be subtracted from meter data showing gross production, and a crosscheck will be made between the result and meter data showing net production. In addition, TEIAS records (monthly net and gross electricity generation data) are also available for cross check.
Purpose of the data	Calculation of baseline emissions
Calculation method	-
Comments	Sales receipts are not available because the proposed project is a captive power plant.

Data / Parameter	f_{wcm}
Data unit	Fraction
Description	Fraction of total energy generated by the project activity using waste energy.
Source of data	Feasibility study
Description of measurement methods	The ACM0012 methodology refers to waste gas, but from the context it is clear that this value refers to waste energy resource in general. In the case of the project activity fwcm has been

and procedures to be applied	interpreted therefore as the fraction of total energy generated using waste heat. The methodology prescribes that this fraction is 1 if the electricity generation is purely from use of the waste energy resource (i.e. waste heat)
Frequency of monitoring/recording	Once in each crediting period
Value monitored	1
Monitoring equipment	-
QA/QC procedures to be applied	The ACM0012 methodology refers to waste gas, but from the context it is clear that this value refers to waste energy resource in general. In the case of the project activity fwcm has been interpreted therefore as the fraction of total energy generated using waste heat. The methodology prescribes that this fraction is 1 if the electricity generation is purely from use of the waste energy resource (i.e. waste heat)
Purpose of the data	
Calculation method	
Comments	

Data / Parameter	f_{cap}
Data unit	Fraction
Description	The ratio of waste energy generated at a historical level, expressed as a fraction of the total waste energy used in the project activity for producing useful in year y
Source of data	Quantity of waste energy generated prior to the start of the project activity and Quantity of waste energy carrying medium used for energy generation during year y
Description of measurement methods and procedures to be applied	The value of fcap has been calculated ex-ante on the basis of the output that can be theoretically be produced on the basis of available waste heat when the cement line is operated under normal load factors and projected power output.
Frequency of monitoring/recording	Once in each crediting period
Value monitored	1

Monitoring equipment	-
QA/QC procedures to be applied	
Purpose of the data	
Calculation method	
Comments	

Data / Parameter	$Q_{OE,y}$
Data unit	MWh
Description	Quantity of actual output/intermediate energy during year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Quantity of gross electricity generation supplied by the project plant/unit in year y
Frequency of monitoring/recording	Monthly
Value monitored	49,498 MWh/y
Monitoring equipment	Electricity meter's information is as below: Model: DSSD331 Serial Code: 1108079381000001 Accuracy: 0.2 s Manufacturer: Wasion Group Limited
QA/QC procedures to be applied	-
Purpose of the data	Calculation of f_{cap}
Calculation method	-
Comments	-

Data / Parameter	Abnormal operation
Data unit	-
Description	Abnormal operation of the project facility including emergencies and shut down
Source of data	Operation of project facility
Description of measurement methods and procedures to be applied	The hours of abnormal operation of parts of project facility that can have an impact on waste energy generation and recovery
Frequency of monitoring/recording	Daily, aggregated annually
Value monitored	There is no abnormal operation of parts of project facility that can have an impact on waste energy generation and recovery during this monitoring period.
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	-
Calculation method	-
Comments	-

4.3 Monitoring Plan

The purpose of the monitoring is measurement and analysis of greenhouse gas emissions of the project within the project boundary in order to determine the amount of emission reductions that are attributable to the project.

The relevant data that will be monitored is the electricity supplied to the internal grid of the cement factory (EGy) per year and the gross output of the proposed project (QOE,y)

At the end of one monitoring period, the data from the monthly meter reading records will be added up to the yearly net electricity generation and multiplied with the combined margin emission factor with the help of an excel spreadsheet. Thus, the complete baseline approach is always transparent and traceable.

Properties of electricity meters are given below tables.

Electricity meter for net electricity generation	
Model	DSSD331
Serial Code	1108079381000002
Accuracy	0.2 s
Manufacturer	Wasion Group Limited
Calibration Date	06/04/2023

Electricity meter for gross electricity generation	
Model	DSSD331
Serial Code	1108079381000001
Accuracy	0.2 s
Manufacturer	Wasion Group Limited
Calibration Date	06/04/2023

Electricity meter for auxiliary electricity consumption	
Model	DSSD331
Serial Code	1108079381000003
Accuracy	0.2 s
Manufacturer	Wasion Group Limited
Calibration Date	06/04/2023

In order to correct emission reductions for the whole monitoring period where calibration is missing, the highest accuracy error among measured and manufacturer's specification that is %0.2 was applied.

There will be 9 person (Previously, in addition to permanent employees of Batıçim, there were employees assigned by the Chinese founding company in the project. Afterwards, after the departure of the Chinese team, a spare member was added to the existing staff and continued with 9 people) work during the operation of the WHR plant.

Technicians in BATICIM conduct daily meters readings and keep records for electricity generation amount and reports to management. These records can be used for monitoring in case of any problem will arise in meters.

Energy Chief of the Batıcim will be in charge of the projects.

The data is monitored via electricity meters. There are three meters at the plant (showing gross electricity production, net electricity production and auxiliary consumption). Meters are read monthly. Yearly electricity generation will be calculated by summing up monthly meter reading records. Data monitored will be kept in electronic form and hard copy until the end of second year after the end of crediting period.

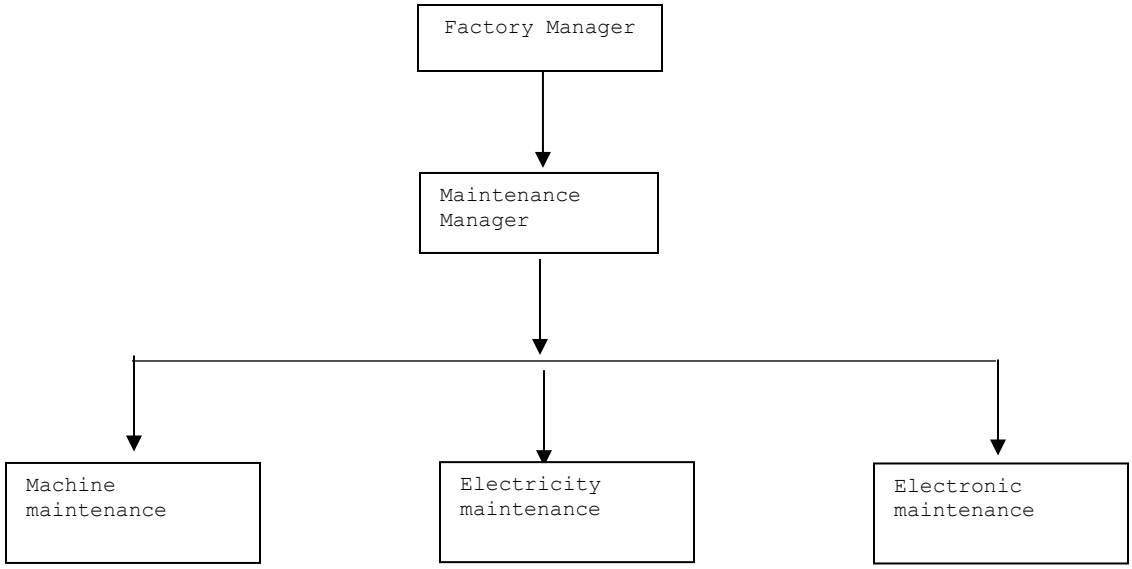

Figure 4-1: Plant organization diagram

Responsibilities of the workers in the plant:

Maintenance Manager: Supervising the operation of power station and the implementation of monitoring plan; validating the monthly monitoring report.

Machine Maintenance staff: Responsible for the repair of machines in case of breakdown. Maintenance of WHR equipments.

Electrician engineer/ Electricity and electronic maintenance staff: Maintenance of electrical equipments. Work in shifts and the monitor of each shift note the monitoring data and fill the monitoring record sheet.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per ACM0012 baseline emissions shall be generally calculated using the following formula:

$$BE_y = BE_{En,y} + BE_{flst,y} \quad (1)$$

Where:

BE_y = The total baseline emissions during the year y in tCO_2

$BE_{En,y}$ = The baseline emissions from energy generated by the project activity during the year y in tCO_2

$BE_{flst,y}$ = Baseline emissions from fossil fuel combustion, if any, either directly for flaring of waste gas or for steam generation that would have been used for flaring the waste gas in the absence of the project activity (tCO_2), calculated as per equation 26. This is relevant for those project activities where in the baseline steam is used to flare the waste gas

$BE_{flst,y}$ is not applicable as there is no such direct/indirect utilization of fossil fuels for flaring of waste gas.

Therefore the BE is identical to $BE_{En,y}$.

According to project type and respective procedures and formulae in ACM00012, the following calculations apply:

For calculation of baseline emissions from energy generated by the project activity:

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad \textbf{(2)}$$

Where:

$BE_{Elec,y}$ = Baseline emissions from electricity during the year y in tCO_2

$BE_{Ther,y}$ = Baseline emissions from thermal energy (due to heat generation by elemental processes) during the year y (tCO_2)

$BE_{Ther,y}$ is not applicable as there is no such heat generation involved

Therefore the $BE_{En,y}$ is identical to $BE_{Elec,y}$.

For calculation of baseline emissions from electricity ($BE_{Elec,y}$) generation:

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(3)}$$

Where:

$BE_{elec,y}$ = Baseline emissions due to displacement of electricity during the year y (tCO_2)

$EG_{i,j,y}$ = The quantity of electricity supplied to the recipient j by generator, which in the absence of the project activity would have been sourced from source i (the grid or an identified source) during the year y in MWh

$EF_{elec,i,j,y}$ = The CO_2 emission factor for the electricity source i (for grid and an identified source), displaced due to the project activity, during the year y (tCO_2/MWh)

f_{wcm} = Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy.

Note: For a project activity using waste pressure to generate electricity, the electricity generated from waste pressure should be measurable and this fraction is 1

f_{cap} = Factor that determines the energy that would have been produced in project year y using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year y. The ratio is 1 if the waste energy generated in project year y is the same or less than that generated at a historical level.

As f_{wcm} has the value "1" (electricity is purely from use of waste energy), the consolidated calculation reads as follows:

Consolidated formula for calculation of baseline emissions(1):

$$BE_y = f_{cap} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(3a)}$$

For f_{cap}, in ex-ante calculations of emission reductions, a neutral value of "1" is applied (assuming waste heat is same or less than that generated at a historical level).

For real calculation of baseline emissions for project year y, f_{cap} shall be derived according to method 3 case 2. Applicable formulae and parameters are the following:

The following equation is used to determine f_{cap}:

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}} \quad \textbf{(40)}$$

Where:

$Q_{OE,BL}$ = Output/intermediate energy that can be produced (MWh), to be determined on the basis of maximum energy that could be recovered from the WECM (MER), which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of VCS project activity.

$Q_{OE,y}$ = Quantity of actual output/intermediate energy generated during year y (MWh)

In case of the proposed project activity $Q_{OE,BL}$, consists of the theoretical maximum electrical output (in kWh) that can be generated with the available waste heat, while $Q_{OE,y}$, is the actual electrical output of the project in year y (in kWh). Below determination of $Q_{OE,BL}$. is described.

Table 3-1: Measurement results to determine available waste heat from the clinker production line

SP stage	Volume of the hot air	165,597 Nm^3/h
	T inlet	376 ℃
	T outlet	90 ℃
	Quantity	2
AQC stage	Volume of the hot air	91,871 Nm^3/h
	T inlet	380 ℃
	T outlet	240 ℃
	Quantity	2

Information in table 3-1 provides an indication of total available waste energy, which is the only energy used for the boilers to produce steam, but not all waste energy can be utilized by currently available waste heat utilization technologies as part of the waste energy will still be released into the atmosphere as heat contained in the exhaust of the waste heat recovery boilers. Calculated waste heat which can be sensibly utilized by applying the following approach:

First, gross energy content (relative to 0°C) of the hot air released from the SP and AQC stage is calculated by applying the standard specific heat capacity of dry air (i.e. 1005.7[5] J/kg*K).

- Second, the energy contained in the exhaust air of the waste heat boilers is calculated by applying the design exhaust temperature specifications of the equipment to be used in the proposed project activity (376°C for the SP Stage and 380°C for the AQC stage) to account for waste heat which will remain unused by the waste heat utilization equipment.
- Third, the net available energy for the proposed project activity is calculated by subtracting the energy contained in the exhaust air from the gross available energy and calculate the net available energy for the proposed project activity as approximately 288,123 GJ (see table 3-2 below).

Table 3-2: Energy data

Total available	464.50	TJ
Exhaust heat	176.38	TJ
pre-gen losses	155.54	TJ
Aux consumption	-132.59	TJ

[5] Please see PD.

Net Supply	265.17	TJ
Total usage	464.50	TJ

Subsequently calculate the annual electrical output that can theoretically be produced on the basis of available waste heat ($Q_{OE,BL}$) by multiplying the above figure by the yearly working hours of the plant (7,700 h). On the basis of the above data annual available electrical output is calculated by considering design specifications and efficiencies listed in the table 3-3 below and available heat data. The result for $Q_{OE,BL}$ is 73,660 MWh.

Table 3-3: Efficiency data

	Efficiencies (%)
AQC Boiler	78.30%
SP Boiler	53.60%
Turbine	80.2%
Generator	97.5%

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}}$$

As per the methodology, the ratio is 1 if the waste heat generated in the project year y is same or less then that generated in base year. This is the case in the project scenario.

$$fcap = \frac{73{,}660}{49{,}498} = 1{,}49$$

$Q_{OE,BL}$/ $Q_{OE,}$y>1; Thus, f_{cap} = 1

Consolidated formula for calculation of baseline emissions (2):

$$BE_y = \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(3b)}$$

5.2 Project Emissions

Project Emissions are calculated as follows:

$$PE_y = PE_{AF,y} + PE_{EL,y} \quad \textbf{(41)}$$

Where:

PE_y = Project emissions due to the project activity (tCO_2)

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or co-generation plant(s) if they are used as supplementary fuels due to non-availability of waste energy to the project activity or due to any other reason (tCO_2)

$PE_{EL,y}$ = Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption (tCO_2) (as per Table 1: Summary of gases and sources included in the project boundary)

$PE_{AF,y}$ is zero as there is no technologically possible supplementary fossil fuel consumption at the project's electricity generating facilities.

$PE_{EL,y}$ is zero as the project there will be no emissions from consumption of electricity for gas cleaning or other supplementary electricity consumption.

Thus PE_y is zero.

5.3 Leakage

No leakage is applicable under this methodology.

5.4 Net GHG Emission Reductions and Removals

Emission reductions due to the project activity during the year y are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(42)}$$

Where:

ER_y = Total emissions reductions during the year y in tons of CO_2

PE_y = Emissions from the project activity during the year y in tons of CO_2

BE_y = Baseline emissions for the project activity during the year y in tons of CO_2, applicable to Scenario 2

Since PE_y is 0 (see 3.2 above), emission reductions are equivalent to the determined baseline emissions.

Baseline emissions are calculated as per consolidated formula for calculation of baseline emissions (see section 3.1 above). In ex-ante calculations here, the value f_{cap} is assumed to be 1 (implying that all accruing waste energy in considered years are equal or lower to historical level of last three years before project implementation). The calculation reads as follows:

Consolidated formula for ex-ante calculation of baseline emissions:

$$ER_y = BE_y = \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad \textbf{(42c)}$$

Year	Project activity emissions (tonnes of CO_2e)	Baseline emissions (tonnes of CO2e)	Leakage (tonnes of CO2e)	Overall emission reductions (tonnes of CO_2e)

12/10/2013-31/12/2013	0	5.805	0	5.805
2014	0	27.345	0	27.345
2015	0	26.850	0	26.850
2016	0	17.853	0	17.853
2017	0	26.077	0	26.077
2018	0	26.219	0	26.219
01/01/2019-11/10/2019	0	18.187	0	18.187
Total (tonnes of CO2e)	**0**	**148.337**	**0**	**148.337**
Annual Reduction				**24.761**
Estimated Annual Reduction				**25.180**

Ex-ante emissions reductions /removals	Achieved emissions reductions /removals	Percent difference	Justification for the difference
5,518	5,805	5.2%	Efficiency of waste heat recovery
25,180	27,345	8.6%	Efficiency of waste heat recovery
25,180	26,850	6.6%	Efficiency of waste heat recovery
25,180	17,853	29%	Efficiency of waste heat recovery
25,180	26,077	3.6%	Efficiency of waste heat recovery
25,180	26,219	4.1%	Efficiency of waste heat recovery
19,592	18,187	7.1%	Efficiency of waste heat recovery