Project design document form for CDM project activities

(Version 08.0)

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

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Efficiency Improvement by Boiler Rehabilitation in fossil fuel-fired (Natural Gas) Steam Boiler System
Version number of the PDD	10.1
Completion date of the PDD	08/11/2016
Project participant(s)	Al Jubail Fertilizer Company (Al Bayroni) Saudi Basic Industries Corporation (SABIC)
Host Party	Kingdom of Saudi Arabia
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	Approved baseline and monitoring methodology AM0056 (version 1.0): "Efficiency improvement by boiler replacement or rehabilitation and optional fuel switch in fossil fuel-fired steam boiler systems
Sectoral scope(s) linked to the applied methodology(ies)	1
Estimated amount of annual average GHG emission reductions	66,098 tCO2e/yr

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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AL Jubail Fertilizer Company (Al Bayroni), is a petrochemical complex in the business of manufacturing ammonia, urea, 2 Ethyl Hexanol and DOP. Al Bayroni is an affiliate of Saudi Basic Industries Corporation (SABIC) and a joint venture with Taiwan Fertilizer Company (TFC). Saudi Basic Industries Corporation (SABIC) is another project participant.

Al Bayroni currently operates two packaged boilers supplied by Mitsubishi Heavy Industries (MHI) with specifications as summarized in the table below. Steam from the boilers is utilized exclusively within Al Bayroni at the process plants. The purpose of this project is to enhance energy efficiency and reduce fuel consumption of these boilers whilst maintaining present steam quality and production rates. The project will involve modifications and installations as summarized below.

TABLE A.1 Boiler Rehabilitation Summary (Pre Project Implementation and Post Project Implementation Scenarios)

Boiler ID	2008-U	2008-UA
Pre-Rehabilitation (Pre Project Implementation Scenario)		
Steam Production Rate (Name Plate Capacity)	129.25MT/H	129.25 MTH/H
Steam delivery pressure	38.3 BarG	38.3 BarG
Steam Temperature	399 ^{O}C	399 ^{O}C
Fuel	Natural Gas	Natural Gas
Year of Commissioning	1983	1983
Thermal Efficiency	83% (LHV)	83% (LHV)
Post Rehabilitation (Post Project Implementation Scenario)		
Steam production rate	No Change	No Change
Steam delivery pressure	No Change	No Change
Steam temperature	No Change	No Change
Reduction in Fuel Consumption[1]	20.18%	20.18%

The potential for energy savings and in turn reduction of GHG emissions have been evaluated through an independent study in 2007-2008 by M/S Mitsubishi, Japan and subsequently confirmed through a study by KBR during the same period. As a result, the following modifications and installations have been proposed to realize energy and GHG savings from the packaged boilers:

- New Economizer
- New modified super-heater
- Associated modifications in convection ducts

[1] The 20.18% rreduction in fuel consumption in post project scenario is based on the actual fuel reduction achieved in real life operations (18.28%) plus 10% added as a upper range.

The new economizer unit will improve energy efficiency by heat recovery from the exhaust gases. Economizers are essentially (heat exchange) mechanical devices which utilize exhaust gases to preheat boiler feed water thereby reducing overall heat demand and consequentially fuel consumption for steam production.

Super heater units proposed in the project will also improve energy efficiency by utilizing heat from flue gas to convert wet steam to dry steam. The super heater is placed in the path of flue gases from the combustion chamber allowing steam to be heated above its saturation temperature removing moisture at constant pressure.

Baseline Scenario

Please note that the Baseline Scenario is the same as Pre Project Scenario.

Project contribution to sustainable development

The Project will benefit local contractors whose participation will be required for the modification and commissioning phases thereby contributing to the local economy and communities in Jubail. The project will not cause an increase in pollutant emissions from the current situation hence no additional negative impacts will occur as result of implementing the project. Conversely, enhancing energy efficiency and reducing fuel consumption will contribute to reduction in GHG emissions (Table A.2 below).

TABLE A.2 POTENTIAL GHG REDUCTIONS AND TRADEABLE VOLUMES

Daily CO2 Emission Reductions	181 tCO2e
Annual CO2 Reduction	66,098 tCO2e
Reduction over 10 years	660,980 tCO2e

Project Timeline, Current Status and Monitoring

07/11/2010: The Project Idea Note was prepared. This is the date of official decision making.
25/08/2011: Start date of project activity. The contract with supplier was signed.
27/11/2011: Prior Consideration Note was submitted to UNFCCC.
27/11/2011: Board Resolution for project implementation was obtained. The Board confirmed approval for implementation budget.
05/12/2011: Prior Consideration Note was submitted to Saudi DNA.
10/05/2013: Modification of the first two boilers has been completed.
20/04/2013: Prior Consideration Form (Notification of Progress) submitted to UNFCC.
20/02/2014: Modification of third boiler has been completed.

The monitoring of the proposed project will be based on company's overall monitoring programme which is third party certified. All monitoring programmes including associated calibration are within the scope of the QMS and subjected to several audits and reviews including Internal Audits, SABIC Corporate Audits and Third Party (BSI) audits.

A.2. Location of project activity

A.2.1. Host Party

>>
Kingdom of Saudi Arabia

A.2.2. Region/State/Province etc.

>>
Eastern Province

A.2.3. City/Town/Community etc.

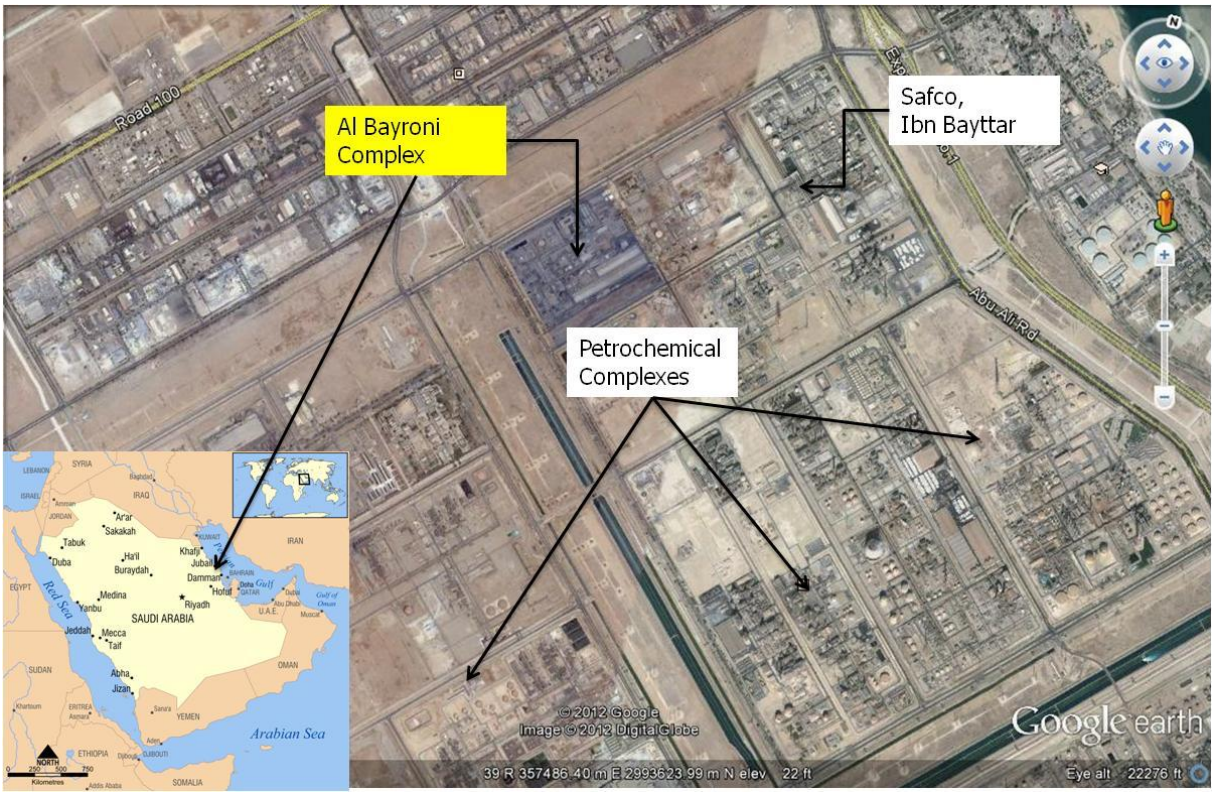
>>
Jubail Industrial City

A.2.4. Physical/Geographical location

>>
The proposed project will be carried out inside Al Bayroni, in Jubail Industrial City, Eastern Province, Kingdom of Saudi Arabia (49° 33´ 27.98˝ E and 27° 3´ 54.64˝ N)

The Jubail Industrial City, is managed by the Royal Commission for Jubail and Yanbu and specifically caters to the Petroleum and Petrochemical Sector and associated support industries. SABIC operates 3 facilities in the fertilizer sector in Jubail, namely Safco, Al Bayroni and Ibn Bayttar. See figure A-1 below for a map showing the location where the proposed project will be carried out. The proposed rehabilitation project will be within the Al Bayroni Complex. The nearest airport is the King Fahad International Airport in Jubail city located 80km south of the complex.

Figure A-1: Project Location and Surrounding Land Use



A.3. Technologies and/or measures

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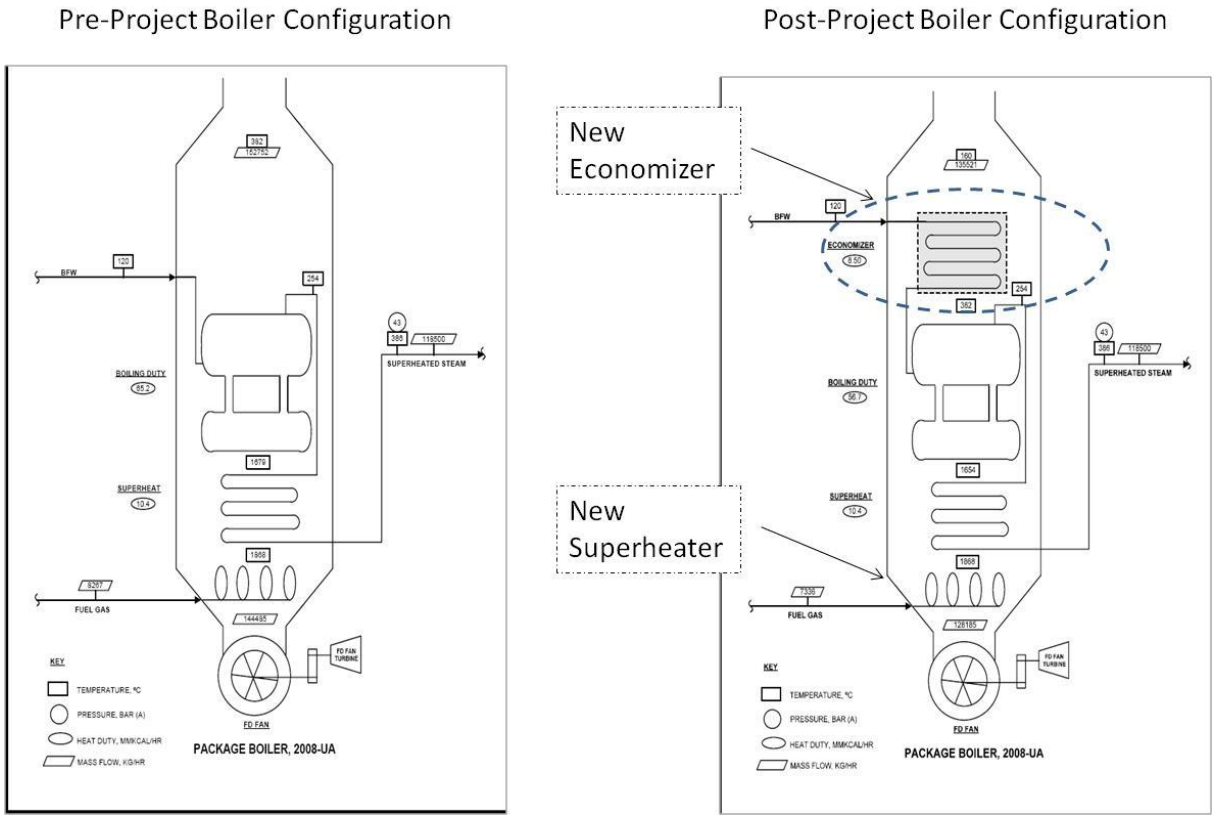
This project will involve the following modifications and installations to realize energy and GHG savings from the packaged boilers:

- New Economizer
- New modified super-heater
- Associated modifications in convection ducts

The new economizer unit will improve energy efficiency by heat recovery from the exhaust gases. Economizers are essentially (heat exchange) mechanical devices which utilize exhaust gases to preheat boiler feed water thereby reducing overall heat demand and consequentially fuel consumption for steam production.

Super heater units proposed in the project will also improve energy efficiency by utilizing heat from flue gas to convert wet steam to dry steam. The super heater is placed in the path of flue gases from the combustion chamber allowing steam to be heated above its saturation temperature removing moisture at constant pressure.

Figure A-2: Pre Modification and Post Modification Case



Source: KBR Energy Optimization Study (2008)

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)

Kingdom of Saudi Arabia (host)	Private: Al Jubail Fertilizer Company (Al Bayroni) a subsidiary of Saudi Basic Industries Corporation	No
Kingdom of Saudi Arabia	Private: Saudi Basic Industries Corporation (SABIC)	No

A.5. Public funding of project activity

>>
There is no source of public funding for the proposed Boiler Rehabilitation Project.

No Official Development Assistance (ODA) is involved in this project. It is 100% equity funded. Please see Appendix 2 (Al Bayroni's Declaration dated January 20, 2014).

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

>>
The Baseline and Monitoring method has been established for the proposed project following the approved methodology AM0056 (version 1.0) "***Efficiency improvement by boiler replacement or rehabilitation and optional fuel switch in fossil fuel-fired steam boiler systems***".

The following tools and guidelines have also been referred to:

1. Combined tool to identify the baseline scenario and demonstrate additionality (version 05.0.0 EB 70, Annex 9)
2. Guidelines on Additionality of First-Of-Its-Kind Project Activities (version 2.0, EB 69, Annex 7)
3. Guidelines for objective demonstration and assessment of barriers (EB-50, Annex 13 Version 01)
4. Paragraph 28/Decision 1/CMP 2 FCCC/KP/CMP/2006/10/Add.1 2 March 2007

Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 2, EB 41, Annex 11)

B.2. Applicability of methodology and standardized baseline

In the project activity, the large scale methodology, AM0056, version 1.0 has been applied and application of the methodology is as justified in Table B.1 below.

TABLE B.1: JUSTIFICATION FOR USE OF SELECTED METHODOLOGY

Applicable Criteria in AM0056 (version 1.0)	Justification
This methodology is applicable to project activities that in an existing facility: • Completely replace one or more boilers with some remaining lifetime; and/or • Implement fitting of additional new	The proposed project l involves fitting existing boilers with additional new equipment, namely: • New Economizer • New modified super-heater • Soot blower

equipment to an existing steam generating system (retrofitting); and • Implement optional switch in fossil fuel	• Associated modifications in convection ducts
Steam generation in the project activity is carried out through the use of fossil fuel fired steam boiler(s)	Steam generation in the project activity is carried out through two boilers, (namely 2008-U, 2008-UA) using only fossil fuel (natural gas).
National/local regulations do not require the replacement or retrofit of the existing equipment. The project participants shall demonstrate this through documented evidence (e.g. building code documents). These documents shall be submitted to a DOE at the time of validation	Al Bayroni complex being located within the industrial city of Jubail, is required to comply with the regulations of the Royal Commission for Jubail, Ras Al Khair and Yanbu specified in the Royal Commission Environmental Regulations (RCER, 2010). No requirements for replacement or retrofit of existing boilers has been prescribed in the RCER 2010.
There are no enforced national/local regulations/standards on minimum efficiency ratings for the boiler(s) included in the project boundary. The project participants shall confirm this through documented evidence (e.g. building code documents, industrial regulations, etc). These documents shall be submitted to a DOE at the time of validation	There are no requirements/standards in the RCER 2010 on minimum efficiency ratings for boilers.
National/local regulations/programmes do not constrain the facility from using the fossil fuel being used prior to fuel switching	The RCER 2010 does not specify any constraints or limits on the Al Bayroni complex on using fossil fuel. In addition, this condition is not applicable as the project activity does not include fuel switch.
Steam quality (i.e. pressure and temperature) is the same before and after the start of the implementation of the project activity	The quality as measured by temperature and pressure of steam prior to and post project implementation remains the same.
The existing steam generating system in the facility where the project activity is implemented may consist of more than one boiler	The project activity involves rehabilitation of two boilers (namely 2008-U, 2008-UA).
Only one type of fossil fuel is used in all boilers included in the project boundary. If the fossil fuel switch is implemented, it should involve all boilers in the project boundary. Small amounts of other start-up or auxiliary fuels can be used, provided that they do not account for more than 1% of total fuel use	The boilers are fired utilizing only one type of fossil fuel - natural gas.
If the fossil fuel switch is implemented, only those project activities are eligible to use this methodology where both energy efficiency measures and fuel switch are additional.	This condition is not applicable as the project activity does not include fuel switch.

B.3. Project boundary

The selected methodology, AM0056 (version 1.0) provides the following guidance for the project boundary:

> *The project boundary encompasses all equipment that is primarily used for the steam generating process (within the steam generation system), including auxiliary systems. The most relevant components of the steam generation system include the boiler(s), fuel supply, combustion air system, feed water system, including a condensate return system, and an exhaust gases venting system. In addition, all components that are required and predominantly used for steam generation are also part of the steam generation system.*
>
> *In order to ensure a common approach for determination of the project boundary as well as a common approach for determination of specific fuel consumption, international/national acknowledged norms and guidelines equivalent to ASME PTC 4-1998[2] have to be applied in conjunction with this methodology*.

Based on the guidelines above, the project boundary is the steam generation system comprising the two boiler units, namely Boiler 2008-U, Boiler 2008-UA and associated components as listed below and illustrated in Figure B-1 below:

1. Inputs:
    a. Fuel supply
    b. Combustion air
    c. Feed water system
    d. Condensate return
2. Output
    a. Exhaust gases
    b. Greenhouse Gas Emissions
    c. Steam

Emission sources included in the baseline scenario and project activity are summarized in table below.

Sources		GHGs	Included?	Justification/Explanation
Baseline	Fossil fuel consumption in the boilers	CO_2	YES	Main Source of GHG Emission
		CH_4	NO	Minor Source, Negligible
		N_2O	NO	Minor Source, Negligible
Project Activity	Fossil fuel consumption in the boilers	CO_2	YES	Main Source of GHG Emission
		CH_4	NO	Minor Source, Negligible
		N_2O	NO	Minor Source, Negligible

Figure B-1: Project Boundary following AM0056 (version 1.0)

[2] American Society of Mechanical Engineers: Performance Test Codes for Fired Steam Generators, ASME PTC 4-1998

The operational life time of all boilers has been established to be at least 15 years from the modification completion date. This is supported by Internal Memorandums issued separately for each boiler after inspection and checks. Specifically:

1. Memorandum No RP&I/INSP/05/13 (dated 06/05/2013)
Issued for the Boiler 2008 – U

2. Memorandum No RP&I/INSP/06/13 (dated 06/05/2013)
Issued for the Boiler 2008 – UA

In addition, AlBayroni is strictly adhering to regular maintenance practice as stipulated by Mechanical Integrity Program government by SABIC's Mechanical Integrity and Reliability Programme under the SABIC's Safety, Health and Environmental Management System (SHEM)[3]. Operational manuals and records have been submitted to the auditors during their validation visit in January 2014.

B.4. Establishment and description of baseline scenario

>>
The version 05.0.0 of the "Combined tool to identify the baseline scenario and demonstrate additionality" has been used to identify the baseline scenario.

Step 0. Determination of whether the proposed project activity is the first-of-its-kind:

The "Guidelines on Additionality of First-Of-Its-Kind Project Activities" (version 2.0, EB 69, Annex 7) is used hereby to demonstrate that the project is "First-of-its-kind".

1. **Applicable Geographical Area:** The applicable geographic area is limited to industrial cities of Jubail, Yanbu and Ras Al Khair in the Kingdom of Saudi Arabia. The justification for the limitation is as follows: industrial cities of Jubail, Yanbu and Ras Al Khair are geographically distinct from the rest of the country because they are specially designated and developed as industrial centers. The entirety of these areas is managed by autonomously distinct authority - the Royal Commission (RCJY). The RCJY was established in 1975 as an autonomous organization (independent from other ministries and licensing agencies in the Kingdom) reporting directly to the Council of Ministers. It establishes policies, promotes investment, provides infrastructure, develops and enforces standards including environmental regulations specifically targeting petrochemical and high energy intensive industries (RCJY, 2014) in the above mentioned industrial cities

2. **Measure**: The Boiler Rehabilitation project involves energy efficiency improvement and therefore satisfies criteria 2(b) of EB 69 Annex 7.

3. **Output**: The output is steam. The output remains the same before and after post project implementation. There will be no change in steam quality or production rates as a result of the energy efficiency improvement.

[3] AL Bayroni' s adherence to SHEM is third party certified by 1) BSI QMS ISO 9001:2008 Certificate (attached) and 2) DNV Responsible Care: 14001:2008 and DNV ISO 14001:2008 Certificate (attached)

4. **Application of Different Technology:** Technology proposed differs from other technologies by large scale energy efficiency. The Boiler rehabilitation project will realize energy savings of 134 GWH per year (estimations are included in ER sheet). This is over the 60GWH annually criteria stipulated for small installations in paragraph 28 of decision 1/CMP.2. Therefore the criteria of different technology apply through "large scale energy efficiency".

5. **Identification of first-of-its-kind project activity:** In accordance to the "Guidelines on Additionality of First-Of-Its-Kind Project Activities" (version 2.0, EB 69, Annex 7) the project is identified as first of its kind in the applicable geographical area because:

   (a) The project is the first in the applicable geographical area that applies a technology that is different from technologies that are implemented by any other project, which are able to deliver the same output and have started commercial operation in the applicable geographical area before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of the proposed project activity, whichever is earlier;

   There are no similar projects (both CDM and non CDM) implemented, being implemented or considered for implementation in applicable geographical area as confirmed by the Saudi Authorities (please refer to the attached statements issued by the Royal Commission dated 24 January 2014 and "first-of-its-kind" statement from Saudi DNA).

   (b) The project implements one or more of the measures;

   The proposed project involves energy efficiency improvement and therefore satisfies criteria 2(b) of EB 69 Annex 7.

   (c) *The project participants selected a crediting period for the project activity that is "a maximum of 10 years with no option of renewal".*

   The project participant selected a crediting period of 10 years with no option of renewal.

Outcome of Step 0 The proposed project is "First-Of-Its-Kind" in the applicable geographic region.

Step 1. Identification of alternative scenarios:

Step 1a. Define alternative scenarios to the proposed CDM project activity

The scenarios alternative to the proposed boiler rehabilitation project are listed in Table B-2 below and are based on guidelines provided in the Section 4.2.1 of the tool and AM0056 (version 1.0).

TABLE B-2: ALTERNATIVE SCENARIOS

Scenario	Scenario Description	Reference	Analysis	Baseline
S1	The proposed project activity undertaken without	• Combined tool to identify the	• The proposed project is not common practice as demonstrated in Step 0	No

Scenario	Scenario Description	Reference	Analysis	Baseline
	being registered as a CDM project activity	baseline scenario and demonstrate additionality • AM0056 (v.1.0)	above. • Further, there are no regulatory benefits or financial incentives for the project to be implemented. No requirements have been specified in the RCER 2010[4] for upgrade of existing boiler utilities or for reduction of energy consumption.	
S2	Where applicable, no investment is undertaken by the project participants but third party(ies) undertake(s) investments or actions which provide the same output to users of the project activity	• Combined tool to identify the baseline scenario and demonstrate additionality	• Third party investment providing the same output to users of the project activity, would require separate installation and assurance of reliable supply at desired steam quality and quantity. This is not a feasible scenario as the steam generation system is a core and integral component of the facility operations and production activities. Outsourcing to third parties risks reliability of supply and consequentially compromise downstream production	No
S3	*Where applicable, the continuation of the current situation, not requiring any investment or expenses to maintain the current situation*	• *Combined tool to identify the baseline scenario and demonstrate additionality* • *AM0056*	• Not feasible as continuation of the boiler in the current scenario will entail operational and maintenance expenses	*NO*

[4] Royal Commission Environmental Regulations (http://rcjewt.org/regulations/regulationsrcer-2010%20volume%20iii%20penalty%20system%20.pdf)

Scenario	Scenario Description	Reference	Analysis	Baseline
		(v1.0)		
S4	Where applicable, continuation of current situation with investment	• Combined tool to identify the baseline scenario and demonstrate additionality	• Continuation of the current situation with expenses is a feasible scenario given the boiler has a lifetime of 15 years and extendable through regular maintenance. • Al Bayroni subscribes to and implements SABIC's Mechanical Integrity and Reliability Programme under the Safety, Health and Environmental Management System (SHEMS) [5] which in turn subjects all process equipment to inspection, preventive maintenance, planned and scheduled shut down and turn around to ensure reliability and longer life times.	YES
S5	Other plausible and credible alternative scenarios to the project activity scenario, including the common practices in the relevant sector, which deliver the same output, taking into account, where relevant, examples of scenarios identified in the underlying methodology	• Combined tool to identify the baseline scenario and demonstrate additionality • AM0056 (v1.0)	• Boiler rehabilitation to include modifications proposed in the project activity is not common practice as demonstrated in Step 0	No

[5] Al Bayroni' s adherence to SHEM is third party certified by 1) BSI QMS ISO 9001:2008 Certificate (attached) and 2) DNV Responsible Care: 14001:2008 and DNV ISO 14001:2008 Certificate (attached). Also attached is a "Rotating Equipment Program" standard which serves as an example of SHEM.

Scenario	Scenario Description	Reference	Analysis	Baseline
S6	Where applicable, the "proposed project activity undertaken without being registered as a CDM project activity" to be implemented at a later point in time	• Combined tool to identify the baseline scenario and demonstrate additionality	• The proposed project activity being carried out without registration to CDM is unlikely as remaining life of the boiler is 15 years and can be further extended through regular maintenance.	No

Outcome of Step 1a: List of plausible alternative scenarios to the project activity
The plausible alternative scenario to the project activity, is
Scenario 4: Continuation of the current situation with expenses to maintain current situation

Step 1b. Consistency with mandatory applicable laws and regulations

Alternative Scenario S4 (**Continuation of the current situation with expenses to maintain current situation**) is in compliance to the applicable standards and limits prescribed in the RCER 2010.

Current boiler operations are subject to the RCER permitting and monitoring programmes. The boiler operation/steam generation system is permitted under the Environmental Permit to Operate (EPO) issued to Al Bayroni. As a result the boilers are required to comply with point source emission standards prescribed in the RCER for which Al Bayroni undertakes a third party stack monitoring programme to demonstrate compliance.

Outcome of Step 1b: **Scenario 4: Continuation of the current situation with expenses to maintain current situation –** is in compliance with mandatory applicable laws and regulations

Step 2. Barrier Analysis

The Barrier Analysis presented below is in accordance with the version 05.0.0 of the "Combined tool to identify the baseline scenario and demonstrate additionality".

Step 2a. Identify barriers that would prevent the implementation of alternative scenarios

In accordance with paragraph 23c (other barriers) the prevailing practice is identified as a barrier. The proposed project activity is the only such project in the distinct geographical area. There are no similar projects (both CDM and non CDM) implemented, being implemented or considered for implementation in applicable geographical area as confirmed by the Saudi Authorities (please refer to the attached statements issued by the Royal Commission dated 24 January 2014 and "first-of-its-kind" statement from Saudi DNA).

Outcome of Step 2a List of barriers that may prevent one or more alternative scenarios to occur: 1. Prevailing practice in the distinct geographical area is barrier which may prevent alternative scenarios to occur.

Step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

The only scenario not prevented by the identified barrier (prevailing practice) is Scenario 4: Continuation of the current situation with expenses to maintain current situation. All other scenarios are eliminated due to prevailing practice.

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Outcome of Step 2b List of alternative scenarios to the project activity that are not prevented by any barrier ***Alternative Scenario that is not prevented by barrier is Scenario 4: Continuation of the current situation with expenses to maintain current situation.***

Outcome of Step 2 **1. The Alternative Scenario not prevented by the Barrier is the Continuation of the current situation with expenses to maintain current situation (i.e. operate Boilers as per current design without rehabilitation). This Alternative Scenario therefore represents the baseline scenario.** **2. The proposed Project (i.e. boiler rehabilitation) is the first-of-its-kind. Hence the Project is additional.**

As the proposed project activity is first-of-its-kind and has been demonstrated to be additional, the remaining procedures of the "Combined tool to identify the baseline scenario and demonstrate additionality" (version 05.0.0) is not applicable

B.5. Demonstration of additionality

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Chronology for Prior Consideration of the Project

- 07/11/2010: The Project Idea Note was prepared. This is the date of official decision making.
- 25/08/2011: Start date of project activity. The contract with supplier was signed.
- 27/11/2011: First Prior Consideration Note was submitted to UNFCCC.

  Please note that the project proponent (Al Bayroni) has submitted the Prior Consideration Note to UNFCCC with the original title of the project as "Energy Optimization of Packaged Boilers at Fertilizer Production".

- 20/04/2013: Second Prior Consideration Form (as Notification of Progress) submitted to UNFCCC.

  Please note that on 06/06/2012 the title of the project was renamed as "Efficiency Improvement by Boiler Rehabilitation in fossil fuel-fired (Natural Gas) Steam Boiler System". The second Prior Consideration Form (as Notification of Progress) submitted to UNFCCC on 20/04/2013 has the updated title of the project. Please note that the name of project proponent

(Al Bayroni), description, authorized representative and exact location of the project in both forms are exactly the same which proves that this is the same project.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

>>
Baseline emissions were estimated following the steps and equations 1 to 7, prescribed in AM0056 (version 1.0), namely:

1. Step 1: Baseline capacity of the boilers were estimated based on results from actual measurements, independent third party technical assessments and upper range of boiler load class
2. Step 2: Load classes of the boilers were determined. In establishing the load classes, the baseline capacity as determined in Step 1 and boiler operating modes were determined
3. Step 3: Specific fuel consumption (SFC) and for each boiler in the system under each load class was determined. The SFC is a function of average fuel consumption for a load class and the average observed amount of steam produced within the load class. Using the net calorific value of the fuel, the specific energy consumption of the system was then determined for each load class.
4. Baseline emissions were then calculated using equation 7 in the methodology.

In calculating the Project Emissions, a net reduction of 20.18% in fuel consumption was considered. This is within 10% upper range of the actual fuel savings achieved in the first year of operations (18.28%). Equation 7 in the methodology was considered in estimating the Project Emissions assuming a proportionate reduction in fuel consumption

For estimating leakages, since the facility will not utilize LNG, equation 8 assumes on fugitive upstream emissions of methane, which was calculated using equation 9 of AM00056. Since there is no change in the fuel source as a result of the project, the same upstream emission factors have been used. As required 25TCO2/TCH4 has been assumed for GWP for the 1st year

Net reductions have been estimated using equation 12 where Project emissions and leakages were reduced from the baseline estimation.

B.6.2. Data and parameters fixed ex ante

The following data and parameters have been considered in the baseline assessment but are not considered for monitoring in the crediting period as stated in the methodology. The Project Proponent has extensive hourly data archived at the facility which can be extracted. Monitoring data in excess of 3 months is available for validation.

Data / Parameter	**CAP**
Unit	Tons/Hour (steam)
Description	Maximum long term load (capacity) of the boiler or steam system (tonnes of steam output per hour at full load).
Source of data	Hourly Measurement Data
Value(s) applied	100-120Tons/Hour for each of the two boilers

Choice of data or Measurement methods and procedures	Boiler load classes have been selected based on review of third independent assessments of boiler performance, name plate capacity and historical data. All measurements shall comply with ASME PTC 4-1998
Purpose of data	Calculation of baseline emissions
Additional comment	All Measurements are in compliance to ASME PTC 4-1998

Data / Parameter	**Boiler load class, i and j**
Unit	Range Tons/Hour
Description	Boiler load classes in the case of multi-boiler installations. For each boiler 'j'load classes 'i' are introduced.
Source of data	Hourly Measurement Data
Value(s) applied	See Section 6.3 (Table 1)
Choice of data or Measurement methods and procedures	The proposed methodology requires the project developer to choose at least two boiler load classes per boiler freely.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**System Load Class "K"**
Unit	(Tons/Hour) Tons/Annum
Description	System Load Classes
Source of data	Hourly Measurement Data
Value(s) applied	See Table B.6.5
Choice of data or Measurement methods and procedures	Facility operates 24 hours continuously over the calendar year. Hence hourly measurements and annual totals are available
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**FC_{BLi}**
Unit	M3/h
Description	Fuel Consumption in each load class (Data available hourly/annually)
Source of data	Hourly Measurement Data
Value(s) applied	See Table B.6.2
Choice of data or Measurement methods and procedures	Information from steam system operator based on measurements following strictly international or national acknowledged norms and guidelines.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**PB_{Li}**

Unit	Tons/Hour (Tons/Annum)
Description	Average Hourly Steam Production in each load class
Source of data	Hourly Measurement Data
Value(s) applied	Tons/Hour
Choice of data or Measurement methods and procedures	Information from steam system operator based on measurements following strictly international or national acknowledged norms and guidelines.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$NCV_{EF,BL}$**
Unit	GJ/m3
Description	Net Calorific Value of Fossil Fuel (Natural Gas)
Source of data	Analysis reports
Value(s) applied	0.04
Choice of data or Measurement methods and procedures	Information from steam system operator based on measurements.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$EFC_{,FF,BL}$**
Unit	tC/GJ
Description	Carbon Emission Factor for fuel used in the boiler system
Source of data	IPCC default value (table 1.4 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories)
Value(s) applied	0.056tCO2e/GJ
Choice of data or Measurement methods and procedures	Regional/local emission factors are not available, hence IPCC factors have been used.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$OXIDFF_{,BL}$**
Unit	Fraction
Description	Oxidation factor for the fossil fuel used in the baseline boiler
Source of data	IPCC/ Industry Practice
Value(s) applied	1
Choice of data or Measurement methods and procedures	Regional/local emission factors are not available

Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**PRESSBL,MIN**
Unit	bar
Description	Lowest measured pressure of the generated steam during determination of the specific energy consumption.
Source of data	Measurement. Use test result for calculations.
Value(s) applied	3.1
Choice of data or Measurement methods and procedures	Measurement strictly following international acknowledged norms and guidelines such as ASME PTC 4-1998 .
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$PRESS_{BL,MAX}$**
Unit	bar
Description	Highest measured pressure of the generated steam during determination of the specific energy consumption.
Source of data	Measurement. Use test result for calculations.
Value(s) applied	38.3
Choice of data or Measurement methods and procedures	Measurement strictly following international acknowledged norms and guidelines such as ASME PTC 4-1998 .
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$TEMP_{BLMIN}$**
Unit	K
Description	Lowest measured temperature of the generated steam during determination of the specific energy consumption.
Source of data	Measurement. Use test result for calculations.
Value(s) applied	571.1
Choice of data or Measurement methods and procedures	Measurement strictly following international acknowledged norms and guidelines such as ASME PTC 4-1998 .
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**$TEMP_{BLMAX}$**
Unit	K
Description	Highest measured temperature of the generated steam during determination of the specific energy consumption.

Source of data	Measurement. Use test result for calculations.
Value(s) applied	671.9
Choice of data or Measurement methods and procedures	Measurement strictly following international acknowledged norms and guidelines such as ASME PTC 4-1998 .
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data / Parameter	**GWP_{CH4}**
Unit	-
Description	Global Warming Potential of Methane (CH_4)
Source of data	IPCC
Value(s) applied	25
Choice of data or Measurement methods and procedures	Default Value
Purpose of data	Calculation of baseline emissions
Additional comment	Valid from 1 Jan 2013 onwards

B.6.3. Ex ante calculation of emission reductions

>>

Baseline Emission

Project emissions were calculated using the Approved baseline and monitoring methodology AM0056 (version 1.0).
Baseline emissions are calculated via the degree of efficiency of the overall steam generation system of the 3 boilers. The following detailed calculation procedures are based on the specific fuel consumption (SFC) for steam generation.

Step 1: Determination of the capacity of the baseline equipment
To determine the steam capacity of the boilers the following were considered:

- The name plate capacity for each boiler from the manufacture: 129.25 metric tonnes of steam per hour (MT /H)
- Technical analysis carried out by Kellog Brown Roots (KBR) for the modification of the boilers determined that the capacity of each boiler to be 120 MT/H
- Measurements carried out established an operating range for the boilers. The measurements methods have been reviewed and determined to be in accordance with the ASTM standards. The facility being a 24hour continuously operating petrochemical plant, the boilers are designed and maintained to operate at near constant loads. Hence based on the review of measurement data, the operating ranges were identified as summarized below:
  1. 2008-U: Operating Range: 100-120 Tons/hr
  2. 2008-UA: Operating Range: 100-120 Tons/hr

From the above considerations, 100-120 Tons/hr was selected as the representative steam capacity for the boilers.

Step 2: Determination of the load classes of the boilers:

Based on hourly measurement data available at Al Bayroni, it has been observed that the facility operates at near constant load in the range of 100 - 120 Tons/hr. For representation purposes, however, a range of load classes have been evaluated and these are represented in the table below.

Table B.6.1: The selected boiler load classes

Boiler Load Class (Tons/hr)	2008-U Load Classes	2008-UA Load Classes
0-20	1	1
21-40	2	2
41-60	3	3
61-80	4	4
81-100	5	5
101-120	6	6
>120	7	7

Step 3: Determination of the specific fuel (energy) consumption of each boiler (per load class) within the steam system:

Step 3 b.1: Determination of the specific fuel consumption for each boiler 'j'per load class 'i' within the steam generation system

The specific fuel (energy) consumption of each boiler per load class within the steam system is determined using the following formula:

$$SFC_{i,j} = \left(\frac{FC_{BL,i,j,x}}{P_{BL,i,j,x}} \right)$$

Where

$SFC_{i,j}$ Specific fuel consumption within load class 'i' for each boiler 'j' as observed from performance tests (Nm^3/tSteam)

$FC_{BL,i,j,x}$ Average observed fuel consumption for load x, using repeated performance test for that load, within load class 'i' for each boiler 'j' (Nm^3/hr)

$P_{BL,i,j,x}$ Average observed amount of produced steam for load x, using repeated performance test for that load, within load class 'i' for each boiler 'j' (T/hr)

Table B.6.2: SFC estimation per load class

Boilers	Load Class	Range (MT/H)	FCBL,i	PBL,i	SFCi,j
			Fuel (Nm3/Hour)	Steam(Tons/hr)	Nm3/Tsteam
2008-U	1	0-20	10.8	334.6	31.0
	2	21-40	25.5	4164.9	163.3
	3	41-60	53.4	4767.0	89.3
	4	61-80	75.2	7012.6	93.3
	5	81-100	91.3	7988.2	87.4
	6	101-120	112.6	10285.5	91.4
	7	>120	128.0	11125.3	86.9
2008-UA	1	0-20	7.3	687.2	94.2
	2	21-40	39.5	3292.2	83.4
	3	41-60	49.8	3872.4	77.8
	4	61-80	69.6	7350.9	105.7
	5	81-100	90.8	8559.3	94.2
	6	101-120	113.1	11041.1	97.7

Boilers	Load Class	Range (MT/H)	FCBL,i	PBL,i	SFCi,j
			Fuel (Nm3/Hour)	Steam(Tons/hr)	Nm3/Tsteam
	7	>120	130.1	8473.3	65.2

Step 3 b.2: Determination of the specific energy consumption within the capacity of the boiler system for each boiler 'j' per load class 'i'

$SEC_{ij} = SFC_{ij} \cdot NCV_{BL,FF}$

Where

$SEC_{i,j}$ Lowest specific energy consumption within load class 'i' for each boiler 'j' (GJ/t)

$SFC_{i,j}$ Lowest possible specific fuel consumption within load class 'i' for each boiler 'j' (Nm^3/t)

$NCV_{BL,FF}$ Net caloric value of fossil fuel used in the baseline boiler (GJ/m^3): 0.039GJ/Nm3

Table B.6.3: SEC-Calculation

Boilers	Load Class	Range (MT/H)	FCBL,i	PBL,i	SFCi,j	Calorific Value	SEC
			Fuel (Nm3/Hour)	Steam(T/Hour)	Nm3/Tsteam	GJ/Nm3	GJ/T Steam
2008-U	1	0-20	10.8	334.6	31.0	0.0398516	1.2341
	2	21-40	25.5	4164.9	163.3	0.0398516	6.5082
	3	41-60	53.4	4767.0	89.3	0.0398516	3.5570
	4	61-80	75.2	7012.6	93.3	0.0398516	3.7168
	5	81-100	91.3	7988.2	87.4	0.0398516	3.4849
	6	101-120	112.6	10285.5	91.4	0.0398889	3.6444
	7	>120	128.0	11125.3	86.9	0.0398887	3.4658
2008-UA	1	0-20	7.3	687.2	94.2	0.0398516	3.7535
	2	21-40	39.5	3292.2	83.4	0.0398516	3.3242
	3	41-60	49.8	3872.4	77.8	0.0398516	3.0997
	4	61-80	69.6	7350.9	105.7	0.0398516	4.2115
	5	81-100	90.8	8559.3	94.2	0.0398516	3.7554
	6	101-120	113.1	11041.1	97.7	0.0398712	3.8938
	7	>120	130.1	8473.3	65.2	0.0399768	2.6046

Step 3 b.3: Determination of the specific energy consumption of the steam generation system (per load class)

$SEC_{sys} = SEC_{ij} \cdot PB_{L,i}$

Where

SEC_{sys} Lowest of all calculated values of the specific energy consumption within each steam generation system's load class (GJ/hr).

$SEC_{ij,j}$ Lowest specific energy consumption within load class 'ij' of boiler 'j' (GJ/t) where 'i' corresponds to load class 'ij'

$P_{BL,i,j,x}$ Average observed amount of produced steam for load x, using repeated performance test for that load, within load class 'i' for each boiler 'j' (T/hr)

Table B.6.4: SEC of steam generation system calculation

Boilers	Load Class	Range	FCBL,i	PBL,i	SFCi,j	Calorific Value	SEC
		MT/hr	Fuel (Nm3/Hour)	Steam(T/Hour)	Nm3/T steam	GJ/Nm3	GJ/T Steam
2008-U	1	0-20	10.8	334.6	31.0	0.0398516	1.2341
	2	21-40	25.5	4164.9	163.3	0.0398516	6.5082
	3	41-60	53.4	4767.0	89.3	0.0398516	3.5570
	4	61-80	75.2	7012.6	93.3	0.0398516	3.7168
	5	81-100	91.3	7988.2	87.4	0.0398516	3.4849
	6	**101-120**	**112.6**	**10285.5**	**91.4**	0.0398889	**3.6444**
	7	>120	128.0	11125.3	86.9	0.0398887	3.4658
2008-UA	1	0-20	7.3	687.2	94.2	0.0398516	3.7535
	2	21-40	39.5	3292.2	83.4	0.0398516	3.3242
	3	41-60	49.8	3872.4	77.8	0.0398516	3.0997
	4	61-80	69.6	7350.9	105.7	0.0398516	4.2115
	5	81-100	90.8	8559.3	94.2	0.0398516	3.7554
	6	**101-120**	**113.1**	**11041.1**	**97.7**	0.0398712	**3.8938**
	7	>120	130.1	8473.3	65.2	0.0399768	2.6046

Step 4: Determination of the load classes of the steam system

The steam system load classes in Table B.6.5 below are the result of any possible combination of the boiler load classes given in Table B.6.1 above using the On-Off-Operation. Figure B.1-B.3 below present an analysis of the steam generation from the two boilers from which the following is evident:

1. Steam generation from two boilers is largely within 100-120T/hour
2. Steam generation below 100 Tons/Hr is an occasional standalone occurrence and may represent downtime
3. Similarly steam generation above 120 Tons/hr is a rare occurrence and not sustained

Table B.6.5: Steam generation system load classes

System Load Class	System Load	2008U	2008UA
1	0-21	ON	OFF
		ON	ON
		OFF	ON
	21-40	ON	OFF
		ON	ON
2		OFF	ON
3	41-60	ON	OFF
		ON	ON
		OFF	ON
4	61-80	ON	OFF
		ON	ON

		OFF	ON
5	81-100	ON	OFF
		ON	ON
		OFF	ON
6	101-120	ON	OFF
		ON	ON
		OFF	ON
7	121-140	ON	OFF
		ON	ON
		OFF	ON
8	141-160	ON	ON
9	161-180	ON	ON
10	181-200	ON	ON
11	201-220	ON	ON
12	221-240	ON	ON
13	241-260	ON	ON
14	261-280	ON	ON
15	281-300	ON	ON
16	301-320	ON	ON

Figure B.1: Boiler Performance Analysis: 2008U

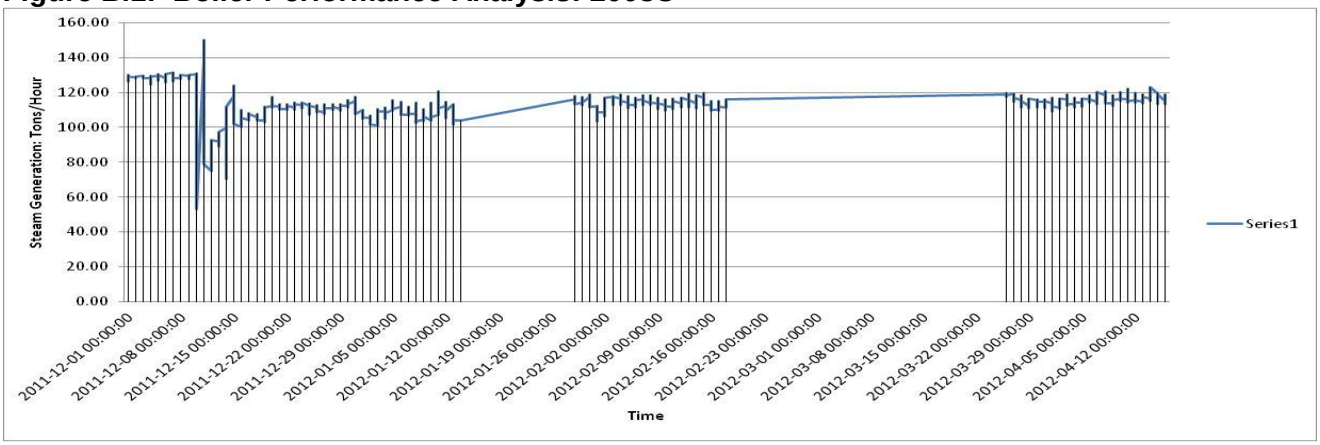
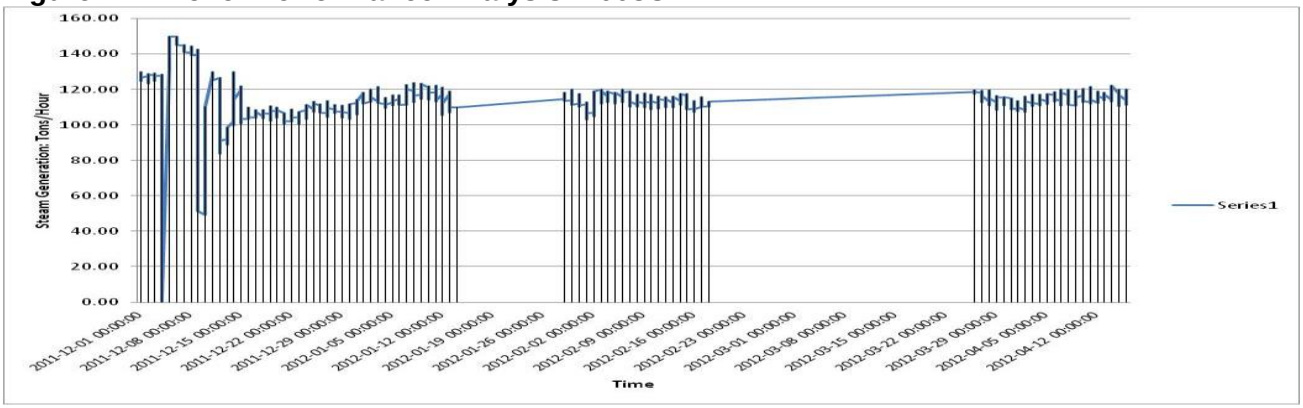


Figure B.2: Boiler Performance Analysis: 2008UA



Step 5: Determination of the specific fuel consumption of the steam system (per load class):

The specific fuel consumption of the steam system for different combinations is provided in the table below.

Table B.6.6: Specific Fuel Consumption & Energy Consumption

System Load Class	System Load	2008U	2008UA	Average Stem Production (T/hr)	Net Calorific Value of Fuel (GJ/m3)	NG Fuel (Nm3/h)	Specific Fuel Consumption (Nm3/T)	Specific Energy Consumption (SEC)(GJ/t of steam	Specific Energy Consumption System (SEC system)(GJ/hr)
Reference/ Source				Al Bayroni	Al Bayroni	Al Bayroni	Calculated	Calculated	Calculated
1	0-21	ON	OFF	7.93	0.0398516	50.24	6.34	0.25	2.00
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		OFF	ON	0.51	0.0398516	506.29	991.89	39.53	20.18
	21-40	ON	OFF	25.50	0.0398516	4164.853	163.31	6.51	165.98
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
2		OFF	ON	39.47	0.0398516	3292	83.41	3.32	131.20
3	41-60	ON	OFF	53.41	0.0398516	4767.026	89.26	3.56	189.97
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		OFF	ON	49.79	0.0398516	3872	77.78	3.10	154.32
4	61-80	ON	OFF	75.19	0.0398516	7012.59	93.27	3.72	279.46
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		OFF	ON	69.56	0.0398516	7351	105.68	4.21	292.95
5	81-100	ON	OFF	91.35	0.0398516	7988.19	87.45	3.48	318.34
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		OFF	ON	90.83	0.0398516	8559	94.23	3.76	341.10
6	101-120	ON	OFF	112.58	0.0398889	10285.54	91.36	3.64	410.28
		ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
		OFF	ON	113.06	0.0398712	11041	97.66	3.89	440.22
7	121-140	ON	OFF	128.04	0.0398887	11125.27	86.89	3.47	443.77
		ON	ON	130.33	0.0398516	12264	94.10	3.75	488.73
		OFF	ON	125.47	0.0400163	11140	88.79	3.55	445.78
8	141-160	ON	ON	142.81	0.0398516	13176	92.27	3.68	525.10
9	161-180	ON	ON	175.42	0.0398516	15881	90.54	3.61	632.90
10	181-200	ON	ON	186.17	0.0398516	16918	90.88	3.62	674.22

11	201-220	ON	ON	214.88	0.0398133	20263	94.30	3.75	806.72
12	221-240	ON	ON	228.82	0.0399062	21647	94.60	3.78	863.85
13	241-260	ON	ON	252.74	0.0399594	22180	87.76	3.51	886.30
14	261-280	ON	ON	273.12	0.0398516	11667	42.72	1.70	464.94
15	281-300	ON	ON	281.06	0.0398516	11855	42.18	1.68	472.46
16	301-320	ON	ON	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Step 6: Calculation of baseline emissions

Baseline Emission for the system is calculated using the formula:

$$BE_y = 44/12 \cdot EF_{C,FF,BL} \cdot OXID_{FF,BL} \cdot SEC_{syst}$$

Where

BE,y	Baseline emissions resulting from steam generation within the capacity of the baseline equipment in the year 'y' (tCO2/yr)
SECsyst	Specific energy consumption (GJ/t) of the multi boiler steam generation system
EFC,FF,BL	Carbon emission factor of baseline fossil fuel (tC/GJ)
OXIDFF,BL	Oxidation factor of baseline fossil fuel
44/12	Ratio of the molecular weight of CO2 to the molecular weight of carbon

Given the steam generation capacity for all two boilers has been determined to be 100-120Tons/hour and considering that boiler operations are predominantly within this load range, the following has been considered in estimating annual baseline emissions.

Table B.6.7: Annual Baseline Emissions Calculation

Steam Generation & Energy Consumptions		Reference (from ER sheet)
Annual Steam Production (2011) (Tons/Annum) (from all load classes)	1988121	Al Bayroni Steam Generation Data (See *Boiler Steam Summary Tab*)
Boiler Load Classes considered for baseline emissions	100-120 (Individual Boiler)	
Annual Steam Generation within selected load class - 2008U (T/Annum)	867725	Estimated based on steam generation data within the 100-120 T/H load class - refer 2008U & 2008-UA Tabs)
Annual Steam Generation within selected load class - 2008-UA (T/Annum)	915398	
Total Steam Generation within selected load class (2 boilers) (T/Annum)	1783123	
Average Fuel Consumption (Nm3/Ton)	94.45	Based on fuel and energy consumption data (See *System load classes & emissions tab*)
Annual Fuel Consumption within representative load classes (Nm3/ annum)	168674357.22	
Average Energy Consumption (GJ/Ton)	3.76	Based on fuel and energy consumption data (See *System load classes & emissions tab*)
Annual Energy Consumption (GJ/Annum) (SECsyst)	6726658.44	
Carbon Emission Factor (Fossil Fuel) (tc/GJ) (EFC.FF.BL)	0.056	Table 2, AM0029.
Oxidation Factor (OXIDFF.BL)	1	
Baseline Emission (Tons/Annum)	376692.8727	

Project Emissions

The proposed rehabilitation project is expected to achieve up to 20.18% savings in fuel consumption annually. Therefore the anticipated fuel consumption after implementation of project is expected to be 138312972.9Nm3 per annum for the representative system load classes (100-120T/h).

To estimate the project emissions, the '**Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion' (version 2)** was used. The tool requires CO2 emissions to be calculated using equation 1 as stated below:

$PE_{FC,JY} = \sum FC_{I,J} \text{ X } COEF_{I,Y}$

Where,

$PE_{FC,JY}$ = Are the CO2 emissions from fossil fuel combustion in process j during the year 'y' (tCO2/year)

$\sum FC_{I,J}$ = Is the quantity of fuel type 'i' combusted in process 'j' during the year y (Mass or Volume Unit/year)

$COEF_{I,Y}$ = Is the CO2 emission coefficient of fuel type 'i' in year 'y' (tCO2/mass or volume unit)

i = are the fuel types

Two options have been provided in the tool to calculate the CO2 emission coefficient (COEFi,y). Option B (equation 4 below) (i.e. based on net calorific value and CO2 emission factor) has been used in estimating the emission coefficient.

COEFi,y = NCVi,y X EF CO2i,y

Where,
NCVi,y = Is the weighted average net calorific value of the fuel type i, in year y (GJ/Mass or Volume Unit)

EF CO2 i,y = Is the weighted average CO2 emission factor of fuel type i in year y (tCO2/GJ)

Project emissions have been estimated as presented in Table B.6.8 below.

Table B.6.8: Project Emission Calculations

Representative System Load Classes considered	100-120 (Individual Boilers)
Baseline Fuel Consumption within representative load classes (Nm3/annum)	168674357.22
Project Fuel Savings (%)	20.18%
Revised Fuel Consumption within representative load classes (Nm3/annum)	134637056.6
Average Calorific Value of Fuel (GJ/m3)	0.039859732
Annual Energy Consumption (GJ/Annum) (Post Rehabilitation)	5366597.335
Project Emissions (Tons/Annum)	300529.4508

LEAKAGE

Emissions due to leakage have been calculated using equation 9 of the AM0056 (v 1.0):

$$LE_{CH4,y} = \left(FC_{PJ,y} \cdot NCV_{PJ,y} \cdot EF_{PJ,upstream,CH4} - FC_{BL,y} \cdot EF_{BL,upstream,CH4}\right) \cdot GWP_{CH4}$$

Quantity of fossil fuel combusted in the project plant during the year 'y' (t or m³), monitored as described in the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (FCpjy)	134637056.6
Average net calorific value of the fossil fuel combusted during the year 'y' (GJ/t or GJ/m³) monitored as described in the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (NCVpjy)	0.039859732
Emission factor for upstream fugitive methane emissions of fossil fuel used in the project activity from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, (t CH4 per GJ fuel supplied to final consumers) tCH4/GJ (EFPJ, UPSTREAM CH4)	0.000296
Fossil fuel that would have been combusted in the absence of the project activity during the year 'y' (GJ) ($FC_{BL,Y}$)	6726658.44
Global warming potential of methane valid for the relevant commitment period.	25
Leakage (Tons/Annum)	10,064.45218

Note: There will be no change in the source of fuel supply or mode of delivery as a result of the project. Therefore emission factor for upstream fugitive methane emissions remains same prior to and post project.

EMISSION REDUCTIONS

Emission reductions are calculated using equation 12 of AM0056 (version 1.0) as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where

ER_y Emissions reductions of the project activity during the year 'y' in tCO_2e
BE_y Baseline emissions during the year 'y' in tCO_2e
PE_y Project emissions during the year 'y' in tCO_2e
LE_y Leakage emissions in the year 'y' in tCO_2e

Emission reductions from the above equation is 66,098.96 MT/Annum or 66,098 MT/Annum rounded down.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/10/2014 – 30/09/2015	376,692.87	300,529.45	10,064.45	66,098
01/10/2015 – 30/09/2016	376,692.87	300,529.45	10,064.45	66,098
01/10/2016 – 30/09/2017	376,692.87	300,529.45	10,064.45	66,098
01/10/2017 – 30/09/2018	376,692.87	300,529.45	10,064.45	66,098
01/10/2018 – 30/09/2019	376,692.87	300,529.45	10,064.45	66,098

01/10/2019 – 30/09/2020	376,692.87	300,529.45	10,064.45	66,098
01/10/2020 – 30/09/2021	376,692.87	300,529.45	10,064.45	66,098
01/10/2021 – 30/09/2022	376,692.87	300,529.45	10,064.45	66,098
01/10/2022 – 30/09/2023	376,692.87	300,529.45	10,064.45	66,098
01/10/2023 – 30/09/2024	376,692.87	300,529.45	10,064.45	66,098
Total	3,766,928.7	3,005,294.5	100,644.5	660,980
Total number of crediting years	10			
Annual average over the crediting period	376,692.87	300,529.45	10,064.45	66,098

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

As per Section III (Monitoring Methodology) of the methodology AM0056 (version 1) the following data and parameters are monitored:

Data / Parameter	$P_{PJ,i,y}$
Data Unit	t/yr
Description	Generated steam in the year 'y' subdivided into load classes in the case of single boiler installations
Source of data	There is no single boiler installation therefore not applicable.
Value(s) applied	There is no single boiler installation therefore not applicable.
Measurement methods and procedures	There is no single boiler installation therefore not applicable.
Monitoring frequency	There is no single boiler installation therefore not applicable.
QA/QC procedures	There is no single boiler installation therefore not applicable.
Purpose of data	There is no single boiler installation therefore not applicable.
Additional comment	There is no single boiler installation therefore not applicable.

Data / Parameter	$P_{PJ,k,y}$
Unit	t/yr
Description	Generated steam in the year 'y' subdivided into load classes in the case of Multi boiler installations

Source of data	Monitoring Data measured and archived at the facility
Value(s) applied	1,783,123
Measurement methods and procedures	Measurement (every 15 minutes) of the mass flow rate of generated steam (t/h) following ASME PTC 4-1998. Steam generation is allocated to the associated load class by comparison of measured steam mass flow and the range of the load classes. By multiplication of every 15-minutes-value with 0.25 hours the amount of generated steam is determined. At the end of each year the steam generation within each load class is aggregated.
Monitoring frequency	Every 15 minutes, allocated and aggregated into load classes. Online PIMS Server Data Stamping (Sec/Min/Hours).
QA/QC procedures	Measuring instruments subject to a regular maintenance and testing regime in accordance to ASME PTC 4-1998.
Purpose of data	Calculation of project emissions
Additional comment	Please see Note 1 below

Data / Parameter	$EF_{PJ,upstream,CH4}$
Unit	t CH4/GJ Fuel
Description	Emission factor for upstream fugitive methane emissions of fossil fuel used in the project activity from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in t CH4 per GJ fuel supplied to final consumers.
Source of data	not applicable as this parameter is not used in the project activity.
Value (s) applied	not applicable as this parameter is not used in the project activity.
Measurement methods and procedures	not applicable as this parameter is not used in the project activity.
Monitoring frequency	not applicable as this parameter is not used in the project activity.
QA/QC procedures	not applicable as this parameter is not used in the project activity.
Purpose of data	not applicable as this parameter is not used in the project activity.
Additional comment	not applicable as this parameter is not used in the project activity.

Data / Parameter	$EF_{BL,upstream,CH4}$
Unit	t CH4/GJ Fuel
Description	Emission factor for upstream fugitive methane emissions of fossil fuel used in the baseline equipment from production, transportation, distribution, and, in the case of LNG, liquefaction, transportation, re-gasification and compression into a transmission or distribution system, in t CH4 per GJ fuel supplied to final consumers.
Source of data	not applicable as this parameter is not used in the project activity.
Values(s) applied	not applicable as this parameter is not used in the project activity
Measurement methods and procedures	not applicable as this parameter is not used in the project activity.

Monitoring frequency	not applicable as this parameter is not used in the project activity.
QA/QC procedures	not applicable as this parameter is not used in the project activity.
Purpose of data	not applicable as this parameter is not used in the project activity
Additional comment	not applicable as this parameter is not used in the project activity.

Data / Parameter	$EF_{CO2,upstream,LNG}$
Unit	tCO2/GJ Fuel
Description	Emission factor for upstream CO2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, regasification and compression of LNG into a natural gas transmission or distribution system.
Source of data	not applicable as this parameter is not used in the project activity.
Value(s) applied	not applicable as this parameter is not used in the project activity
Measurement methods and procedures	not applicable as this parameter is not used in the project activity.
Monitoring frequency	not applicable as this parameter is not used in the project activity.
QA/QC procedures	not applicable as this parameter is not used in the project activity.
Purpose of data	not applicable as this parameter is not used in the project activity
Any comment	not applicable as this parameter is not used in the project activity.

Data / Parameter	$PRESS_{PJ}$
Unit	bar
Description	Pressure of the generated steam
Source of data	Test results
Value(s) applied	3.1 to 38.3
Measurement methods and procedures	Measurement following international acknowledged norms and guidelines (ASME PTC 4-1998).
Monitoring frequency	Every 15 minutes. Online PIMS Server Data Stamping (Sec/Min/Hours).
QA/QC procedures	Measuring instruments subject to a regular maintenance and testing regime in accordance to ASME PTC 4-1998.
Purpose of data	Calculation of project emissions
Additional comment	Please see Note 1 below

Data / Parameter	$TEMP_{PJ}$
Unit	K
Description	Temperature of the generated steam
Source of data	Measured. Test results.
Value(s) applied	671.9

Measurement methods and procedures	Measurement following international acknowledged norms and guidelines (ASME PTC 4-1998).
Monitoring frequency	Every 15 minutes. Online PIMS Server Data Stamping (Sec/Min/Hours).
QA/QC procedures	Measuring instruments subject to a regular maintenance and testing regime in accordance to ASME PTC 4-1998.
Purpose of data	Calculation of project emissions
Additional comment	Please see Note 1 below.

In addition, the following parameters are included in the monitoring plan as per Option B for establishing CO2 emission coefficient in accordance with the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (version 02):

Data / Parameter	$FC_{i,j,y}$
Unit	m3/yr
Description	Quantity of natural gas combusted in one year
Source of data	Onsite measurements at the facility
Value(s) applied	168,674,357
Measurement methods and procedures	Information from steam system operator based on hourly measurements. Devices used by supplier are properly calibrated with the ruler gauge and receive a regular maintenance.
Monitoring frequency	Continuously on hourly basis
QA/QC procedures	Metered fuel consumption is cross checked with supplier invoices. The consistency of metered fuel consumption quantities is cross-checked with monthly energy balance based on purchased quantities.
Purpose of data	Calculation of project emissions
Additional comment	NA

Data / Parameter	$NCV_{i, y}$
Unit	GJ/m3
Description	Weighted Average Net Calorific Value of Fossil Fuel Used (Natural Gas)
Source of data	Provided by natural gas supplier (ARAMCO – Saudi Arabian Oil Company) in invoices.
Value(s) applied	0.04
Measurement methods and procedures	Measurements are undertaken by supplier in accordance with ASME PTC 4-1998 standard.
Monitoring frequency	By supplier (ARAMCO – Saudi Arabian Oil Company) in monthly invoices for each monthly delivery based on weighted average values.

QA/QC procedures	As per the requirement of "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (version 02), the value (50.2 TJ/Gg) is within the uncertainty range of the IPCC default values (lower value 46.5 TJ/Gg and upper value 50.4 TJ/Gg)provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines.
Purpose of data	Calculation of project emissions
Additional comment	NA

Data / Parameter	$EFCO2_{i, y}$
Unit	tCO2/GJ
Description	Weighted average CO2 emission factor of natural gas in year y
Source of data	IPCC default value (table 1.4 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories)
Value(s) applied	0.056
Measurement methods and procedures	NA
Monitoring frequency	Annual monitoring of IPCC Guidelines on National GHG Inventories.
QA/QC procedures	NA
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Note 1:

- Al Bayroni's monitoring programme is integral to the company's third party certified (i.e. by British Standards Institute-BSI) ISO 9001:2008 compliant Quality Management System (QMS). All monitoring programmes including associated calibration is within the scope of the QMS and subjected to several audits and reviews including Internal Audits, SABIC Corporate Audits and Third Party (BSI) audits. Further, Al Bayroni subscribes to SABIC corporate's Safety, Environment, Health & Security Management Systems (SHEMS) applicable to all Rotating equipment, Pressure Relief Devices, Instrument Devises, Tanks & Pressure vessels, Piping, Car seals and Blinds, Hoses, Critical Instruments & Devices by pass, and Cathodic protection program. As a result, any modifications/ changes, replacements and emergency response is governed by the SHEMS programme. Al Bayroni is also certified to the American Chemistry Council Technical Specification Responsible Care® RC 14001.

- Al Bayroni Instrument testing/calibration process complies with ASME PTC 4 where applicable as follows:

Measurement	Applicable ASME code	Compliance
Pressure	PTC 19.2	1) The tests done by certified Technicians. 2) Test equipment are traceable to Accredited Standards. 3) The accuracy is up to 1% of span. 4) 5 point calibration carried out
Temperature	PTC 19.3	1) The tests done by certified Technicians. 2) Test equipment are traceable to Accredited Standards. 3) The accuracy is up to 5 degrees. 4) 5 point calibration carried out
Flow	PTC 19.5	1) The tests done by certified Technicians. 2) Test equipment are traceable to Accredited Standards. 3) The accuracy is up to 1% of span.

		4) Temperature and Pressure compensation is done.

All the modified facilities have passed through safety review during the design stage (namely HAZOP review) to identify all potential hazards and appropriate mitigation were incorporated during design phase of the project." In addition, there are Standard Operating Procedures (SOPs) available with operating personnel to start, operate and shutdown the boiler safely that includes the emergency scenarios of failure also. These SOPs are facilitated by the online instrumentation, Distributed Control System and Emergency Shutdown System

Through the management systems, monitoring and measurements program, testing and calibration is achieved. Testing and calibration are scheduled through the SAP system and notified by the workflow system to the Instrument division through the SAP maintenance planner.

The equipment / tag for the boilers is marked in block diagrams Figure B.7.1 -7.2 below). The flow and temperature is continually monitoring through DCS log sheet (Table 7.1). The monitoring testing and its frequency with the management system procedure reference is also provided in Table 7.2.

Figure B.7.1: Packaged Boiler Block Diagram (Boiler 2008-UA)

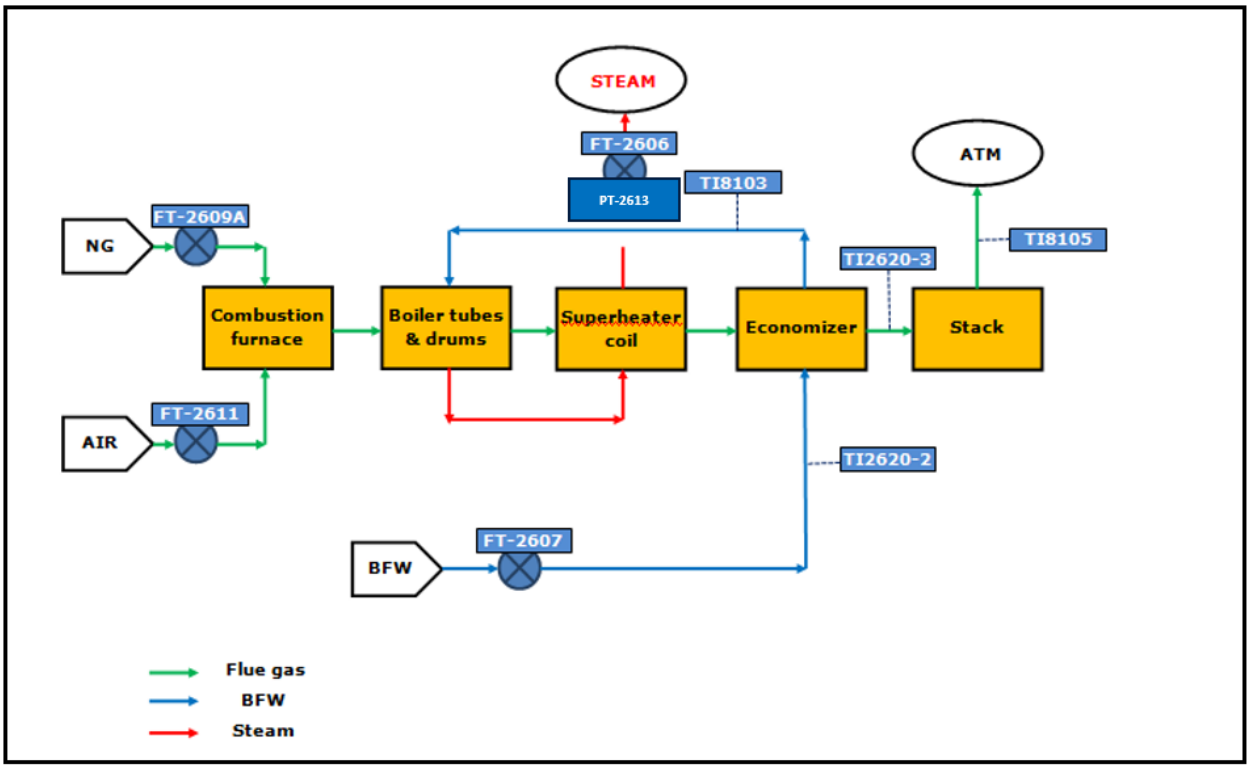


Figure B.7.2: Packaged Boiler Block Diagram (2008-U)

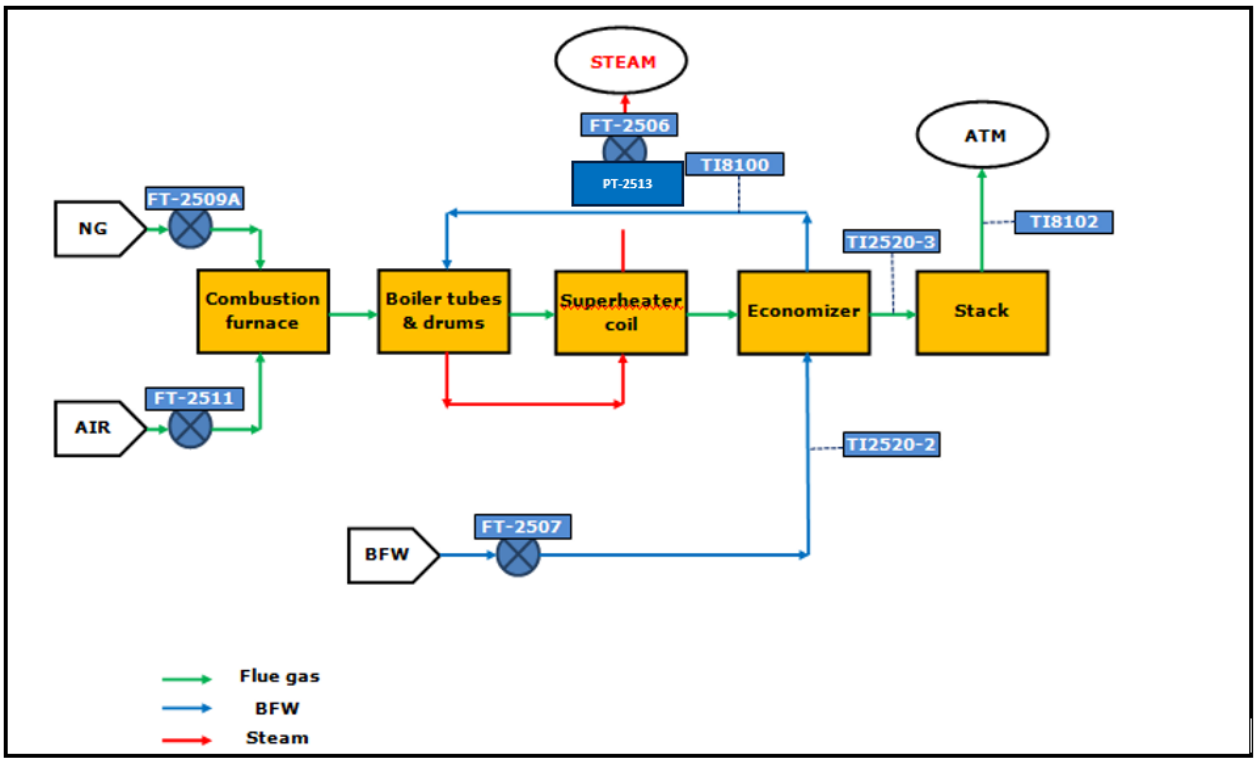

STEAM
FT-2506
PT-2513
TI8100
ATM
TI8102
NG
FT-2509A
TI2520-3
Combustion furnace
Boiler tubes & drums
Superheater coil
Economizer
Stack
AIR
FT-2511
TI2520-2
BFW
FT-2507
Flue gas
BFW
Steam

Table 7.1 Sample DCS Log Sheet

Log Items	STEAM SUPPLY			STEAM DRUM		BFW			CBD		FUEL GAS (NG)			
	Temp.	SH Stm Press.	Flow	Level (N)	Level (S)	Flow	Temp.	Econ. Out T.	Cond.	PH	Header Press.	Flow	Burner Press.	Flow Meter
	TI-2520-1	PI-2513	FIC-2506	LIC-2508	LI-2516	FIC-2507	TI-2520-2	TI-8100	CI-2517	AI-2518	PIC-2219	FIC-2509	PIC-2510	FI-2509A
	°C	BAR	T/H	MM	MM	M^3/H	°C	°C	µS/cm	pH	BAR	NM^3/H	BAR	NM^3
C. R.	360-410	37-43	<129	-25 ~+100	-25 ~+100	<135	105-125	160-190	<500	9.0-11	2.5-3.5	<12000	0.1-0.9	-
00/MV														
02:00														
04:00														
06:00														
08/MV														
10:00														
12:00														
14:00														
16/MV														
18:00														
20:00														
22:00														

Log Items	(a)	COMBUSTION AIR							FLUE GAS					LOAD
	Fuel/Air Ratio	Flow	F.D.Fan Speed	2008-UJM	F.D.Fan Suc. T.	F.D.Fan Out Pres.	Windbox Pressure	Furnace Pressure	Furnace Draft Pr.	Econ. out Press	Outlet Temp.	Econ. out Temp	Excess O_2	MV Open
	HC-2511-1	FIC-2511	-	Selector mode	TI-2520-4	PI-2515-1	PI-2515-2	PI-2515-3	PI-2515-4	PI-8102	TI-2520-3	TI-8102	AI-2519	XMV 2505
	%	KNM^3/H	RPM	A .O .M	°C	mmH_2O	mmH_2O	mmH_2O	mmH_2O	mBar	°C	°C	%	%
C. R.	70-99	100-170	1600-1850	CP LP	4-55	230-330	220-330	80-150	-10 ~+10	-10 ~+10	320-400	144-205	1.0-3.5	<80
00/MV														
02:00														
04:00														
06:00														
08/MV														
10:00														
12:00														
14:00														
16/MV														
18:00														
20:00														
22:00														

REMARKS:			
SIGNATURE BY:	**1ST SHIFT**	**2ND SHIFT**	**3RD SHIFT**
DCS BRD.			

Boiler 2008 U				**Boiler 2008 U A**			
	Tag #	Calibration / Testing Frequency	Procedure#		Tag #	Calibration / Testing Frequency	Procedure#
1	Natural Gas			**1**	Natural Gas		
	FT 2509 A	Yearly	IMP-017		FT 2609 A	Yearly	IMP-017
2	Air			**2**	Air		
	FT 2511	Yearly	IMP-017		FT 2611	Yearly	IMP-017
3	Boiler Feed Water			**3**	Boiler Feed Water		
	FT 2507	Yearly	IMP-017		FT 2607	Yearly	IMP-017
4	Steam			**4**	Steam		
	FT 2506	Yearly	IMP-017		FT 2606	Yearly	IMP-017
5	Steam Temperature			**5**	Steam Temperature		
	TI 8100	Yearly	IMP-024		TI 8103	Yearly	IMP-024
6	Flue Gas Temp			**6**	Flue Gas Temp		
	TI 2520-3	Yearly	IMP-024		TI 2620-3	Yearly	IMP-024
7	Boiler Feed water temp			**7**	Boiler Feed water temp		
	TI 2520-2	Yearly	IMP-024		TI 2620-2	Yearly	IMP-024
8	Flue Gas Tem (Stack)			**8**	Flue Gas Tem (Stack)		
	TI 8102	Yearly	IMP-024		TI 8105	Yearly	IMP-024

Note: Instrument, Maint. Procedure -SHEM 03.02

B.7.2. Sampling plan

>>
No sampling is required as 100% of data will be monitored during the project scenario

B.7.3. Other elements of monitoring plan

>>

Same as above.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>
Not applicable

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
25/08/2011
The contract with supplier of goods and services for project implementation was signed on this data and therefore it is considered as a start date of the project activity.

C.1.2. Expected operational lifetime of project activity

>>
Twenty years
As was demonstrated to the Validator during the validation visit, Al Bayroni is employs strict maintenance practice which allows to extend the operational life time of the project.

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Fixed (10 Years)

C.2.2. Start date of crediting period

>>
01/10/2014

C.2.3. Length of crediting period

10 Years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
The proposed boiler rehabilitation project is not expected to cause additional adverse impacts on the environment in comparison to the baseline scenario, as detailed below:

- Air Quality: This project is not expected to cause any additional emissions and affect ambient air quality from current levels caused by emissions from the existing boiler system.
- Soil and Groundwater: As the proposed project largely involves replacement within the boilers and as no new construction and commissioning of facilities is required, no impact on soil and groundwater is expected from the project.
- Flora and Fauna: There will be no displacement of flora and fauna as the site for the project is already developed and accommodates the existing boiler system
- Socio-Economic: The local economy will be benefited through contracts to in Kingdom contractors for labour supply and logistical support to implement the rehabilitation.
- Noise: The proposed project is not expected to elevate noise levels above current levels.

Energy Savings: There will be considerable energy savings from the project (estimated to be 20.18%).

D.2. Environmental impact assessment

>>

The Environmental Impact Assessment (EIA) is within the Environmental Permit Application process. As per RCER 2010 (section 1.3.7), a new or amended permit will be required only if production increases by 10% or more. Given that the proposed project activity will not result in an increase in production, no new or amended permit would be required, hence EIA is excluded.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

Formal consultations with local stakeholders were held on September 30, 2013 at the Al Jubail Intercontinental Hotel, in Jubail Industrial City. An open invitation was issued to the public soliciting their participation in the consultation session in local newspaper "Arab News dated 8th September, 2013.

E.2. Summary of comments received

>>

In total 33 participants took part in the meeting representing various stakeholder groups:

- Royal Commission for Jubail (local government)
- ALBAYRONI Employees
- Employees of other companies
- Local residents
- DNA representatives
- Media representatives etc...

The meeting participants were requested to provide their feedback on the proposed CDM project through Stakeholder Consultation Feedback Form. They were asked to rate the quality of the project design, the adequacy of the information provided, project benefits, impact of the project, concerns, suggestions or criticism. The results of the survey are as follows:

- 22 respondents stated that they had received adequate information about proposed CDM project
- 1 respondent did not receive adequate information
- 14 rated the design of the project as excellent
- 6 rated the design as good
- Respondents stated that the project in their opinion would result in environmental (21), social (7) and economic (7) benefits
- 13 participants stated that the project impact would be significant
- 6 stated that impact would be fair

Table E.1 below presents concerns and criticisms about the project expressed by participants and the way they are addressed:

Table E.1: Summary of Comments Received from the Stakeholder Consultations

	Response
the monitoring processes of the project not very clear	The project will strictly follow monitoring procedures outlined by the applied methodology.

economic aspect of the project not very clear	Financial estimations (cash flow, IRR etc..) are currently being developed by team and will be explained in details in PDD
UNFCCC rules for CDM are over complicated	The team agrees with the concern however rules must be followed to complete CDM project
project being limited to only one SABIC Affiliate	Other companies within SABIC are currently investigating opportunities to implement CDM projects including the similar one (as part of PoA)
Proposed technologies not being the most advanced.	The project design is based on the tested technology.

In general, the comments were positive and supportive, recognizing the importance of sustainability agenda in the Kingdom of Saudi Arabia. Most comments urged the roll out of similar projects across entire SABIC (i.e. in other Affiliates) and other companies.

E.3. Report on consideration of comments received

>>
See Table E.1 above

SECTION F. Approval and authorization

>>
The Letter of Approval was issued by National Committee for Clean Development Mechanism, Kingdom of Saudi Arabia (Saudi DNA) on 8th January, 2014.

Modalities of Communication (MoC) has been prepared and duly signed.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	**X** Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	AL-BAYRONI (Al-Jubail Fertilizer Company)
Street/P.O. Box	10046
Building	Main Building
City	Madinat Al-Jubail Sinaiyah
State/Region	
Postcode	31961
Country	Kingdom of Saudi Arabia
Telephone	+966 (3) 340 6111
Fax	+966 (3) 341 6100
E-mail	amshamrani@albayroni.sabic.com
Website	www.sabic.com
Contact person	Abdullah Al Shamrani
Title	President
Salutation	Mr
Last name	Al-Shamrani
Middle name	
First name	Abdullah
Department	
Mobile	
Direct fax	+966 (3) 341 6100
Direct tel.	+966 (3) 340 6111
Personal e-mail	amshamrani@albayroni.sabic.com

Project participant and/or responsible person/ entity	**X** Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	AL-BAYRONI (Al-Jubail Fertilizer Company)
Street/P.O. Box	10046
Building	Main Building
City	Madinat Al-Jubail Sinaiyah
State/Region	
Postcode	31961
Country	Kingdom of Saudi Arabia
Telephone	+966 (3) 340-6177
Fax	+966 (3) 340 6221
E-mail	anaziaa@albayroni.sabic.com
Website	www.sabic.com
Contact person	Ali A. Al-Anazi

Title	EHSS Senior Manager
Salutation	Mr
Last name	Al-Anazi
Middle name	
First name	Ali
Department	EHSS
Mobile	+966 505956448
Direct fax	+966 (3) 340 6221
Direct tel.	+966 (3) 340-6177
Personal e-mail	anaziaa@albayroni.sabic.com

Project participant and/or responsible person/ entity	**X** Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Saudi Basic Industries Corporation (SABIC)
Street/P.O. Box	5101
Building	
City	Al-Riyadh
State/Region	
Postcode	11422
Country	Kingdom of Saudi Arabia
Telephone	+966 (11) 225 9215
Fax	+966 (11) 225 9220
E-mail	hazmi@sabic.com
Website	www.sabic.com
Contact person	Ahmed AL-Hazmi
Title	Environmental Affairs General Manager
Salutation	Mr
Last name	Al-Hazmi
Middle name	
First name	Ahmed
Department	Environmental Affairs
Mobile	+966 505203897
Direct fax	+966 (11) 225 9220
Direct tel.	+966 (11) 225 9215
Personal e-mail	hazmi@sabic.com

Project participant and/or responsible person/ entity	**X** Project participant **X** Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Saudi Basic Industries Corporation (SABIC)
Street/P.O. Box	5101
Building	
City	Al-Riyadh
State/Region	

Postcode	11422
Country	Kingdom of Saudi Arabia
Telephone	+966 (11) 225 8346
Fax	+966 (11) 225 9220
E-mail	israfilofzy@sabic.com
Website	www.sabic.com
Contact person	Zaour Israfilof
Title	CDM Specialist
Salutation	Mr
Last name	Israfilof
Middle name	
First name	Zaour
Department	Environmental Affairs
Mobile	
Direct fax	+966 (11) 225 9220
Direct tel.	+966 (11) 225 8346
Personal e-mail	israfilofzy@sabic.com

Appendix 2. Affirmation regarding public funding

Below is the Declaration about ODA dated January 20th, 2014.

بسم الله الرحمن الرحيم

البيروني
albayroni

January 20, 2014
Jubail Industrial City, KSA

Declaration

To Whom It May Concern,

I hereby declare that no Official Development Assistance (ODA) funding has been used or will be used by Al Jubail Fertilizer Company (Al Bayroni) for its proposed CDM project titled "Efficiency Improvement by Boiler Rehabilitation in fossil fuel-fired (Natural Gas) Steam Boiler System".

The proposed CDM project is 100% equity funded.

Regards,

Khalid Abdullah Al-Omar
Senior Manager, Finance & Planning

سابك sabic شركة تابعة لسابك A Sabic Affiliate

Albayroni
P. O. Box 10046
Madinat Al-Jubail Al-Sinaiyah 31961
Kingdom of Saudi Arabia
Tel 966 (0) 3 341 6488
Fax 966 (0) 3 341 7122

Al Jubail Fertilizer Company
Limited Liability Company
Authorized Capital: SR 700 Million
Paid Capital: SR 671.5 million
CR 2055000435

شركة الجبيل للأسمدة
شركة ذات مسؤولية محدودة
رأس المال المصرح به ٧٠٠ مليون ر.س
رأس المال المدفوع ٦٧١,٥ مليون ر.س
س ت ٢٠٥٥٠٠٠٤٣٥

البيروني
ص.ب ١٠٠٤٦
الجبيل الصناعية ٣١٩٦١
المملكة العربية السعودية
هاتف ٦٤٨٨ ٣٤١ (٠٣) ٩٦٦
فاكس ٧١٢٢ ٣٤١ (٠٣) ٩٦٦

Appendix 3. Applicability of methodology and standardized baseline

Please refer to Section B.2.

Appendix 4. Further background information on ex ante calculation of emission reductions

Not Applicable.

Appendix 5. Further background information on monitoring plan

Please refer to Section B.7.

Appendix 6. Summary of post registration changes

The following post registration changes have been made:

ID	Description	Category of change / requirement for EB approval (in accordance with Appendix 1 of the CDM Project Standard version 09).
1	Removal of the boiler 2052-U from the project boundary, baseline emissions, leakage and emission reduction calculations. This is a permanent change in the project design due to use of the fuel other than natural gas in quantity of more than 1% threshold as stipulated by the methodology. At the time of project registration (validation) it was envisaged that this boiler (one of the three) will use fuel other than natural gas in the quantities that would not exceed 1% of the total project fuel consumption as required by methodology. The historic records of type of fuel and their quantity (data also used for baseline as outlined in the registered PDD) led the PP to assume that the 1% threshold for the use of fuel other than natural gas would not be exceeded. This was also accepted by DOE at validation stage based on historic records. The project was registered on 17/07/2014 while the retrofit of the boiler 2052-U has been completed on 20/02/2014. However, during the first crediting period (01/10/2014 to 30/09/2015) due to operational circumstances and constraints of the natural gas supply the 1% threshold was exceeded. PP does not expect this to occur again but to avoid doubts and to be conservative decision was made to remove this boiler permanently. This change does not impact applicability or application of the methodology, additionality or the scale of the project activities. They remain unchanged in this revised PDD when compared to the registered PDD.	(4) Changes to the project design of a registered project activity EB approval is not required in accordance with paragraph 6, points a, b and c.

2	Changing monitoring frequency of parameter $P_{PJ,k,y}$ (System) and parameter $TEMP_{PJ}$ in the monitoring plan from 1 hour to 15 minutes as required by the methodology. This change relates to the change of monitoring frequency and does not affect the design of the project.	(3) Permanent changes from the registered monitoring plan, applied methodology or applied standardized baseline EB approval is not required in accordance with paragraph 5, point g.
3	Changing the unit of parameter $P_{PJ,k,y}$ (system) from "tons per hour and tons per year" into "tones per year" in accordance to the methodology. This is corrective change for typographical error that does not affect the design of the project.	(1) Corrections EB approval is not required in accordance with paragraph 1.
4	Adding monitoring parameters $NCV_{i,y}$ $FC_{i,j,y}$ and $EF_{CO2\ i,\ y}$ to section B.7.1. These parameters are stipulated by the Option B for establishing CO_2 emission coefficient in accordance with the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (version 02). These parameters are monitored by PP in accordance with methodology and tool mentioned above. They were included into ER of the registered PDD but were not included in the registered PDD due to omission. Including these parameters is not changing the project design, applicability and application of the methodology, additionality or the scale of the project.	Does not fall under Appendix 1 of the CDM PS (version 09).
5	In section B.7.1 (Note) addition of the description of how PP follows the ASME PTC 4 standard where applicable for instrument testing/calibration requirements. This guideline is stipulated by the methodology and was already mentioned in the registered PDD. Adding more detailed information will strengthen the overall quality of the monitoring process section in the PDD.	(3) Permanent changes from the registered monitoring plan. EB approval is not required in accordance with paragraph 5, f.
6	Some minor formatting changes across PDD due to the use of PDD form version 06.0 (instead of version 05.0). This is corrective change that does not affect the design of the project.	(1) Corrections EB approval is not required in accordance with paragraph 1.
7	In subsection Leakage of the section B.6.3 and ER the global warming potential of methane in the registered PDD was wrongly stated as 21 as value from outdated IPCC source was used. This was updated to 25 in accordance with the latest IPCC values. This is corrective action in project information that does not affect the design of the project.	(1) Corrections EB approval is not required in accordance with paragraph 1.
8	1. In section B.6.3 the Load Class average consumption range is corrected for selected 100-120 Load Class. In Version 07 the range was selected erroneously for >120 Load Class also. 2. Tables (B.6.2, B.6.3, B.6.4 & B.6.6) in Calculation section are reformatted for uniformity of data decimal places. These corrections are carried out in project information only and they do not affect the design of the project.	(1) Corrections EB approval is not required in accordance with paragraph 1.

9	Some minor formatting changes across PDD due to the use of PDD form version 08.0 (instead of version 06.0). This is corrective change that does not affect the design of the project.	(1) Corrections EB approval is not required in accordance with paragraph 1.
10	Changing the estimated fuel savings from 9.7% to 20.18% based on data derived from real life operations. In original PDD the fuel savings of 9.7% was based on minimum guaranteed values as advised by the vendor. This theoretical number was used in estimating GHG savings. The real data shows that natural gas saving amounts with 10% upper range amounts to 20.18% which in turns leads to higher GHG savings.	(1) Change to project design EB approval is not required in accordance with appendix 1.
11	Figure B.7.1 and B.7.2 has been revised to mention the pressure transmitters as well for both the boilers.	(1) Corrections EB approval is not required in accordance with appendix 1.

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Document information

Version	*Date*	*Description*
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revisions to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; Editorial improvement.

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	• Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
04.0	13 March 2012	Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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