Component project activity design document form for small-scale CDM component project activities

(Version 04.0)

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

COMPONENT PROJECT DESIGN DOCUMENT (CPA-DD)

Title of the CPA: Energy Efficient Building Materials Production Technologies Development Program, CPA 001

Version number of the CPA-DD: 01

Completion date of the CPA-DD: 03/04/2016

Title of the PoA to which the CPA is included: Energy Efficient Building Materials Production Technologies Development Program

Host Party: Bangladesh

Estimated amount of annual average GHG emission reductions: 48,658 tCO_2e

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

Energy Efficient Building Materials Production Technologies Development Program

A.2. Title of the CPA

Energy Efficient Building Materials Production Technologies Development Program, CPA 001

A.3. Description of the CPA

The CPA includes establishment of the 3 (Three) Tunnel kiln technology brick manufacturing projects which will use sintering/firing process to produce brick/block . The projects are located in the following geographical area of Bangladesh

Location details of the CPA
Example:

Sl. No	Name of Brick Projects Included	Technology Type	Current Installed Capacity in million per annum	Location
1	Stone Bricks Ltd	Tunnel Kiln	90	Manikganj, Dhaka, Division
2	Naz Auto Bricks Ltd.	Tunnel Kiln	30	Rangpur, Rangpur Division
3	Sahara Green Bricks Ltd.	Tunnel Kiln	30	Mymensingh, Dhaka Divison

A.4. Entity/individual responsible for the operation of CPA

The CPA will be coordinated and managed by Greentech Carbon Solutions Limited, (GCSL), the CME of the PoA.

A.5. Technical description of the CPA

i. **Description of production technology**

The Tunnel Kiln technology was invented in Germany. This technology is most common in developed countries, since their invention tunnel kilns have now become highly automated and are for large brick production. Bricks move mechanically through a long stationary fire zone. They have minimal labour requirements but a very high capital cost. They must be operated in continuous mode and require a guaranteed electricity supply.

Tunnel kiln is a long structure in which only the central portion is directly heated. From the cool entrance, Brick on railed based trolley system is slowly transported through the kiln, and its temperature is increased steadily as it approaches the central, hottest part of the kiln. From there,

its transportation continues and the temperature is reduced until it exits the kiln at near room temperature. A continuous kiln is the most energy-efficient, because heat given off during cooling is recycled to pre-heat the incoming bricks.

Tunnel kiln technology also uses green brick drying with kiln exhaust, mixing coal with clay as internal fuel, better thermal insulation etc.

ii. Process diagram and description

Clay Extraction, Transportation and Preparation:

Clay selection is an important factor for making bricks by any process. The quantity and quality of bricks are largely dependent on the availability of good quality clay and composition and properties of clays. The raw materials for brick vary considerably with their geographic locations and also with their geologic age.

Clays having the composition of clay minerals with appreciable amounts (25 %-50 %) of unsorted fine grained non clay minerals are most suitable for brick manufacturing. Iolite, Kaolinite and Chlorite are the most common clay minerals present in brick clays. Smectite may present in a very small amount as otherwise the shrinkage may be excessive.

The physical properties will be tested by preparing sample products as these properties will play a vital role during actual production. The process will determine suitability of different clays as well as additive mixing requirements. The supplier who will be able to supply identified clay will be selected and after receiving the clay it will be reserved under plant-clay stacking yard.

Brick Shaping:

a) ***Hopper Feeder:*** *The clay will be dropped on hopper feeder while the conveyor with clay will be moving, the clay will be cut by a set of revolving knives. The function of the knives is to reduce the clay particle size. In this way, the clay will be conveyed to the roller by an inclined conveyor. The highest and end point of this conveyor is over the roller, that means the clay is dropped in the space between two rollers.*

b) ***Roller Mill/Crusher:*** *Here two heavy rollers will move in opposite directions. The space between these two rollers can be changed but for the time being, it is 0.5 to 1 mm. the clay will move through these moving rollers and in this way it will be pressed. Any hard material except metal will become pressed and crushed. It is obvious that the purpose of roller mill is to facilitate the mixing of clays. The out put of rolling is thin clay materials and it will be conveyed to hopper of double-shaft mixture machine where water is added in such a manner as to ensure moisture content of 18 %.*

c) ***Mixture Machine:*** *The main objective will be that the clay mixture contains appropriate moisture and binding quality. Once mixing is complete, it will be dropped by the discharge conveyor.*

d) ***Extruder :****The thin clay materials will be fed into a vacuum extruder (Pug Mill) for continuous column production. The function of pug mill is to improve the uniformity of a plastic clay body giving it greater workability because of the proper coating of clay particles with water. The pug mill consists essentially of knives set as a screw on one or two rotating shafts. The machine is a continuous one and is fitted with a suitable feeding hopper, and usually the discharge end has an auger and a mouthpiece for extrusion of a column of pugged material. The extruded clay column through the die is cut in to bricks with a wire cutter of required lengths. Green bricks are then loaded on dryer car for loading in tunnel*

dryer. In this process, wire-cut bricks, hollow bricks, roofing and floor tiles, cable cover, perforated bricks etc. will be manufactured.

Tunnel Dryer (Drying)

The product will be dried mainly in tunnel dryer or in natural dryer. In tunnel dryer, the bricks will enter in to an atmosphere almost identical with that outside and will gradually warmed up, reaching the highest temperature when they will be driest. The brick is moved through the tunnel on tracks. Temperature, time and humidity control will be effectively maintained by various dampers. Green products contain approximately 18 % moisture and are dried in hot air circulated tunnel dryers. Hot air is supplied inside tunnel dryers from a coal fired hot air generating furnace and also from cooling zone of a tunnel kiln. In natural drying, the product will be kept on shelf. Here drying will take a number of weeks, depending on the nature of the clay.

Tunnel Kiln (Firing)

After proper drying in tunnel dryer or in natural dryer, the product will be loaded in trolleys which will move through a Tunnel Kiln on rail systems.

Tunnel kiln is continuous straight lne kiln having a pre-heating zone, a firing zone in the middle and a cooling zone in the rear side. The fire remains fixed in the firing zone and bricks in trolleys enters pre heating zone and then stays in the firing zone from 60-90 minutes and then move through the cooling zone before final unloading of bricks from the cooling zone end. The airflow will be regulated to pass first through bricks that has been fired and will be cooled, and then, in its heated condition it will move in to the kiln that will be fired. The hot waste gases will pass on to product about to be fired, preheating it, so that it will need less fuel during actual firing.. Generally the maximum temperature of firing will be about 1050˚C to 1260˚C.

Kiln Unloading

After completion of firing, the product will pass the cooling stage. When it will be cooled enough to handle with human hand, it will be unloaded by placing on 3-wheel cars. And this 3-wheel cars will be placed at the site where the product will be graded and stacked.

Grading and Stacking:

Here company supervisor and workers will sort-out the products according to their color, size and shape, breaking etc. as 1st grade, 2nd grade, under burnt and broken. Then according to sorting they will be stacked and will be given stack number. Then it will be handed over to the delivery section.

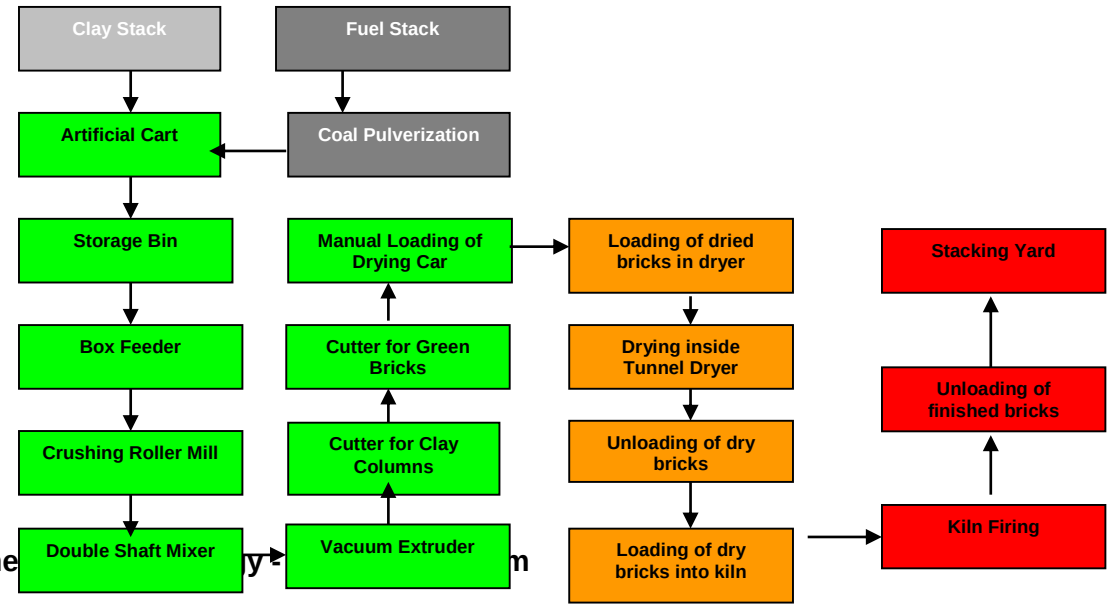

Figure: Tunne y m

Raw Material: Clay i.e same raw material as used in the baseline
Fuel: Coal, i.e same fuel as used in the baseline

iii. General Layout of kiln and/or the brick project

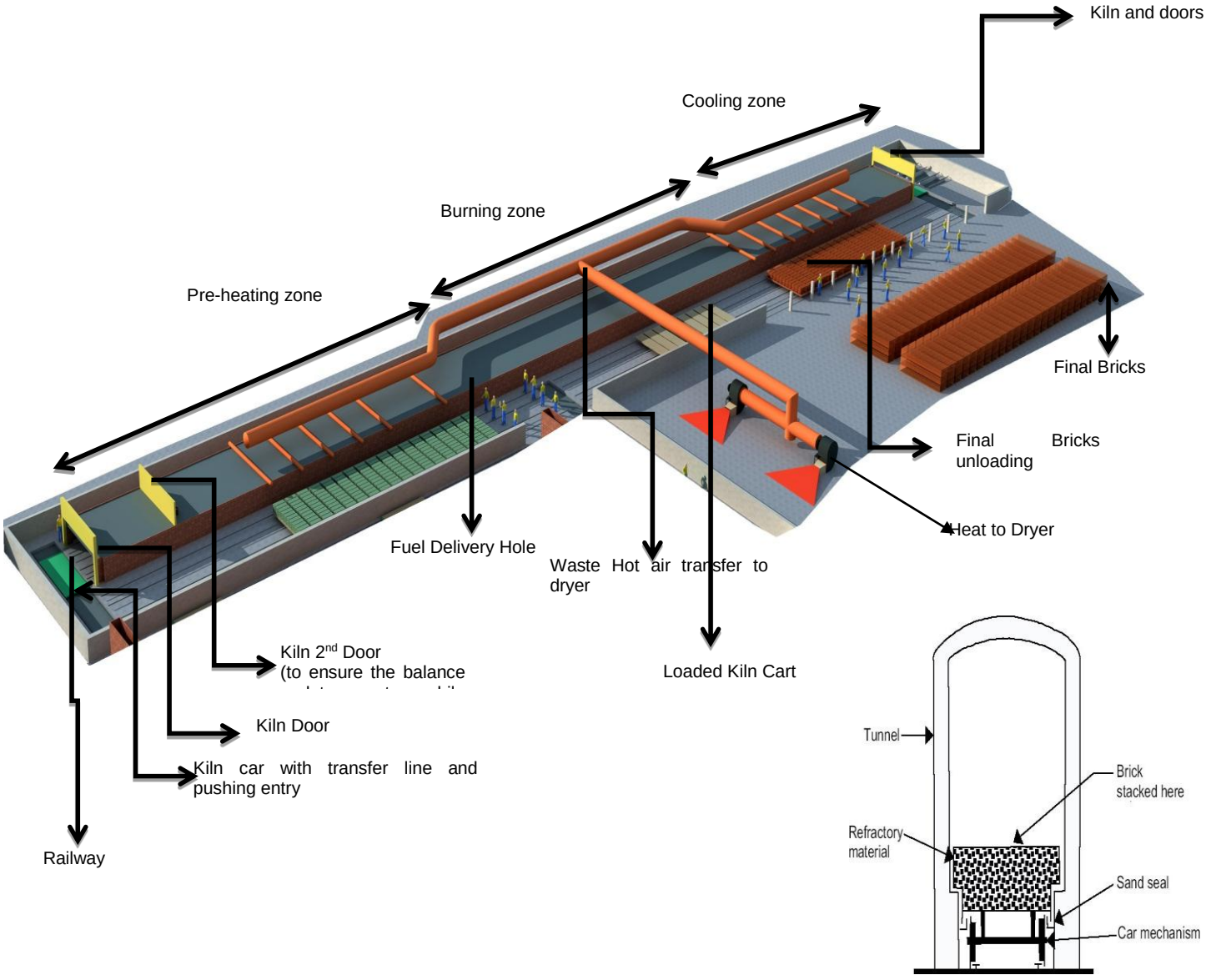

Figure: Tunnel Kiln Technology - Isometric View and Cross Sectional Diagram of the Kiln

A.6. Party(ies)

Name of Party involved (host) indicates host Party	Private and/or public entity(ies) CPA implementer(s) (as applicable)	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)

Bangladesh (host)	Greentech Carbon Solutions Limited (Private entity)	No

A.7. Geographic reference or other means of identification

Sl. No	Name of Brick Projects Included	Location	Geo Coordinates	
			Latitude	Longitude
1	Stone Bricks Ltd	Manikganj, Dhaka, Division	23.85212°N	89.90446°E
2	Naz Auto Bricks Ltd	Rangpur, Division	25.64709°N	89.26782°E
3	Sahara Green Bricks Ltd.	Mymensingh, Dhaka Division	24.51623°N	90.410782°E

A.8. Duration of the CPA

A.8.1. Start date of the CPA

05/06/2013, Letter of Credit opening date of the first Tunnel Kiln project (Stone Bricks) included in the CPA

A.8.2. Expected operational lifetime of the CPA

21 years

A.9. Choice of the crediting period and related information

Renewable

A.9.1. Start date of the crediting period

01/10/2016 or the date of inclusion of the CPA in the registered PoA, whichever is later

A.9.2. Length of the crediting period

7 years, twice renewable

NOTE: Please note that the duration of crediting period of any *CPA* shall be limited to the end date of the *PoA* regardless of when the CPA was added.

A.10. Estimated amount of GHG emission reductions

Emission reductions during the crediting period	
Years	Annual GHG emission reductions (in tonnes of CO_2e) for each year
Year 1	48,658
Year 2	48,658
Year 3	48,658
Year 4	48,658
Year 5	48,658
Year 6	48,658
Year 7	48,658
Total number of crediting years	7
Annual average GHG emission reductions over the crediting period	48,658
Total estimated reductions (tonnes of CO_2e)	**340,606**

A.11. Public funding of the CPA

Currently there is no public funding involved in the CPA.

A.12. Debundling of small-scale component project activities

According to "*Guidelines on Assessment of De-bundling for SSC Project Activities, version 03"* EB 54, Annex 13, Section II.8

No Brick project which is included in this CPA satisfies both conditions (a) and (b) below:

(a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;
(b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

Moreover, CME has provided a statement that CME has undertaken debundled check as per the above procedure and the CPA is not a debundled component of a large scale project activity.

A.13. Confirmation for CPA

Other registered CDM project activities and registered PoAs have been reviewed and it can be confirmed that the small-scale CPA is not registered as a CDM project activity or part of another registered PoA.

A.14. Contact information of responsible persons/ entities for completing the CDM-SSC-CPA-DD-FORM

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Email: barman_shaymal@yahoo.com
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SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts

One clearance for documenting and mitigating the environmental impacts of the project activity are required:

Bangladesh “DoE Site Clearance” permits:

Brick Project entrepreneurs are required to submit a “Initial Environmental Examination” containing information relevant to the brick project facility for which an site clearance is requested. This study enables the Bangladesh Department of Environment to assess the level of compliance of the new HHK industrial facility against the Environmental Conservation Act (1995) and Rules (1997). The study includes general information on the project, lists the industrial wastes generated, by-products from liquid wastes, drainage systems, solid dust and gaseous emissions, sound pollution control management, adopted measures for

SECTION C. Local stakeholder consultation

C.1. Solicitation of comments from local stakeholders

The local stakeholder consultation process is performed at each of the Brick project site.

The objective of these stakeholder consultations was to share information about the various aspects of the overall project to the local communities and different stakeholder groups and getting their views/feedbacks through information sharing and discussions. In addition to explaining the different aspects of the energy efficient brick technology and the project’s global and country objectives related to environmental and socioeconomic benefits, consultation focused on the environmental and social issues and impacts expected to arise under the project; identification of issues that are unique to the locations of particular brick plants; and consideration of alternatives in order to minimize the project’s adverse impacts and maximize the beneficial ones

Key institutional stakeholders included representatives of CME; entrepreneurs using the Brick technology; technology providers, financiers. At the local/community level, in addition to the people from nearby communities, these consultations were participated by the representatives of the local government (Union Parishad Chairman and Members – both male and female); community leaders and civil society organizations; and landowners who have sold or leased out lands for the brick plants. Apart from those mentioned above other consultation participants included persons interested in the new technology, including owners of the traditional brick kilns in the area and potential new entrants to the brick manufacturing industry.

The stakeholder consultations were announced in several ways. First, a full list of potential stakeholders was compiled by the project participants that included Stakeholders mentioned in the above list. In few cases formal invitation letter was sent to the participants and received copies were obtained. In some cases stakeholders that had email addresses, invitations were sent via email. Many participants were also invited by phone and personal visits.

The major issues and topics discussed in the stakeholder meetings are as follows:

- Global Warming and its impacts on the earth and recent efforts for mitigating Global warming

- Environmental pollution status in Bangladesh in the context of brick manufacturing practices using the traditional technology.
- Project background and objectives– overall economic, social, environmental and other benefits
- CDM aspects of the project
- Information on brick technology and a brief description of the brick manufacturing plant and process, as opposed to traditional FCK or modified Bull Trench kilns
- Information on positive environmental impacts of the project
- Information on local socioeconomic impacts of the project
- Information on improved working conditions in comparison with to traditional kiln

All stakeholder comments have been compiled and accounted for in the Local Stakeholder Consultation Report and are summarized below

C.2. Summary of comments received

Comments received during the CDM stakeholder consultation at each of the Brick Project sites covered by this project were as follows

- The representatives of the local Governments and local communities opined that local FCKs are thecause of various diseases and low agricultural productivity in the surrounding community. One attendee commented that local agriculture is severely affected due to the exhaust gas from chimneys of FCKs eventhough the chimney height is increased to 120 feet from 30 feet. Most of the attendees strongly urge that local FCKs should switch to energy efficient technology;

- At all sites, the Brick projects were strongly supported by local residents as they viewed the Brick plants as significant job opportunities for the communities;

- At all sites, stakeholders supported the Brick projects since the project was presented as a clean industrial facility with few if any adverse environmental impacts;

- At all sites, there were significant concerns that the entrepreneurs might only import skilled workers from outside their communities;

- At all sites, the Brick facility was viewed as a means to facilitate development of other infrastructure projects in the area (namely road development) further creating more employment opportunities;

- At all sites the CDM was explained as a means to fund and transfer cleaner technologies such as the HHK to developing countries such as Bangladesh. The explanations were positively received by all attendees and

- At all sites, local brick makers wanted technical assistance to assess their ability to convert their brick fields to the energy efficient technology.

C.3. Report on consideration of comments received

The project has responded to stakeholder comments as follows:

Use of local labour:

- All entrepreneurs are intending to employ personnel from local communities to the extent possible for the unskilled labour requirements; and

- All entrepreneurs will be hiring semi-skilled personnel from outside but expect to train local unskilled personnel on a continual basis and promote them to semi-skilled positions as required;

Promotion of the Energy Efficient technology:

- The project promoters have made arrangements with respective Technology Service Provider to technically support and build the capacity of a new and cleaner brick industry through the construction and operation of new Projects. The role of Technology service providers will be to provide knowledge transfers, capacity building and technical assistance to entrepreneurs, engineers, and vocational level personnel in the planning, financing, design, construction, operation and maintenance of brick projects in Bangladesh for this program; and

- Technical advice on optimizing energy efficiency in brick project operations and continuing to reduce project emissions still further, will be provided through the long-term involvement of respective Technology service providers contracted by kiln owners.

Promote efficient use of coal and further reduce air pollution:

- The project promoters said that the Brick projects will reduce use of coal.

SECTION D. Eligibility of CPA and estimation of emissions reductions

D.1. Reference of methodology(ies) and standardized baseline(s)

Methodology to be applied:

AMS-III.Z. Fuel Switch, process improvement and energy efficiency in brick manufacture --- Version 6.0

Associated Methodologies and/or Tools that the selected methodology refers:

- Tool to calculate project or leakage CO2 emission from fossil fuel combustion, Version 02
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption, Version 01

D.2. Applicability of methodology(ies) and standardized baseline(s)

Clause # AMS III Z	Applicability Criteria as described in AMS IIIZ	Demonstration of compliance
1	The methodology comprises one or more technology/measures listed below in brick [1] production facilities: • Shift to an alternative brick production technology/process; or • Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels.[2]	All brick project included in this CPA uniformly applies Tunnel Kiln technology which is an alternative brick production technology than the baseline.
2	The measures may replace, modify, retrofit[6] or add capacity to systems in existing facilities or be installed in a new facility	All brick project in this CPA will demonstrate that measures applied in the CPA willbeinstalledinanewfacility by complying with the CPA inclusion Criteria 1 .
3	New facilities (Greenfield projects) and project activities involving capacity additions are only eligible if they comply with the requirements for Greenfield projects and capacity increase projects specified in the "General Guidelines for SSC CDM methodologies"	All brick project in this CPA (Greenfield project) is selected which will comply with the requirements in the General Guidelines for SSC methodologies.
4	In the case of project activities involving changes in raw materials (including additives) it shall be demonstrated that additive materials are abundant in the country/region, according to the following procedures: **Step 1:** using relevant literature and/or interviews with experts, a list of raw materials to be utilized is prepared based on the historic and/or present consumption of such raw materials. **Step 2:** the current supply situation for each type of raw material to be utilized is assessed and their surplus availability is demonstrated using one of the approaches below: • Approach 1: demonstrate that the raw materials to be utilized, in the region of the project activity, are not fully utilized. For this purpose, demonstrate that the quantity of material is at least 25% greater than the demand for such materials or the availability of alternative materials for at least one year prior to the project implementation; • Approach 2: demonstrate that suppliers of the raw materials to be utilized, in the region of the project	No brick project in this CPA is involving changes in raw material. All brick projects use same raw material i.e clay as used in the baseline technology.

[1] Brick in the context of this methodology includes solid bricks and blocks as well as hollow blocks used in building construction.

[2] For example from anthracite coal to natural gas

	activity, are not able to sell all of their supply of these materials. For this purpose, project participants shall demonstrate that a representative sample of suppliers of the raw materials to be utilized, in the region, had a surplus of materials (e.g. at the end of the period during which the raw material is sold) that they could not sell and that is not utilized.	
5	This methodology is applicable under the following conditions: (a) The service level of project brick shall be comparable to or better than the baseline brick, i.e. the bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline bricks (in terms of, for example dry compressive strength, wet compressive strength, density). An appropriate national standard shall be used to identify the strength class of the bricks; bricks that have compressive strengths lower than the lowest class bricks in the standard are not eligible under this methodology. Project bricks are tested in nationally approved laboratories at six-month intervals (at a minimum) and test certificates on compressive strength are made available for verification; (b) Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	a) Project bricks will be tested in a nationally approved laboratory at least every six (6) months and certificates of these tests will be available for verification. The unburnt bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline bricks (e.g., dry compressive strength) b) Each CPA-DD section will provide ER calculation in CPA-DD section D.7
6	This methodology is not applicable if local regulations require the use of the proposed technologies or raw materials for the manufacturing of bricks unless widespread non compliance (i.e. less than 50% of brick production activities in the country comply) of the local regulation evidenced.	Tunnel Kiln technology used in this CPA has less than 50% of total brick production in the country. Actual market share is less than 1%.

D.3. Sources and GHGs

	Source	Gas	Included?	Justification /explanation
Baseline	Emissions from fossil fuels/NRB utilized or fossil fuels/NRB that would be utilized for obtaining safe drinking water displaced due to project activity	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions
Project Emission	Emissions from consumption of fossil fuels and/or electricity for the operation of the project activity	CO_2	Yes	Major source of emissions
		CH_4	No	Minor source of emissions
		N_2O	No	Minor source of emissions

D.4. Description of the baseline scenario

According to AMS.III.Z the baseline scenario is the following:

The baseline emissions are the fossil fuel consumption related emissions (fossil fuel consumed multiplied by an emissions factor) associated with the system(s), which were or would have otherwise been used, in the brick production facility(ies) in the absence of the project activity.

(a) For projects that involve replacing, modifying or retrofitting systems in existing facilities, the average of the immediately prior three-year historical fossil fuel consumption data, for the existing facility, shall be used to determine an average annual baseline fossil fuel consumption value. Similarly, prior three-year historical production data (excluding abnormal years) for the existing facility, shall be used
to determine an average annual historical baseline brick production rate in units of weight or volume. For calculating the emission factor for fossil fuel, reliable local or national data shall be used. IPCC default values shall be used only when country or project specific data are not available or demonstrably difficult to obtain;

(b) For projects involving the installation of systems in a new facility or a capacity addition in an existing system, the average annual baseline fossil fuel consumption value and the baseline brick production rate shall be determined as that which would have been consumed and produced, respectively, under an appropriate

baseline scenario. If the baseline scenario identification as per paragraph 4 above results in more than one alternative technologies with different levels of energy consumption, the alternative with the least emissions intensity should be chosen for determining the baseline emissions of the facility.

The baseline emissions are the fossil fuel consumption related emissions (fossil fuel consumed multiplied by an emissions factor) associated with the clamps, which were or would have otherwise been used, in the brick production facility(ies) in the absence of the project activity.

Technology Baseline

Currently, the brick making sector in Bangladesh uses four types of technologies which are described in greater detail in Annex 3[3]: Fixed Chimney Kilns (FCK), Bull's Trench Kilns (BTK), Zigzag Kilns, and traditional Hoffman Kilns. Prior to 2004, most of the kilns in Bangladesh used the BTK design, a relatively primitive design that is over 150 years old. It is highly polluting and exceedingly inefficient in terms of fuel use because its poor design results in crevices forming in the kiln walls. These leaks allow excessive air intake, which results in poor combustion; moreover, there is considerable heat loss through the kiln walls.

The market share for BTKs, in 1995, was 95%. After promulgation of the Brick Burning (Control) Act in 2004, almost all of the BTKs were converted to FCKs. This is due, in part, to the requirement that brick kilns must have a fixed chimney with a minimum height of 120 feet. The FCK design is slightly more energy efficient than the BTK whilst particulate emissions are similar.

Zigzag or Hebla kiln was slowly gaining popularity is the early stage of this decade. It costs same as FCK and initial stage was expected to be slightly energy efficient than FCKs. However due to dependency on Indian experts and informal dispersion of the technology after a decade the market share of Zigzag kiln is merely 4.8%. Moreover many Zigzag kilns operating in Bangladesh have not

[3] Based on UNDP Project Document, titled "Bangladesh - Improving Kiln Efficiency in the Brick Making Sector", August 2006) Page 2

been constructed according to the design standard and several zigzag designs exists in the sector as the entrepreneurs had to rely on their own experts and interventions. So there is no specific zigzag type kiln which could consider as model zigzag for comparingemission and energy consumption standard with other type of kilns.

There are less than 30 Hoffman gas kilns, which is essentially a gas fired version of the HHK, in Bangladesh, for several reasons: lack of gas availability in areas where brickfields are located; high cost to finance these kilns; and government policies discouraging the use of gas for the brick industry in order to use it for power generation. The 2006 market share of the different brick kiln technologies in Bangladesh is presented in Table 1 below which shows that the FCK market share is about 76%[4].

Table 1*:* 2006 Market Share of different Technologies in the Brick Making Sector

Kiln type	Number	Percentage of total	Annual brick production (billions)	Percentage of total production
FCK	3,123	75.4	9.4	75.8
BTK	794	19.2	2.0	16.1
Zigzag	197	4.8	0.7	5.7
Hoffmann Gas	26	0.6	0.3	2.4
Total	**4,140**	**100**	**12.4**	**100**

According to the latest information available at the database of Department of Environment, Ministry of Environment and Forest, Government of Bangladesh, the current market share of different brick technologies are as follows:

Table 3: 2010 Market Share of different Technologies in the Brick Making Sector[5]

Kiln Type	Number (Range)	Use of Technology as Percentage of Total
FCK	≤ 4500	92.21%
BTK	N/A	0.00%
Zigzag	≤ 150	3.07%
Hoffman – gas	≤ 20	0.41%
HHK	≤ 10	0.20%
Others	≤ 200	4.10%
Total	≤ 4880	100%

Source: Department of Environment, Bangladesh Government-Memo no: DOE/Enforcement/37,

Therefore, the FCK has been selected as the baseline technology since it is most common practice and meets legal requirements.

Energy baseline

Coal for brick making has until most recently, been imported into Bangladesh from coalmines in the Indian state of Assam, Meghalaya and West Bengal, mainly through Hilli, Haluaghat, Srimongal and Burimari border land ports. It is sold to brick manufacturers directly from the border land ports or brought to major coal distribution centres such as Dhaka and Bhairab. Current information on Indian

[4] Refer to report titled: Clean Development Mechanism Project Opportunities in Bangladesh, Pre Feasibility Report on a Brick Manufacturing Fuel Substitution CDM Project, Bangladesh University of Engineering, December 2002, Table A, pg 3, which discusses kiln types: http://pubs.pembina.org/reports/cdm_bangladesh_brickkilns.pdf

[5] Department of Environment, Bangladesh Government-Memo no: DOE/Enforcement/37

Coal data shows that the Calorific Value of coal from Meghalaya is in the range of 6,500 to 7,500 KCal/Kg[6] and coal from Assam is in the range of 5,240 to 7,950 KCal/Kg.[7]

A UNIDO study in 1980 and an SDC-SCAT study in 1991 on the brick making Sector in Bangladesh established Specific fuel consumption as 0.25 kg coal per brick and Calorific Value (heat value) as 24.2 MJ/brick. It also showed the Specific Energy Consumption as 6.05 MJ/brick[8]. From these data Specific Energy Consumption per Kg brick production can be derived as 2.1 MJ/ Kg-brick for conventional sized bricks of 2.9 Kg/brick.

However, to update the present energy Baseline, further review of the baseline was undertaken for the Project.

Coal consumption figures for FCK are based on the following studies undertaken between 2002 and 2009:

⇒ In 2002, Bangladesh University of Engineering and Technology (BUET) prepared the "Clean Development Mechanism Project Opportunities in Bangladesh, Pre Feasibility Report" on a Brick Manufacturing Fuel Substitution CDM Project, including a survey of coal consumption of different brick making technologiesin Bangladesh. The survey showed consumption of 22-26 tons for production of 100,000 bricks. .

⇒ In 2006, the UNDP-GEF project was initiated to transform the brick industry towards cleaner technologies and practices[9]. Under the project, a survey of coal consumption of FCK was carried out. The survey established specific fuel (coal) consumption as 24 tons of coal per 100,000 bricks, which affirmed the coal use of 22-26 ton per 100,000 bricks reported in the previous 2002 BUET Study.

Calorific Value of coal and Specific Energy Consumption figures for FCK are based on the following studies undertaken between 2002 and 2009:

⇒ Both the BUET report in 2002 titled as "Clean Development Mechanism Project Opportunities in Bangladesh, Pre Feasibility Report" and the UNDP-GEF project report in 2006 used the default IPCC data for Calorific value to calculate the baseline emission.Using 24 ton coal consumption per 100,000 bricks and the default IPCC value for Indian coal at 4,000 kcal/kg[10], the UNDP –GEF project reported a lower specific energy consumption figure than the Baseline established under FAO report.

⇒ In 2008 and 2009, upon becoming aware that higher calorific values were being reported for Indian Coal, the calorific values of coal, used by FCK was laboratory tested by the project.[11] The results indicated a calorific value of 6,400 kcal/kg coal, which is close to the values stated in the websites of Indian Coal suppliers[12]. This result justifies the use of high calorific value rather than using the IPCC default value. The specific energy consumption of FCKs, using 6,400 Kcal/Kg and 24 ton coal per 100,000 bricks is thus raised to 2.21 MJ/kg-brick or 6.4 MJ/brick for a 2.9 kg conventional sized brick.

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[6] http://meghalaya.nic.in/industry/opens.htm

[7] http://db.nedfi.com/content/coal-deposits-assam

[8] Refer to report titled : Status and development issues of the brick industry in Asia, FAO Field Document no.35, Table 1.7, page 10, which discussed energy input in bricks: http://144.16.93.203/energy/HC270799/RWEDP/acrobat/fd35.pdf

[9] Improving Kiln Efficiency for the Brick Making Industry - PDF B Phase (UNDP-GEF-BGD/04/014) Emission Baseline Report for the IKEMBI Project

[10] Emission Baseline Report for the IKEMBI Project (PDF-B Phase BGD/04/14) by the Louis Berger Group, Washington DC, June 2006

[11] Coal calorific tests conducted by BUET, BSCIR and Powertech Labs, Surrey Canada. Results showed that in 2008, the FCK operating primarily used Indian coal imported from Meghalaya with a calorific value measured at 6,400 kcal/kg. In 2009, a number of these FCK businesses switched coal supplies from India to Boropukuria (near Dinajpur in northwestern Bangladesh). Coal measured from Boropukuria has a value of 6,135 kcal/kg.

[12] Refer to the following websites: http://meghalaya.nic.in/industry/opens.htm; http://db.nedfi.com/content/coal-deposits-assam

Though Indian Coal has a high calorific value (5,240 K.Cal/Kg to 7,950 K.Cal/Kg), it also has a high sulphur content. Consequently, the Bangladesh Ministry of Environment and Forest and Ministry of Commerce, is promoting less import of Indian coal[13] and promoting the use of the high quality Bangladesh Barapukuria Coal, which is now in surplus. Consequently, domestic coal from the Barapukuria coal mine in north western Bangladesh near Dinajpur is now being used for brick making. The calorific value of this coal is laboratory tested at 6,135 kcal/kg[14].

In summary, for purposes of establishing an energy baseline, the calorific value of Barapukuria coal which is 6,135 kcal/kgwith a specific coal consumption of 24 tonnes per 100,000 bricks is used. Using these values the Specific energy consumption (for conventional size FCK bricks) is as follows:

Table 4: Energy Consumption of FCK Technology

Calorific value of coal	6,135 Kcal/Kg
Coal consumption per 100,000 bricks (conventional size)	24 tonnes
Specific Fuel Consumption per brick	0.24 kg coal / brick
Specific Energy consumption per brick (conventional size)	6.16 MJ/brick
Specific energy consumption per kg brick (conventional size)	2.125 MJ/kg-brick

Note: Specific energy consumption per kg brick is calculated for conventional sized brick of 2.9 Kg/brick

The energy baseline established above according to the current scenario has strong resemblance to the FAO report.

Emission baseline

The emissions baseline is the historic fuel consumption times the CO_2emission coefficient for the fuel displaced. As discussed above, for existing brick fields in Bangladesh, the coal used is sourced either from India or from the Boropukuria coal mine in northwestern Bangladesh and these coals are bituminous type coal. The Inter-governmental Panel on Climate Change (IPCC) default value for the carbon emission factor for Bituminous coal is 25.8 tonnes C/TJ and this value is used in the calculations.

To derive CO_2 emissions per kiln, the data shown in Table 4 have been used.

Table 2: Parameters used to derive CO_2 emissions per FCK kiln

Calorific value of coal	6,135 Kcal/Kg
Coal consumption per 100,000 bricks (conventional size)	24 tonnes
Specific energy consumption	2.125 MJ/kg-brick or 6.16 MJ/brick
Carbon emission factor for fuel	25.8 tonnes tC/TJ
Carbon to CO_2 conversion factor	3.66 t CO2/ tC

[13] http://www.bizbangladesh.com/business-news-2436.php

[14] www.bcmcl.org.bd

D.5. Demonstration of eligibility for a CPA

	Eligibility criteria		Means of proof	Confirmation
#	Description	Condition to be met		
1	Methodology Applicability	Each CPA must meet the criteria for methodology AMS IIIZ, the version that is described in the PoA. No other methodologies will be used.	This CPA is in compliance with the methodology AMS III Z which is adequately described in the CPA-DD section D.2	Yes
2	Technology Requirement	Each CPA will implement anyone of the technology/measures listed below in brick [15] production facilities: 1. New brick/block production technology/process which may include the following a) Tunnel Kiln technology b) Hoffman Kiln technology c) Autoclave technology d) Compressed brick technology e) any other new alternative technology using either fired or non fired brick/block production technology ; or 2. Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels[16].	Technology Description is provided in the CPA-DD section A.5 which shows that this CPA will implement New brick/block production technology/process which will include Tunnel Kiln technology	Yes
3	Boundary and location of the CPA	The geographical boundary of the CPA including any time-induced boundary is consistent with the geographical boundary set in the PoA;	The boundary of this CPA is within the POA boundary, i.e Geographical boundary of Bangladesh and will be stated in the CPA DD (Section A.7)	Yes
4	Conditions that avoid double counting of emission reductions	i) Each CPA Participants (brick factory) of the CPA shall be uniquely identified by its geographical coordinates and Company Name. ii) A confirmation from each CPA Participants /CME that the proposed CPA is neither registered as an individual CDM project activity nor included in another PoA and that no	i) each CPA Participants under the CPA employs unique identification by individual Company name and geographical coordinates as stated in the CPA-DD (A.7 of the CPA-DD) ii) Attestation signed by CPA Participants and/or by the CME	Yes

[15]Brick in the context of this methodology AMSIIIZ includes solid bricks and blocks as well as hollow blocks used in building construction.

[16]For example from anthracite coal to natural gas.

		CERs will be claimed for the CPA Participants (brick factory) other than those claimed by this PoA's CME		
5	Start date	The CPA start date shall be after the PoA prior consideration date[17], i.e. June 02 ,2013)	The start date of the CPA is the June 05, 2013 evidenced by Letter of credit opening date of the first brick project amongst all brick projects included in this CPA-DD.(Section A.8.1) and is after the PoA start date i.e. after January 02 ,2013	Yes
6	The conditions that ensure that CPAs meet the additionality requirements	Each CPA has to meet anyone of the following combination of eligibility criteria 1) Eligibility Criteria no 2(1) , 3 and 7(1) 2) Eligibility Criteria no, 2(1) , 3 and 7 (2)	This CPA meets the combination of eligibility criteria which are as follows 1) Eligibility Criteria no 2(1) , 3 and 7(1)	Yes
7	Size Limit for CPAs	Each CPA (in aggregate if it comprises of independent sub units) meets the 1. Small-scale threshold of 60,000 tCO2e per year. i.e. The annual emissions reductions of each CPA shall not go beyond the limits of 60 ktCO2e/y over the entire crediting period Or, 2. Micro-scale threshold of 20,000 tCO2e per year and remains within this threshold throughout the entire crediting period	This CPA will generate less than 60,000 tCO2e per year and Emissions reductions is estimated in the CPA DD section D.6.3	Yes
8	CPA Development, Management	Each CPA Participants in the CPA has to be approved by the CME for inclusion in the PoA.	A written approval/attestation is provided by the CME	Yes
9	Target Group	The target group is industrial investors/businesses (i.e. brick/block manufacturers) in Bangladesh.	CPA is comprised of individual brick manufacturing factories/plants listed in section A.7 of the CPA-DD	Yes
10	Non-diversion of ODA/Non-	CPA does not lead to a diversion of official	CME provided the following	Yes

[17]The date on which the CME has*submitted the notification of the commencement of the programme of activities (PoA) and the intention to seek CDM status*

	use of Public Funding	development assistance (ODA)	(i) Confirmation from CME that no public funding is involved in the CPA.	
11	Sampling requirements	All sampling requirements for a CPA should be based on the POA-DD and in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys.	Confirmed in CPA-DD (Section D.7.2 of the CPA-DD)	Yes
12	Debundling Check	Confirmation that the CPA is not a debundled component of a large scale project activity.	Attestation from CME that it has undertaken debundling check as per the procdure mentioned in the PoA-DD and the CPA is not a debundled component of a large scale project activity	Yes
13	Local Stakeholder Analysis	Local stakeholder consultations will be carried out at CPA level for each CPA participants	The summary of the local stakeholder consultation procedure, comments, solicitation and consideration of comments will be described in Section C of the CPA-DD	Yes
14	Environmental Impact Analysis	Each CPA will demonstrate the CPA is in line with the host Party environmental laws/regulations.	Analysis of environmental impacts will be conducted by the CME for the technology employed under the CPA and the summary of which is included in section B.1 of the CPA-DD.	Yes

D.6. Estimation of emission reductions

D.6.1. Explanation of methodological choices

Emissions reductions will be calculated as:

ERy = BEy – PEy– Ly

Where

ERy = Emission Reduction in Year y
BEy = Baseline Emission in Year y
PEy = Project Emission in Year y
L y = Leakage

Baseline Emission:

$$BE_y = \sum_{k=1}^{n} (EF_{BL} \times P_{PJ,y})$$

Where:
BEy = The annual baseline emissions from fossil fuels displaced by the project activity in t CO2e in year *y* (of the crediting period)
EF_{BL} = The annual production specific emission factor for year *y*, in tCO2/kg or m3
$EF_{PJ,y}$, = The annual net production of the facility in year *y*, in kg or m3
n = number of kilns included in the CPA

$$EF_{BL} = \sum_{i} (FC_{BL,i,j} \times NCV_j \times EF_{\mathrm{CO2,j}}) \div P_{H,y}$$

Where:
$FC_{BL,i,j}$ = Average annual baseline fossil fuel consumption value for fuel type *j* combusted in the process *i*, using volume or weight units8

NCVj= Average net calorific value of fuel type *j* combusted, TJ per unit volume or mass unit

EFCO2,j = CO2 emission factor of fuel type *j* combusted in the process *i*in tCO2/TJ

$P_{H,y}$ = Average annual historical baseline brick production rate in accordance with paragraph 14(a), in units of weight or volume, kg or m3

$P_{H,y}$= 4,000,000 bricks/years × 2.9 Kg per bricks
= 11,600,000 Kg bricks

$FC_{BL,i,j}$= Annual average production of bricks in FCK × Coal consumption per bricks
= 4,000,000 bricks/years × 24 ton coal per 100000 bricks
= 4,000,000 × (24/1000) / 1000000 Kg coal per year in a average FCK
= 960,000 Kg Coal per year per FCK

NCVj= 6135 (Kcal/Kg) × 4.186 (KJ/Kcal) /1000000000
= 2.56811× 10^{-5} TJ/Kg coal

EFCO2,j= 99.7 t CO2/TJ

EFBL = [960,000 Kg Coal × *2.56811*× 10^{-5} TJ/Kg coal × *99.7 t CO2/TJ]* ÷ 11,600,000 Kg bricks
= 0.000212 t CO2/Kg bricks

Project Emission

The Project emissions shall be calculated as follows:

$$PE_y = \sum_{k=1}^{n} (PE_{elec,y} + PE_{fossil\ fuel\ ,y})$$

Where,

PE_y=Project emissions during the year *y* in (tCO2e)
$PE_{\text{fossil fuel,y}}$ = Project emissions due to fossil fuel consumption in year *y*
$P_{PJ,y}$, = The annual net production of the facility in year *y*, in kg or m3
N = number of kilns included in the CPA

$$PE_{\text{fossil fuel,y}} = \sum_i FC_{i,j,y} \times NCV_{i,y} \times EF_{\text{CO2,i,y}}$$

Where,

$FC_{i,j,y}$= quantity of fuel type icombusted in process j during the year y (mass or volume unit/yr)

$NCV_{i,y}$= weighted average net calorific value of the fuel type iin year y (GJ/mass or volume unit)

$EF_{,CO2,i,y}$= weighted average CO_2 emission factor of fuel type iin year y (tCO_2/GJ)

$$PE_{\text{elec,y}} = \sum_i EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Where,

$PE_{EC,y}$	=	Project emissions from electricity consumption in year *y* (tCO_2/yr)
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr)
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source *j* in year *y* (tCO_2/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
j	=	Sources of electricity consumption in the project

D.6.2. Data and parameters fixed ex-ante

Data / Parameter	***EFBL***
Unit	in tCO 2 /Kg of produced brick
Description	Baseline Emission Factor
Source of data	Calculated in SectionB.6.1
Value(s) applied	0.000212
Choice of data or Measurement methods and procedures	Detailed calculation and justification is available in section B.6.1
Purpose of data	Baseline Emission Calculation
Additional comment	Value is fixed for the entire crediting period.

Data / Parameter	***FC BL,I,J***
Unit	Tonnes
Description	Average annual baseline fossil fuel consumption value for coal *(fuel type j)* combusted in the firing process *(process i),* using volume or weight units
Source of data	Calculated as per applicable methodology as shown in section B.6.1
Value(s) applied	960
Choice of data or Measurement methods and procedures	Detailed calculation and justification is available in section B.6.1
Purpose of data	Baseline Emission Calculation
Additional comment	Value is fixed for the entire crediting period.

Data / Parameter	***NCVj***
Unit	TJ/kg fuel (Terra Joule/kg coal)
Description	Net calorific value (energy content) per mass unit of a fuel
Source of data	www.bcmcl.org.bd
Value(s) applied	NCV for Coal is 6,135 Kcal/Kg or $6135\times 4.186 \times 10^{-9}$ TJ/Kg
Choice of data or Measurement methods and procedures	Country specific CV data of coal is available and therefore used
Purpose of data	Baseline Emission Calculation
Additional comment	Value is fixed for the entire crediting period.

Data / Parameter	***PH***
Unit	Tonnes
Description	Average annual historical baseline brick production rate in units of volume,m3
Source of data	Calculated as per applicable methodology as shown in section B.6.1
Value(s) applied	11,600
Choice of data or Measurement methods and procedures	Detailed calculation and justification is available in section B.6.1
Purpose of data	Baseline Emission Calculation
Additional comment	Value is fixed for the entire crediting period.

Data / Parameter	*EFCO2,j*
Unit	*t CO2/TJ*
Description	Baseline C02 emission factor
Source of data	IPCC Default value
Value(s) applied	*99.7*
Choice of data or Measurement methods and procedures	IPCC Default value
Purpose of data	Baseline Emission Calculation
Additional comment	Value is fixed for the entire crediting period.

Data / Parameter	**EF $_{CO2,ELEC}$**
Unit	tCO2e/MWh
Description	Grid emissions factor per MWh of power produced
Source of data used	BPDB data from 2006 -2009
Value applied	0.683
Choice of data or description of measurement methods and procedures	This is based on BPDB data as of 2009. Grid emission factor is not published
Purpose of data	To Calculate Project Emission
Additional comment	Calculated as a weighted (50:50) sum of the OM (0.7320 tCO2/MWh) and BM (0.6341 tCO2/MWh) emissions.

Data / Parameter	NCV $_{Diesel,, y}$
Unit	*TJ/Kilolitre*
Description	Weighted average net calorific value of Diesel (fuel type)in year *y(TJ/Kilolitre)*
Source of data to be used	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value of data	NCV for HSD is 0.036509 TJ/Kilolitre or 36.509GJ/Kilolitre
Choice of data or description of measurement methods and procedures	Default data from IPCC is used in the absence of Values provided by the fuel supplier in invoices, Measurements by the project participants and Regional or national default values.
Purpose of data	To calculate Project Emission
Additional comment	In mass unit, the value is 43.3 TJ/Gg or 43.3 MJ/kg. The density used for the conversion is 0.8432 litre/kg.

Data / Parameter	**Density $_{Diesel,, y}$**
Unit	*kg/litre*
Description	Density value of Diesel (fuel type)in year *y*
Source of data to be used	IPCC default values as provided in Table 11 (page 81) of Chapter Energy of the 2002 IPCC Background Papers on Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
Value of data	0.8432

Choice of data or description of measurement methods and procedures	Default data from IPCC is used in the absence of Values provided by the fuel supplier in invoices, Measurements by the project participants and Regional or national default values.
Purpose of data	To calculate Project Emission
Additional comment	Density is mass unit = 1/Specific volume. The specific volume published by IPCC is 1186 kilolitre/Gg or 1.186 litre/kg.

Data / Parameter	**EF $_{CO2, Diesel, y}$**
Unit	tCO2/TJ
Description	Weighted average CO2 emission factor of fuel type *i*in year *y*
Source of data used	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value applied	74.07
Choice of data or description of measurement methods and procedures	Default data from IPCC is used in the absence of Values provided by the fuel supplier in invoices, Measurements by the project participants and Regional or national default values.
Purpose of data	To Calculate Project Emission
Additional comment	

Data / Parameter	$TDL_{j,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*
Source of data used	[CPA Specific info: XXX]
Value applied	[CPA Specific info: XXX]
Choice of data or description of measurement methods and procedures	As per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" version 01, Annex 7, EB 39 [CPA Specific info: XXX]
Purpose of data	To calculate Project Emission
Additional comment	

D.6.3. Ex-ante calculation of emission reductions

$$EF_{BL} = \sum_{i} (FC_{BL,i,j} \times NCV_j \times EF_{\mathrm{CO2,j}}) \div P_{H,y}$$

Where:
$FC_{BL,i,j}$ = Average annual baseline fossil fuel consumption value for fuel type *j* combusted in the process *i*, using volume or weight units8

NCVj= Average net calorific value of fuel type *j* combusted, TJ per unit volume or mass unit

EFCO2,j = CO2 emission factor of fuel type *j* combusted in the process *i*in tCO2/TJ

$P_{H,y}$ = Average annual historical baseline brick production rate in accordance with paragraph 14(a), in units of weight or volume, kg or m3

$P_{H,y}$= 4,000,000 bricks/years × 2.9 Kg per bricks

= 11,600,000 Kg bricks

$FC_{BL,i,j}$= Annual average production of bricks in FCK × Coal consumption per bricks
= 4,000,000 bricks/years × 24 ton coal per 100000 bricks
= 4,000,000 × (24/1000) / 1000000 Kg coal per year in a average FCK
= 960,000 Kg Coal per year per FCK

NCVj= 6135 (Kcal/Kg) × 4.186 (KJ/Kcal) /1000000000
= 2.56811× 10^{-5} TJ/Kg coal

EFCO2,j= 99.7 t CO2/TJ

EFBL = [960,000 Kg Coal × *2.56811*× 10^{-5} TJ/Kg coal × *99.7 t CO2/TJ]* ÷ 11,600,000 Kg bricks
= 0.000212 t CO2/Kg bricks

$$BE_y = \sum_{k=1}^{n} (EF_{BL} \times P_{PJ,y})$$

BEy = (0.000212 × 100000*300*80%*3.5) + (0.000212 × 100000*300*80%*3.5)+(0.000212 × 300000*300*80%*3.5)
= 89,034 tCO2

The Project emissions shall be calculated as follows:

$$PE_y = \sum_{k=1}^{n} (PE_{elec,y} + PE_{fossil\ fuel\ ,y})$$

$$PE_{\text{fossil fuel,y}} = \sum_{i} FC_{i,j,y} \times NCV_{i,y} \times EF_{\text{CO2,i,y}}$$

PE coal = (2880 +2880+8640) ton coal ×[6135 Kcal/Kg ×4.186 (KJ/Kcal)] × [99.7 tCO_2/TJ]
= 36870 tCO2

PE diesel = (42*5) kl ×36542 MJ/kl× 74.07 tCO2/TJ * 10^{-6}
= 568 tCO2

$PE_{\text{elec,y}} = \sum_i EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$

= [720 MWh × 0.68 tCO2/MWh× (1+20%)] × 5
= 2938 tCO2

PEy = 36870 tCO2+ 568 tCO2+ 2938 tCO2
= 40376 tCO2

ERy = BEy – Pey
= 89034 tCO2 - 40376tCO2
= 48,658 tCO2

D.6.4. Summary of the 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)
Year 1	89,034	40,376	0	48,658
Year 2	89,034	40,376	0	48,658
Year 3	89,034	40,376	0	48,658
Year 4	89,034	40,376	0	48,658
Year 5	89,034	40,376	0	48,658
Year 6	89,034	40,376	0	48,658
Year 7	89,034	40,376	0	48,658
Total	625,128	282,632	0	340,606
Total number of crediting years	7			
Annual average over the crediting period	89,034	40,376	0	48,658

D.7. Application of the monitoring methodology and description of the monitoring plan

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D.7.1. Data and parameters to be monitored

Data / Parameter	$FC_{Coalj,y}$
Unit	Tonnes/year
Description	Total consumption of coal for brick making in brick plant j in year y
Source of data	Invoices from the Coal suppliers.
Value(s) applied	[CPA Specific Info]
Measurement methods and procedures	Total Purchase will indicate the amount of coal supplied and consumed in brick production. These invoices will be gathered in the project office. Data will be included in the monthly report. At the end of each year total consumption will be calculated.
Monitoring frequency	Annual
QA/QC procedures	Coal stock at the end of each verification period will be estimated and noted in the annual report and the coal stock register will be used to cross check brick production and raw material purchase.
Purpose of data	Project Emission Calculation
Additional comment	

Data / Parameter	$NCV_{Coal\ j,\ y}$
Unit	Kcal/Kg
Description	Net Calorific Value of coal used in y^{th} year in brick field j
Source of data	As per the data provided by the supplier and independently verified by a credible Bangladesh laboratory.
Value(s) applied	6135 Kcal/kg
Measurement methods and procedures	A composite sample of 1 kg coal will be taken from each new consignment of coal. At the end of each quarter all the samples taken in that quarter will be crashed and mingled to produce a representative sample for that quarter and will be laboratory tested to determine the net calorific value of coal used for that particular quarter and the value will be reported in the quarterly report. The entire data will be monitored and will be archived on paper and electronically. Average of the Net calorific values of different quarters will be calculated at the end of each verification/crediting period and will be considered as the net calorific value of coal used by related brick company in that crediting period.
Monitoring frequency	The bundling agent will cross check all the data including coal consumption data by inspecting the coal stock register and reports of calorific value tests at the end of each verification/ crediting period.
QA/QC procedures	$NCV_{Coal\ i,\ y}$
Purpose of data	Project Emission Calculation
Additional comment	

Data / Parameter	$DP_{Bricks,\ i}$
Unit	Bricks/Day
Description	Daily production of bricks in Kiln i
Source of data	On-site measurements by the kiln owner
Value(s) applied	50,000
Measurement methods and procedures	The daily production (units of bricks manufactured) will be noted in a log sheet which will be maintained in the project plant. Measurements will be noted by technicians in the plant in the log sheets every day. Supervisor will sign the log sheet at the end of each day and data will be provided to the CDM Monitoring and Compliance officer, who will maintain data gathered in the project office. Monthly Reports will be prepared periodically by the CDM Monitoring and Compliance officer and will be gathered in electronic and paper mode.
Monitoring frequency	
QA/QC procedures	The amount of bricks manufactured at the end of each crediting period will be cross checked with the invoices for the sale of bricks and the stock in the plant.
Purpose of data	
Additional comment:	The Total Production of bricks per year in plant i is calculated by adding up the daily production of operating days in the year. The data will be archived for up to two years after the end of the crediting period.

Data / Parameter	$DMW_{Bricks,\ i}$
Unit	Kg
Description	Daily Mean Weight of baked bricks in Kilni
Source of data	On-site weighing by the kiln owner
Value(s) applied	3.5
Measurement methods and procedures	The average weight of bricks will be calculated as per the General Guidelines for Sampling and Surveys for Small Scale CDM Project Activities (EB50, Annex 3) using Load cell /Weighing scale. At each production day, a sample size of 100 bricks will be taken as per the sampling plan described in Annex 4 and will be weighed separately and mean daily weight will be calculated.

Monitoring frequency	
QA/QC procedures	Calibration of load cell/ weighing scale every year. The calibration will be carried out by government accredited laboratory
Purpose of data	
Additional comment	The data will be archived for two years after the end of the crediting period.

Data / Parameter	N
Unit	Number
Description	Number of operational days of the kiln in a year
Source of data	Recorded by the kiln owner
Value(s) applied	300
Measurement methods and procedures	The kiln owner will keep a record of the number of operational days of the kiln during the year.
Monitoring frequency	
QA/QC procedures	The kiln owner will record the data.
Purpose of data	
Additional comment	The data will be archived for up to two years after the end of crediting period.

Data / Parameter	$FC_{Diesel, j, y}$
Unit	Kilolitre /yr
Description	Quantity of diesel (fuel type)combusted in process *j* during the year *y*
Source of data	Invoices from the suppliers
Value(s) applied	Purchase will indicate the amount of diesel supplied. The entire purchase in a year will be considered consumed in brick production. These invoices will be gathered in the project office. Data will be included in the monthly report. At the end of each year total consumption will be calculated.
Measurement methods and procedures	
Monitoring frequency	The diesel stock at the end of each verification period will be estimated and noted in the annual report and the diesel stock register will be used to cross check brick production and raw material purchase.
QA/QC procedures	
Purpose of data	Continuous monitoring will be required.
Additional comment	

Data / Parameter	$EC_{i, y}$
Unit	MWh
Description	Electricity Consumption in plant i per year
Source of data	Electricity bill from the REB or the electricity supplier
Value(s) applied	Monthly Electricity bill paid to Rural Electricity Board (REB) will be used to calculate the total electricity consumption of the month and will be noted in the monthly report
Measurement methods and procedures	
Monitoring frequency	This will be cross checked with the monthly noted meter reading
QA/QC procedures	
Purpose of data	
Additional comment	

D.7.2. Description of the monitoring plan

This section details the steps taken to monitor on a regular basis the GHG emissions reductions from this project.

The main components within the monitoring plan are:

1. Parameter to be monitored, and data collection procedures.
2. Management and Operational System/procedures
3. Quality assurance measures and responsibilities including data base management

If necessary, this Monitoring Plan can be updated and adjusted to meet operational requirements, provided that such modifications are approved by a Designated Operational Entity during the process of verification. The Program Manager, GCSL, will be responsible for the activities related to implementation of the procedures.

1. Parameter to be monitored and data collection procedures

Parameters to be monitored, and how data will be collected are described in Section B.7.1.

Continuously all the data to be monitored will be registered in the plant register either in electronic form or on paper worksheets or both. Data collected will be entered in electronic worksheets and stored.

Emission reductions calculations will be carried out by a competent manager using a MS Excel spread sheets. Backup of the data electronically will be conducted on a weekly basis, and hard copy data will be printed monthly and a Performance Report will be prepared quarterly.

All data will be kept for the full crediting period, plus two years.

2. Management and Operational System

The data relevant to the project are proposed to be monitored and recorded manually by the plant operators.

The plant owners (entrepreneurs) will monitor the data for their respective plants based on daily coal consumption, daily brick production and weight of the bricks. This data will be recorded daily in the plant registers and once a month this will be compiled and delivered to GCSL.

The coal supply of each consignment will be evidenced by suppliers invoice. The total coal consumption will be calculated by summing up the values stated in the Invoices. .A composite sample of 1 kg coal will be taken from each new consignment of coal. At the end of each quarter all the samples taken in that quarter will be crashed and mingled to produce a representative sample for that quarter and will be laboratory tested at the BRTC, Bangladesh University of Engineering & Technology (BUET)to determine the net calorific value of coal used for that particular quarter and the value will be reported in the quarterly report. The entire data will be monitored and will be archived on paper and electronically. Average of the Net calorific values of different quarters will be calculated at the end of each verification/crediting period and will be considered as the net calorific value of coal used by related brick company in that crediting period. The above data will be submitted to GCSL for checking and for archiving purposes.

Each plant owner will employ a competent person in his plant as CDM Monitoring and Compliance Officer whose responsibility will be to collect the monitoring data as described in Section B.7.1 from different departments/sections of the plant and compile the data in the Excel format provided to them by GCSL, the bundling agent. The CDM Monitoring and Compliance Officer will also be responsible for monthly delivery of both hard copies and electronic version of the Monitoring Data. Monitoring Officer of GCSL will collect Data from each CPA Participants on a monthly basis and submit these reports to the Senior Project Associate/ Senior Officer to produce quarterly performance reports and annual Emission reports.

The monitoring operation will be conducted according to the following Table

Task and Area of Responsibility	***Method Used***	***Frequency***	***Responsible person***	***Contact details***
Operation of the monitoring equipment	Manual entry, data recording Electronic Recording	Daily Continuously	Operator in-charge Operator in-charge	Respective plant owner
Quality control of information	On a monthly basis monitoring reports will be checked On monthly basis these reports will be forwarded to Senior Project Associate	Data review monthly	Monitoring Officer Project Manager	CME
Data collection	Collection of Monitoring data from each CPA Participants in both hard copies and electronic workbook format provided to each CPA Participants by GCSL	Monthly	Monitoring Officer	CME
Calculation of the emission reductions and any deviations from projections	As per PDD/ monitoring plan with excel spreadsheets	Quarterly	Project Manager	CME
Storage of the data (measured calculated, estimated data)	Data collection from CPA Participantss and storage	Monthly Periodic Monitoring Reports	Monitoring Officer	CME
QA/QC	As per the OMP Weighing equipment (depends on type of scale)	Yearly Yearly	Monitoring Officer	CME Respective Brick Company
Kiln owner's staff training (CDM monitoring)	Training program as and when required	As and when required	Project Manager	CME
Signs off on monitoring reports and achieved ERs		Yearly	CEO	CME

3. Quality assurance measures and responsibilities including data base management

Program Manager, CME will be in charge of, and accountable for, the generation of the ERs, including monitoring, record keeping, computation of ERs, audits and verification. The Program

Manager, GCSL will ultimately be responsible for ensuring that the monitoring system is established and implemented to the satisfaction of a DOE

GCSL may conduct onsite training and quality control programs as and when required to ensure that good management practices are ensured and implemented by all project operating personnel in terms of recordkeeping, equipment calibration, overall maintenance, and procedures for corrective action.

The following quality control measures will be adopted to increase the reliability of the data monitored:

- To improve the reliability of data recorded by the plant operators, CME or their consultants will carry out an audit of the plants on an annual basis. The audit will be carried out at least for three consecutive days, and GCSL nominated auditors (designated as Carbon Inspectors) will verify the data on brick production as well as fuel consumption. and

- The annual coal consumption data reported by the plant operators will be cross-checked against the data recorded in the coal purchase register of the plant, and the higher value after adjusting for the closing stock at the plant will be used to calculate annual coal consumption.

SECTION E. Approval and authorization

The CME has received Host Country Approval on August 13, 2015

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Appendix 1. Contact information of CPA implementer(s) and responsible person(s)/ entity(ies) for completing the CDM-SSC-CPA-DD-FORM

CPA implementer and/or responsible person/ entity	☒ CPA implementer(s) ☒ Responsible person/ entity for completing the CDM-SSC-CPA-DD-FORM
Organization	Greentech Carbon Solutions Ltd.
Street/P.O. Box	Road 9, Rupnagar R/A, Mirpur
Building	House 6
City	Dhaka
State/Region	Dhaka
Postcode	Dhaka- 1216
Country	Bangladesh
Telephone	+88-9014021
Fax	
E-mail	info@greentechcarbonbd.com
Website	www.greentechcarbonbd.com
Contact person	Shaymal Barman
Title	CEO
Salutation	Mr.
Last name	Barman
Middle name	
First name	Shaymal
Department	
Mobile	+88-01716304650
Direct fax	
Direct tel.	
Personal e-mail	barman_shaymal@yahoo.com;

Appendix 2. Affirmation regarding public funding

Currently no public funding is used in this CPA

Appendix 3. Applicability of methodology(ies) and standardized baseline(s)

Please refer to Section D.1 for applicability of methodology and standardized baseline.

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

Please refer to section D.6.3 for any further background information on ex-*ante* calculation of emissions reductions

Appendix 5. Further background information on monitoring plan

Please refer to section D.7.1 and D.7.2 for further background information on monitoring plan

Appendix 6. Summary of post registration changes

The project has not been submitted for registration . Hence this is is not applicable

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Document information

Version	*Date*	*Description*
04.0	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.
03.0	25 June 2014	Revisions to:

Version	*Date*	*Description*
		• Include the Attachment: Instructions for filling out the component project activity design document form for small-scale CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form for small-scale component project activities" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-SSC-CPA-DD-FORMin A.14. and Appendix 1; • Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and **Error! Reference source not found.**; • Change the reference number from *F-CDM-SSC-CPA-DD* to *CDM-SSC-CPA-DD-FORM*; • Editorial improvement.
02.0	13 March 2012	EB 66, Annex 17 Revision required to ensure consistency with the "Guidelines for completing the component project design document form for small-scale component project activities".
01.0	27 July 2007	EB33, Annex44 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: component project activity, project design document, SSC project activities