CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

India-FaL-G Brick and Blocks Project No.3.
Version 04
07 May 2012

A.2. Description of the small-scale project activity:

The purposes of this project activity are:

(1) To reduce GHG emissions by introducing an energy efficient brick making technology to manufacture FaL-G (fly ash-lime-gypsum) bricks and blocks as alternative building materials to the commonly used burnt clay bricks, which use fossil fuel for their production;
(2) To reduce air pollution by avoiding the use of fossil fuel; and
(3) To enhance the use of fly ash, an industrial by-product, as an ingredient of building material.

Burnt clay bricks are predominantly used as walling material by the construction sector in India. The process of producing these bricks involves consumption of fossil fuel and denudation of fertile topsoil. FaL-G bricks and blocks are alternative building materials to the traditional burnt clay bricks and are substitutes to the traditional burnt bricks used for construction. Production process of FaL-G bricks and blocks does not involve sintering and thus completely eliminates the burning of fossil fuels as required in the clay brick production, ultimately contributing to the reduction of greenhouse gas emissions.

This Project Design Document is applicable to 42 FaL-G plants that have been set up at various locations in the states of Andhra Pradesh, Tamil Nadu, Orissa and Chhattisgarh since Feb 2004. The start date of the project is the earliest date of establishment among all the 42 FaL-G plants vide Emission Reduction Transfer Agreement (ERTA) signed with SPE, which is based on applications received from units individually for participation in CDM project, as per Annex 7. The chronology of the project activity is given in table under B.5.

Each FaL-G plant qualifies as a small scale CDM project as per the definition of small scale CDM projects contained in Appendix B to the simplified modalities and procedures for small scale projects. In order to reduce the transaction cost, a bundling approach is being followed in compliance with the rules prescribed by the Executive Board for bundling small scale projects.

Contribution to Sustainable Development

The project promotes an eco-friendly technology for production of alternative building materials. By avoiding use of fossil fuel in the production process, the project contributes to conservation of energy and fossil fuel (coal). By displacing burnt clay bricks in the walling materials market, the project contributes to protect the environment by minimising eco-hostile activities such as topsoil denudation leading to land degradation, and air pollution caused by emission of unprocessed flues. Furthermore, since the alternative building material is manufactured using industrial wastes and byproducts as raw materials, the environmental impacts associated with improper disposal of such industrial wastes are also mitigated by the project. On social front, the project creates business opportunities for the small and micro enterprises. In contrast to the seasonal production-operations in the clay brick industry, FaL-G plants have the advantage of continuous year-wide operation, and hence provide yearlong employment opportunity for

the skilled artisans and create self-help livelihood opportunities for the illiterate poor. The intrinsic environmental and social benefits of the project are further enhanced by a specific community benefit program particularly the health and accident insurance schemes that are implemented to meet the requirements of the Community Development Carbon Fund (CDCF). The project thus contributes to sustainable development in many ways.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	Eco Carbon Pvt.Ltd. (ECPL) as Project Entity, on behalf of individual entrepreneurs listed in Annex- 6 as Sub-Project Entities.	No
Government of Italy acting through the Ministry for the Environment, Land and Sea	International Bank for Reconstruction and Development (IBRD) as the Trustee (the "Trustee") and managing company of the Community Development Carbon Fund (CDCF)	Yes
The State of the Netherlands acting through the Netherlands' Ministry of Infrastructure and the Environment(lenM)	International Bank for Reconstruction and Development as Trustee of the Community Development Carbon Fund (CDCF)	Yes
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Eco Carbon Pvt. Ltd. (ECPL): A private company, which is committed for promoting FaL-G technology as CDM activity on commercial principles. ECPL will provide the technological and operational support to the individual entrepreneurs for implementing the FaL-G plants. ECPL represents the individual entrepreneurs and is responsible for organising the entrepreneurs in order to promote the project activities for carbon transactions.

International Bank for Reconstruction and Development (IBRD): IBRD is the trustee of the CDCF on behalf of the public and private participants. The official contact for the CDM project activity is the International Bank for Reconstruction and Development (IBRD). The contact details of above participants are given in Annex 1.

The Community Development Carbon Fund (CDCF): Trust fund maintained and operated by the International Bank for Reconstruction and Development (IBRD) in its capacity as trustee of the CDCF on behalf of the public and private participants. CDCF will purchase the emission reductions generated by the project and supervise the implementation of community benefit program.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

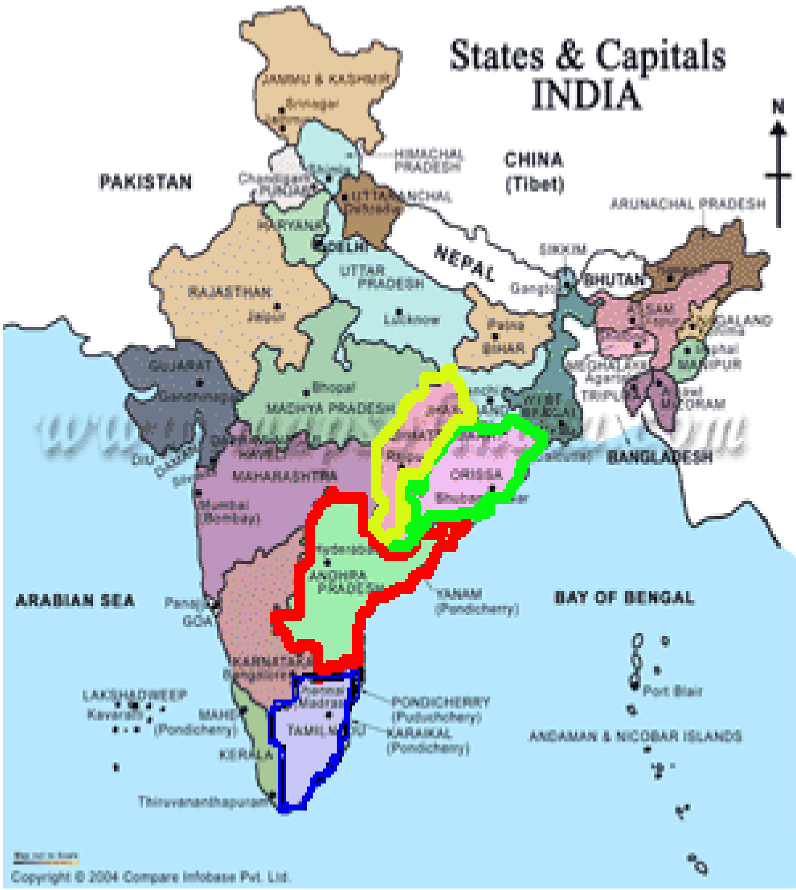
A.4.1.1. Host Party(ies):

India

A.4.1.2. Region/State/Province etc.:

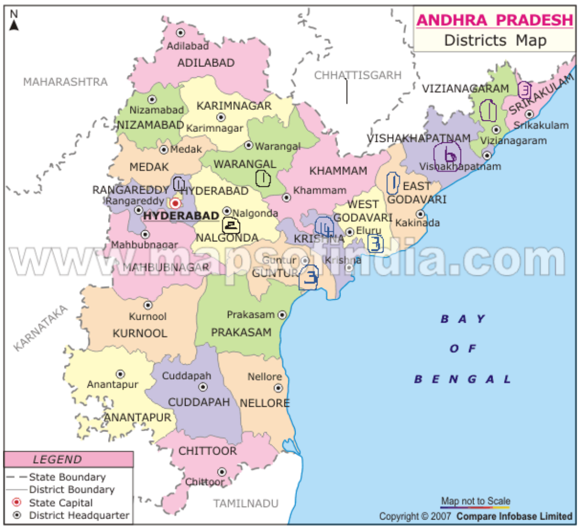
Ten districts in the State of Andhra Pradesh, one district each in the states of Tamil Nadu, Orissa and Chhattisgarh as shown in the geographical maps below.

Geographical Locations of Andhra Pradesh (Red boundary), Tamil Nadu (Blue boundary), Orissa (Green boundary) and Chhattisgarh (Yellow boundary) in India.



Location of FaL-G plants

State of Andhra Pradesh and district wise FaL-G plants

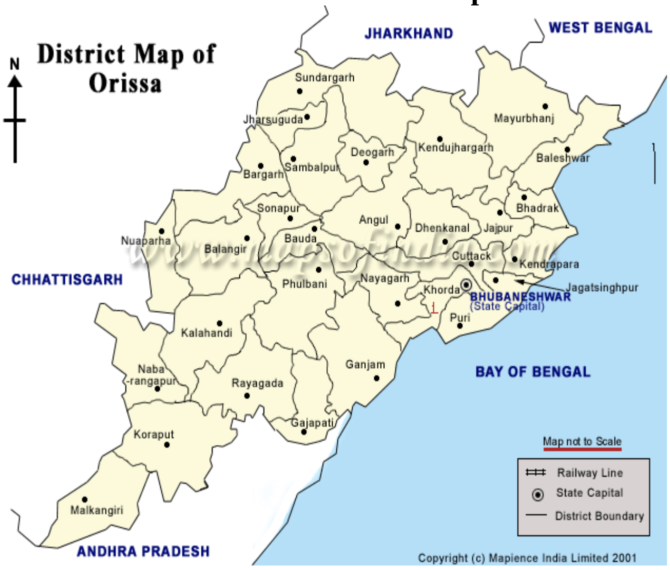


Name of the District	No. of plants
Rangareddy	1
Nalgonda	2
Warangal	1
Guntur	3
Krishna	14
West Godavari	3
East Godavari	1
Visakhapatnam	6
Vizianagaram	1
Srikakulam	3
TOTAL	**35**

State of Tamil Nadu and District wise FaL-G plants

Name of the district	No. of plants
Salem	2

State of Orissa & District wise FaL-G plants



Name of the District	No. of plants
Khorda	1

State of Chhattisgarh and District wise FaL-G plants

Name of the district	No. of plants
Raipur	4

A.4.1.3. City/Town/Community etc:

The districts in which the project activities implemented are as follows.

States	District	No. of Plants	Aggregate Capacity - m^3/year
Andhra Pradesh	Rangareddy	1	2,930
	Nalgonda	2	16,000
	Warangal	1	10,000
	Guntur	3	13,500
	Krishna	14	94,500
	West Godavari	3	16,700
	East Godavari	1	2,600
	Visakhapatnam	6	39,800
	Vizianagaram	1	4,500
	Srikakulam	3	17,200
Tamil Nadu	Salem	2	12,000
Orissa	Khorda	1	3,500
Chhattisgarh	Raipur	4	15,700
Total		**42**	**248,930**

The capacities of individual plants have been separately shown in Annex 6.

Based on Version 03 of AMS-III.Z dt. 11 June 2010, the cap on emission reductions is 60 kt CO_2. For the aggregated capacity of 248,930 m^3 in this bundle the emission reductions result at 46,728 tons CO_2. The capacities of the plants given above are purely indicative based on single shift operations. For a given set of plant and machinery the production output does fluctuate based on workforce efficiency within a shift, and number of shifts operated. Thus the capacity utilisation of individual plants is liable to increase when the operations are stretched to meet the market demand. Thus, even though some units fail in their minimum capacities, the higher operational efficiency of some other units do offset, fulfilling the ultimate cap.

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

FaL-G plants are located in those clusters and geographical areas, which are characterised by easy availability of the key raw materials such as fly ash and also proximity to the brick markets. A typical FaL-G plant is located in rural areas near an urban growth centre where brick demand exists. Each plant requires at least 2000 square meters of land. The plants included in the project are identified by a unique code/serial number for records and administrative convenience. The code consists of identity of the State, followed by identity of the district, Bundle No. in roman, and Serial Number of the plant in that bundle. For example, the ninth Plant in bundle No. III in the state of Andhra Pradesh in Krishna District is represented by the code: AP/KRIS/III/9. As these plants are mostly in tiny sector, located largely in rural sector without significant land mark, indicative geographical coordinates are given in Annex 6.

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

By virtue of avoiding sintering process and, in turn, use of coal, FaL-G brick/ block production contributes for emission reductions. Nevertheless machines in FaL-G plant require electricity and/or diesel for their operation. The consumption of such forms of energy (electricity and/or diesel) however is much lower compared to the thermal energy consumed for production of burnt clay bricks. FaL-G technology needs cement and/ or lime as process inputs, which are sources of emissions during their production. However, such emissions are negligible when compared to the emissions from baseline activity. This is a project not with fuel switch but with total fuel avoidance. It is not a process improvement but altogether a new process. It is energy efficient by avoidance of total thermal energy. Based on the criterion of last factor, as per the recommendations of SSC-Working Group earlier, similar project was registered under AMS-II.D. However, upon the emergence of III.Z in the scenario of Approved Methodologies for bricks that include fly ash-lime/cement-gypsum (FaL-G) chemistry, as per the recommendations of CDM-EB vide Annex 8 of this PDD, the project is categorised under 'Type III - Other Project Types', and III.Z. "Fuel Switch, process improvement and energy efficiency in brick manufacture."

Clay brick manufacturing involves two key processes: i) producing green bricks (clay bricks before firing are called 'green bricks'), and ii) sintering/firing the green bricks in a kiln. The sintering process requires thermal energy inputs. Production of FaL-G bricks and blocks in contrast, does not involve any thermal energy as the product sets and hardens through hydration chemistry, in the lines of cement. Therefore, almost total thermal energy is saved through the use of FaL-G technology. The machinery and equipments used in a FaL-G plant use electricity and/or diesel. But the amount of such energy is much lower compared to the thermal energy used in production of clay bricks. Therefore, total energy savings from the change in brick production process results in substantial energy savings, primarily contributed by the FaL-G technology that completely avoids the use of coal otherwise used in brick production.

The total quantity of emission reductions achieved by the project is estimated as the difference between the emissions due to production of specific volume (m^3) of bricks and blocks produced in the project, and the emissions those would have been occurred due to the production of equal volume of clay bricks. The net emission reductions for an aggregated and indicative production capacity of 248,930 m^3 bricks/year are estimated at 46,728 tons CO_2 per year. Based on improved efficiency and increase in number of shifts the production may go high resulting in further reductions, though net reductions considered would be 60 kt CO_2 only as per Version 03 of AMS-III.Z category.

The Technology

The FaL-G technology used in the project to produce bricks and blocks, has been invented and patented (No. 198639 dated 13.8.1996) by Dr N Bhanumathidas and N Kalidas, and promoted in the host country by the Institute for Solid Waste Research and Ecological Balance (INSWAREB). The technology works with the strength of fly ash, lime and gypsum chemistry. The slow chemistry of fly ash and lime is maneuvered by tapping ettringite phase to its threshold limits through sufficient input of gypsum. Therefore, FaL-G does not require energy intensive equipments such as heavy duty-press or autoclave, which are otherwise required in case of only fly ash and lime brick production. The FaL-G process completely eliminates the thermal treatment, and does not require combustion of any fossil fuel.

The key ingredients of the FaL-G products are fly ash, lime, and gypsum, which are well-known mineral substitutes. All these materials are available in the form of wastes and byproducts from industrial activities and are available in adequate quantities in the areas, where the project activities are located.

FaL-G technology is developed in two approaches, viz. "FaL-G in lime route" and "FaL-G in OPC route". The patent specifications on FaL-G cover both the approaches. Though FaL-G technology was primarily developed using lime, OPC was also identified as a source of lime to facilitate pozzolanic reactions in FaL-G system. . These two approaches have significant bearing on technical point of view in the context of using LT and HT fly ashes as explained below.

INSWAREB has classified fly ash into two categories based on the sintering temperatures of coal in thermal plants and boilers. They are LT (low temperature) fly ash and HT (high temperature) fly ash. The research at INSWAREB established that LT fly ash goes well with lime where as HT fly ash goes well with OPC as per 28-day strength as shown below (pp. 28-30 Fly ash for Sustainable Development, the book authored by Dr Bhanumathidas and Kalidas; 2002).

28-day Compressive strength of FaL-G, MPa

Type of ash	Lime route	OPC route
LT Ash	22.8	20.0
HT Ash	22.0	33.8

However in both the fly ashes either of the routes is interchangeable depending on the logistics of raw material availability and economics. This aspect allowed flexibility in adoption of the technology.

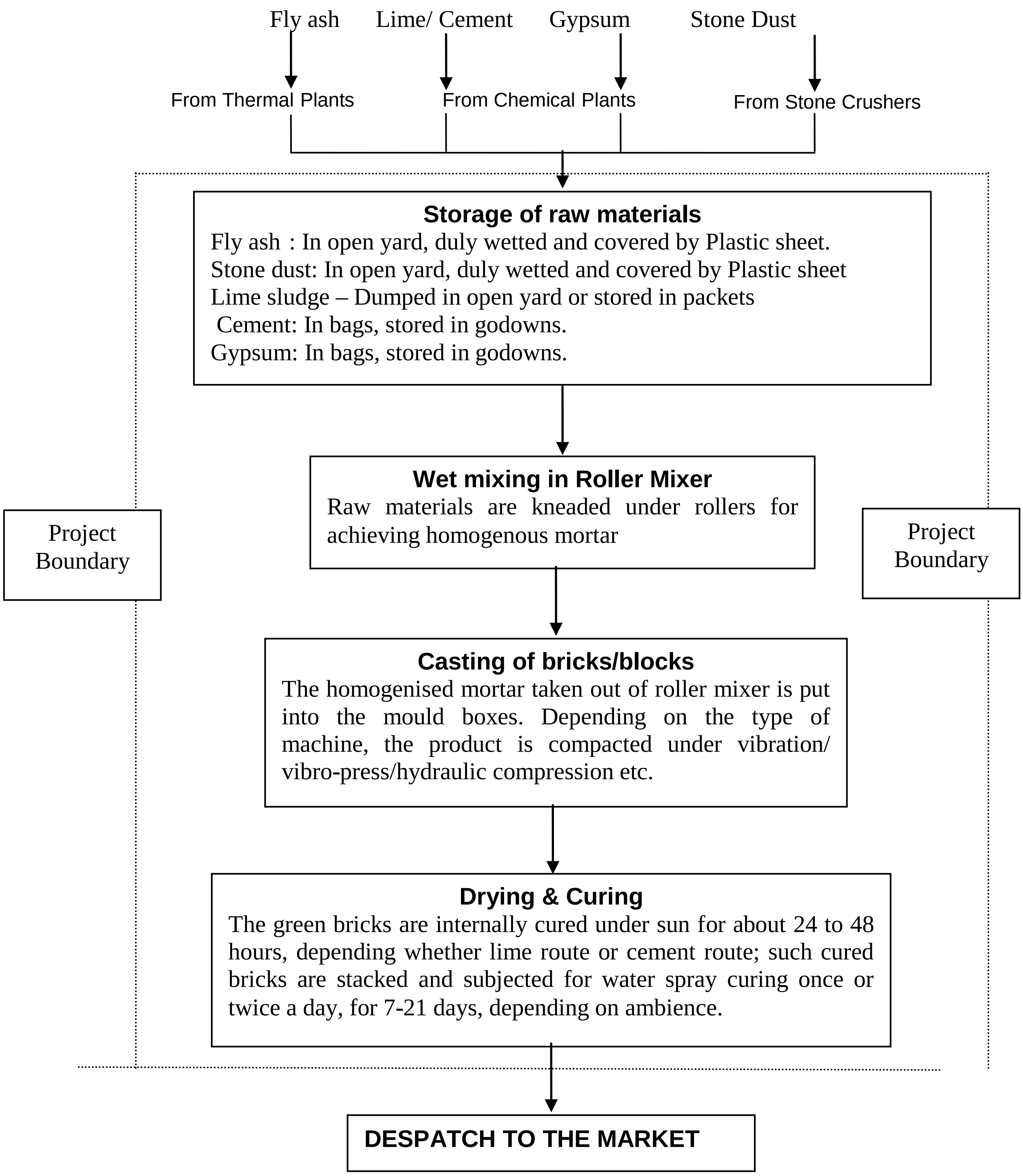
The concept of LT and HT ashes and the related work is the outcome of research during FaL-G development and thus is of proprietary nature. In this background data from INSWAREB labs has authenticity and is considered as third party report.

Byproduct lime is available at almost 1/3rd of the mineral lime cost. Otherwise, it is economical to use Ordinary Portland cement (OPC) over mineral lime and, hence, OPC is preferred in areas where byproduct lime is scarce or not available due to increased FaL-G activity. In view of quality and logistical issues in procuring lime, many entrepreneurs adopt FaL-G in OPC route and some are using both lime and cement. Notwithstanding the choice of lime and/or OPC, the technological flexibilities in FaL-G facilitate the use of blended cements such as Portland Pozzolan Cement (PPC) (fly ash based) also, still maintaining the ultimate quality of the product. In another dimension, FaL-G technology established the use of ground granulated blast furnace slag in association with corresponding complementary reactive-additives to supplement the use of cement. Thus the recipes are tailor-made keeping in view of the quality requirements of the end product.

The following table gives the raw material inputs per cubic meter, for typical recipes, where the density of FaL-G brick/block is 2,000 kg / m^3.

Ingredients	**Lime route**		**Cement route**	
Weight ratio	%	kg	%	kg
Fly ash	15	300	15.2	304
Lime [as $Ca(OH)_2$]	7.5	150	--	--
Cement	--	--	4.0	80
Gypsum	2.5	50	0.8	16
Filler (aggregate)	75	1500	80	1600
TOTAL	100	2000	100	2000

The schematic FaL-G process is provided in a chart below.



INSWAREB is the technology source and closely associated with the project as a technology partner and provider of training and capacity building services. As part of the technology transfer, the entrepreneurs and artisans are given sufficient training in technology and production processes.

INSWAREB has already been engaged in conducting various awareness and market development programs to government and private sector. INSWAREB is also conducting awareness workshops to highlight the CDM opportunities in practicing FaL-G technology in different states of India.

The role of INSWAREB, as mentioned in B8, is to determine the baseline and Monitoring methodology. Thus INSWAREB would impart training to the monitoring personnel of ECPL. An agreement between INSWAREB and ECPL has been signed to this effect.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The project is expected to achieve GHG emission reductions of approximately 467,280 tonnes of CO_2 equivalent in 10 years from operation of 42 FaL-G plants at different locations.

YEARS	Annual Estimation of Emission Reductions (tonnes CO_2 eq.)
01/07/2012-30/06/2013	46,728
01/07/2013-30/06/2014	46,728
01/07/2014-30/06/2015	46,728
01/07/2015-30/06/2016	46,728
01/07/2016-30/06/2017	46,728
01/07/2017-30/06/2018	46,728
01/07/2018-30/06/2019	46,728
01/07/2019-30/06/2020	46,728
01/07/2020-30/06/2021	46,728
01/07/2021-30/06/2022	46,728
Total estimated reductions (tonnes CO_2eq.)	467,280
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes CO_2eq.)	46,728

A.4.4. Public funding of the small-scale project activity:

No public funding from Annex – I Countries is being received by this project as confirmed vide Annex 2.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The project activity is not a debundled component of a larger project activity as defined in appendix C to the simplified M&P for the small-scale CDM project activities. There are no other project activities registered or applying for registration as small-scale CDM projects with the same project participants and in the same project category and technology/measure (FaL-G). All the FaL-G plants included in the project are independently owned and operated by different entrepreneurs. Thus each FaL-G plant is a standalone project with total operations right from raw material input upto the finished product. Hence a check on debundling is totally irrelevant as the emission reductions out of all these plants, put together, are well within the cap, thus making the concept of debundling untenable.

The characteristics of the individual FaL-G plants are provided below.

(i) Each FaL-G plant is independently owned and operated;
(ii) The FaL-G plants use same technology disseminated from the technological source, INSWAREB, acting as an intermediary; but have independent and one to one technological tie up with INSWAREB. Thus, each FaL-G plant enjoys the technical support of INSWAREB under norms of technology counselling.
(iii) Each FaL-G plant signs the Sub-Project Agreement with Project Entity, committing to transfer specified quantity of ERs during the project period.
(iv) No contractual arrangements exist among the bundled FaL-G plants.
(v) Each plant would be catering to different market segments, depending on transport, commercial and other logistical constraints; and
(vi) Each plant has specific boundary delineated by the physical and geographical site and equipments employed.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

This project was submitted for validation in March 2008 based on AMS-II.D, in convention to its previous project, which was duly registered. However, validation could not be taken up by DOE as its immediate previous project got stuck at registration on the issues of Revision and Deviation with regard to considering leakage due to raw material input. Thus, the project got operational for close to two and half years and subjected for verification by PP in accordance to AMS-II.D. Meanwhile,
AMS-III.Z.: Fuel Switch, process improvement and energy efficiency in brick manufacture --- Version 3.0 came into prevalence very recently with relevance to this project. Thus, the project is referring to AMS-III.Z.Version 3.0 vide this PDD.

Type III: Other Project Types

Version 03 of AMS-III.Z. Fuel Switch, process improvement and energy efficiency in brick manufacture dt. June 11, 2010.

As per Approved methodology Project activity emissions associated with the use of electricity and fossil fuel or both are calculated in accordance with the "Tool to calculate baseline, project and /or leakage emissions from the electricity consumption" and /or "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (tCO_2e).

The approved methodology requires monitoring of the following:

a) Production output (m^3 per day)
b) Principal raw and additive material purchases on monthly basis
c) Tests at six-month interval to validate that the project bricks meet the performance requirements in terms of compressive strength.
d) Daily Consumption of fossil fuel and Monthly electricity consumption. Cross checking of consumption with purchase invoices for fossil fuel.

B.2 Justification of the choice of the project category:

The project category selected to the project activity is as follows:

- Type III Other Project Types
- Version 03 of AMS-III.Z. Fuel Switch, process improvement and energy efficiency in brick manufacture

Each of the criteria of the methodology is justified vide table below:

Criteria	Justification
The approved methodology AMS-III.Z aims for emission reductions through activities comprising of one or more technology/ measures listed below in existing brick production facilities: • Shift to an alternative brick production process; or • Partial substitution of fossil fuel with renewable biomass in existing brick production facilities'. or • Complete/partial substitution of high carbon fossil fuels with low carbon fossil fuels. Thus the methodology is applicable for the production of bricks: ▪ Bricks that are the same in the project and baseline cases: or ▪ Bricks that are different in the project case versus the baseline case due to a change(s) in raw materials, use of different additives, and/or production process changes resulting in reduced use or avoidance of fossil fuels for forming, sintering (firing) or drying or other applications in the facility as long as it can be demonstrated that the service level of the project brick is comparable to baseline brick. Examples include pressed mud blocks (soil blocks) with cement or lime stabilisation and other 'unburned 'bricks that attain strength owing to fly ash, lime/cement and gypsum chemistry.	The project activity deploys the patented FaL-G technology where the products attain strength due to hydration chemistry among fly ash, lime/cement and gypsum. Manufacturing of burnt clay bricks is an industrial activity, which requires thermal energy inputs for the purpose of sintering. Fossil fuel and/or biomass are primarily combusted to provide the required amount of thermal energy for sintering the clay bricks, which results in CO_2 emissions. Production of FaL-G bricks and blocks however does not require combustion of fossil fuels or biomass as the FaL-G technology does not require any sintering. Instead, the strength is achieved through chemical reactions among the selected raw materials used, viz. fly ash, lime and/or cement, gypsum, and water. The cast products are then simply air and/or solar dried, to facilitate initial internal curing, and water cured for a specific period (curing time) to achieve the desired strength. The use of thermal energy from fossil fuels or biomass is completely avoided in the process. FaL-G plants are run on electricity and/or diesel. Consumption of such forms of energy (electricity or diesel) however is much lower compared to the thermal energy consumption for production of clay bricks. Thus CO_2 emission due to project activity is much less than in the baseline, resulting in considerable quantities of emission reductions. In addition, the service level of project brick in terms of compressive strength is higher at an average value of 6 to 12 MPa as against 3 to 6 MPa for baseline brick. The comparative data from a typical testing conducted by INSWAREB Building Centre is given hereunder:

<table>
<tr><td></td><td>
<table>
<tr><td>Type of brick</td><td>Compressive strength, MPa</td></tr>
<tr><td>Clay brick</td><td>4.3</td></tr>
<tr><td>FaL-G brick</td><td>9.8</td></tr>
</table>

In this background the choice of the methodology AMS-III.Z is appropriate.</td></tr>
<tr><td>New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the General guidance for SSC methodologies</td><td>This is a Greenfield project. Clay brick is the most plausible baseline as per methodology and the same baseline is applied in the project activity. Hence the methodology is applicable for the project activity.</td></tr>
<tr><td>The methodology requires demonstrating the abundance of raw materials in the country/ region according to the specified procedures.</td><td>The project does not involve change of raw materials since this is a Greenfield project. Hence para 6 on demonstration of abundance of raw materials is not applicable. Notwithstanding this fact, this issue has been discussed below.

The need of demonstration on abundance of raw materials is applicable to plants with large production capacities in single project boundary where the requirement of raw materials is high, and the opportunities for consistent availability get confined/ restricted probably due to growth in demand for the relevant raw materials.

The present project activity is a bundle of small scale units with annual capacities ranging in the order of 2,700 to 13,500 m^3 (~ 9 to 45 m^3 per day) and scattered in different locations of the region and states. As the major raw materials are available within logistical radius for any FaL-G unit in general, INSWAREB in its status as Observer Organisation submitted Request for Revision (Ref No. 297) to SSC-WG seeking to exclude the small scale sector with a capacity of <200 m^3 from the demonstration on abundance of raw materials.

The comments of SSC WG, as given below, at its 20th meeting for above request are significant and confirm that demonstration of abundance of raw material can be done on country/ region basis.

“The SSC WG could not accept the proposal to have any thresholds on the production capacity and the request on exclusion of demonstration of availability of alternative material keeping in view of the competing uses of raw material /additives i.e., the alternative material used in the project activity</td></tr>
</table>

	could be used for other purposes in the absence of the project and its subsequent possibility of leakage effects. Also it should be noted that in terms of demonstration of availability of alternative material, this can be done on a country/region basis (not necessarily required for each brick production facility) as indicated in AMS-III.Z. Version 3.0 paragraph 6" Fly ash is one of the main raw materials used in the project activity. The annual nationwide generation of fly ash is over 130 million tons. (http://www.dst.gov.in/whats_new/what_new08/fly-ash.pdf) Though fly ash constitutes 60-80% in FaL-G as the cementitious binder, the fly ash content comes down to 10-20% in brick by weight when FaL-G is added with filler, depending on the fly ash quality and other logistics. Considering average of 15% fly ash per brick and 3 million bricks of annual output per unit, 130 million tons of fly ash is sufficient for 76,157 units against 42 units of B-III, which abundantly demonstrates the abundance of raw material. Being a by product of coal based thermal power plants with annual generation in millions of tons, fly ash is abundantly available within a feasible distance for any unit in the bundle. The fly ash sources in Andhra Pradesh are Simhadri Thermal Power Project, Visakhapatnam and Ramagundam Thermal Power Project at Ramagundam, both of NTPC and Vijayawada Thermal Power Station at Vijayawada, Kothagudem Thermal Power Station at Kothagudem, Rayalaseema Thermal Power Station at Muddanur and Ramagundam Thermal Power Station at Ramagundam, all of Andhra Pradesh Power Generation Corporation (APGENCO). Notwithstanding the above fly ash is also available from captive thermal plants and steam boilers. Thus all put together the total generation is about 10.0 mtpa in Andhra Pradesh. Similarly fly ash sources in Tamil Nadu are Ennore Thermal Power Station and North Chennai Thermal Power Station both at Chennai, Mettur Thermal Power Station, Mettur and Tuticorin Thermal Power Station, Tuticorin all of Tamil Nadu Electricity

	Board (TNEB), and Neyveli Lignite Corporation, Neyveli. The total generation of fly ash in Tamil Nadu is about 6.0 mtpa. The state of Orissa has two thermal power stations of NTPC with fly ash generation of about 6.0 mtpa. In addition fly ash is generated in other power plants from state electricity board and captive power plants such as from National Aluminium Corporation(NALCO) Fly ash sources in the state of Chhattisgarh are Korba Super Thermal Power Station and other three major thermal power plants which put together generate about 9.0 mtpa of fly ash annually. In addition to the above scenario, with the power plants in pipeline, about 5 million tons of fly ash is expected to be added every year over the next ten years. When compared to the generation of such huge volume the fly ash requirement by small scale units is minuscule. The scenario itself demonstrates the abundance of fly ash in the regions where SPEs in the bundle operate. Cement is a commercially available product in the market and more so is a product of localised market in a given logistical radius. With an annual production of about 260 million tons at national level and having plants spread through all the regions in the country there is no dearth for cement availability. Also the cement input in a brick is low in the range of 2.5 to 4% and this further demonstrates the cement availability without problem. Similarly lime is also a commercial product procured in open market. There is no data available on lime production. However cement being the predominant input as source of lime the users of lime have come down in preference to cement. As already discussed earlier byproduct lime is also used in the process that is available from acetylene industries. Moreover, this technology provides a flexible process mechanism to use cement and/or lime in accordance to availability and other logistics. Gypsum comes as a byproduct from hydrofluoric acid and fertiliser industries with an annual generation of about 3 to 4 million tons and also is

	available commercially in the market. Gypsum input in FaL-G bricks/ block production is very small at 0.1% of total mass hence there is no shortage for this product also.
The service level of project brick shall be comparable to or better than the baseline brick ie., the bricks produced in the brick production facility during the crediting period shall meet or exceed the performance level of the baseline brick. An appropriate national standard shall be used t identify the strength class of the bricks, bricks that have compressive strength lower than the lowest class bricks in the standard are not eligible under this methodology. Project bricks are tested in nationally approved laboratories at 6 months interval (at a minimum) and test certificates on compressive strength are made available for verification.	The average range of compressive strength of baseline bricks is 3 to 6 MPa against which project bricks give compressive strength of 6 to 12 MPa. The strength of baseline brick is stagnant based on clay quality and sintering process whereas the strength of the project brick can be enhanced, by changing the hydration chemistry, to meet the applicational needs. Hence project brick is not only a walling element but also the element for infrastructural constructions. "IS 12894: Pulverised Fuel ash-Lime Bricks" is the national standard for identifying the strength class of the project bricks. IS 516: Methods of Test for Strength of Concrete is the national standard to assess the performance of project bricks in terms of compressive strength. IS 3495: Methods of Tests for Burnt Clay Building Bricks (Part I) is the national standard to test the compressive strength of the clay bricks, the baseline product. The different codes have been made applicable because baseline brick is a ceramic product and project brick is a hydraulic product in the lines of cement concrete. In the context of testing of bricks/blocks, the SSC WG, at its 22nd meeting clarified as follows: "The testing can be undertaken based on the national/regional standards or guidelines applicable to the type of project activity bricks. Testing can also be undertaken as per the procedures provided by the technology provider as long as the testing methods can be substantiated with reference to peer reviewed literature i.e. relevant international journal, publications, publications of national/international building research centres etc. As long as the testing procedures in the guidelines/standards are met, the testing itself can be undertaken in polytechnics, engineering colleges, building centers, national laboratories etc."

	Accordingly the test procedure vide Annex 9 shall be adopted and the bricks/ blocks be tested for their compressive strength at six month interval.
Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	The project activity consists of 42 SPEs in the bundle with an aggregated capacity of 248,930 m^3 per annum resulting in emission reductions of 46,728 tons CO_2 equivalent. These capacities are based on single shift operation and 300 working days which is the general norm practiced by FaL-G brick units. It is important to observe that these are micro-plants and do not have fixed number of workers. Based on local market demand there is likelihood that the capacity utilization of individual plants increases or decreases, and sometimes they may work for more shifts or hours to cater seasonal spurt in demand. Such variation within units of a bundle is common for a portfolio of projects. Thus, as this bundle forms a portfolio of individual micro and small scale plants, even though some units fail in achieving their minimum capacities, some other units may see higher operation and production without exceeding the total cap for the bundle.
This methodology is not applicable if local regulations require the use of proposed technologies or raw materials for the manufacturing of bricks unless widespread non compliance (less than 50% of brick production activities comply in the country) of the local regulations evidenced.	The annual brick demand in the country is about 200 billion nos. Despite government regulations, and monitoring by judiciary, central and various state governments, penetration by fly ash bricks could not go beyond 9%. There is no regulation in India to use FaL-G technology. There is local regulation to use fly ash to manufacture fly ash bricks, and as of date only FaL-G is the feasible technology to manufacture fly ash bricks in India. However the regulations face widespread non-compliance, which is evident from the statistical analyses of the fly ash brick market vide table 1.2. From that time onwards till now, over the period of five years, the penetration level is increased from 1.4% to 9%, based on the data of INSWAREB, and is too meagre in the national perspective, which is due to purely non-compliance of regulations. Ministry of Environment and Forests, Government of India came out with a Gazette Notification No. 2804 dated 3rd November 2009 wherein it is mentioned that the fly ash use in manufacturing bricks and other products increased from 1.5 million tons in 2002-03 to 3.19 million tons in 2006-07, which is commensurate for the production of 3.19 billion bricks. This is only 1.59% on national demand for the bricks.

	In either way the penetration is very meagre demonstrating the non-compliance of the national regulation. Hence referred methodology is applicable for the project activity.

B.3. Description of the project boundary:

In line with the definition for type III-Z methodology, the boundary for the purpose of the proposed project is defined as the physical and geographical area affected by the project activity. Accordingly, the boundary of the project is defined to include the physical and geographical limits of the FaL-G plants in the project, and shown in the process flow chart. The production sites typically include the following facilities:

- The storage yard for raw materials.
- Pan mixer for mortar preparation
- Casting machine
- Drying yard (natural drying in ambient temperature)
- Curing yard (water spray curing in ambient temperature)

The only source of CO_2 emission that occurs within the project boundary is the CO_2 emission associated with consumption of diesel, where the mechanical equipments are run by diesel engines. In such cases diesel is burnt either directly in the engine (not converted to electricity) to run the mechanical equipments such as the pan mixer, or in the gensets for electricity generation during intermittent power breakdowns. Wherever available, electricity is used to run the equipments. Emissions, associated with the consumption of diesel and electricity, are accounted for while estimating the emission reductions.

Project activity covers spatial boundaries of different states where each electricity grid has its specific emission factor and T&D losses. Hence India can be considered as the spatial boundary and emission factor of 0.86 t CO_2/ MWh of power generated at national level can be taken for computation of project emissions due to electricity (http://www.cea.nic.in). Even after considering T&D losses of 45% as highest national average (http://en.wikipedia.org/wiki/Electricity_sector_in_India) this value comes to 1.247.

However to avoid uncertainties in the values a conservative default value of emission factor of 1.3 t CO_2/ MWh is taken as suggested by “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 01), and this value is higher than the national average. Thus the approach results in highest project emissions, and, in turn, lesser emission reductions which are more conservative.

B.4. Description of baseline and its development:

Baseline

As per AMS-III.Z the baseline emissions are the emissions related to fossil fuel consumption (fossil fuel consumed multiplied by an emission factor) associated with the systems(s), which were or would have otherwise been used, in the clay brick production facility in the absence of project activity.

The approved methodology suggests “For project involving installation of systems in a new facility, the average annual historical 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 identified includes different technologies with different levels of energy consumption, a weighted average energy use of these technologies can be considered for determining the baseline emissions of the facility or facilities.”
The project activity involves setting up new facilities for production of bricks and blocks by adopting the FaL-G technology, which results in emission reductions. The baseline is therefore the fossil fuel consumption of the facilities that would otherwise be built in the absence of the project in order to meet the demand for walling material, comparable in quality and utility to that of bricks and blocks produced through FaL-G technology. Under Indian conditions coal is only fossil fuel used in the manufacture of clay brick. The data on walling material market (provided in table 1.2) show that burnt clay bricks represent more than 95% of the total walling material market. Production of burnt clay bricks is therefore considered the baseline scenario.

In the absence of the project activity, it is expected that the burnt clay brick manufacturing using conventional technologies will continue to meet the walling material demand in the country resulting in substantial CO_2 emissions. Production of burnt clay bricks employs different technologies with different levels of coal consumption. Since it is difficult to determine precisely a particular technology that would be used in the absence of project activity, a weighted average coal consumption of these technologies is considered to best represent the baseline coal consumption in lieu of the weighted average energy use suggested by methodology. The technologies, which are banned by regulation, have not been considered in calculating the weighted average coal consumption.

The different technologies that are used to produce burnt clay bricks include clamps, Movable Chimney-Bull Tranche Kilns (MCBTK), Fixed Chimney-Bull Tranche Kiln (FCBTK), High Draft Kilns (HDKs) and the recently introduced Vertical Shaft Brick Kiln (VSBK) technology. Concerned over the increasing pollution from brick industry, the Government of India has already banned the use of MCBTK and it does not issue any clearances/approvals to set up new brick units using MCBTK. Therefore, MCBTKs have not been considered in the baseline. The baseline specific coal consumption (coal use for production of unit volume of bricks/blocks) is determined by considering the remaining technologies and their prevalence in the market using the data presented in the table 1.1 below. Annual production specific emission factor is then computed based on the specific coal consumption and its calorific value. (source[1] : Emission Standards for brick kilns- An opportunity for Technology upgradation by Sameer Maithel, The Energy Research Institute (TERI), India).

Since there is no drastic change in the logistics and technology of clay brick industry in India over the last one century, and the production being continued as a traditional activity with no adoption of modern technologies, no variation in the fuel consumption can be expected since the time of Teri study in 1999. This observation is further substantiated with the failure of VSBK technology to make in-roads into clay brick industry despite CDM-revenue support.

[1] http://www.brickindia.com/articledetail.asp?id=36&cat=5

Table 1.1 :Baseline Specific Coal consumption and annual production specific emission factor

Basis:

Size and Density of clay brick	22 x 10 x 7 cm; 1.8 t/m^3
Specific emission factor for coal	25.8 tC/ TJ
Calorie to Joule	4.1858
Specific heat of coal	4500 kCal/kg
Carbon to CO2	3.666

Burnt clay brick technologies	Coal consumption, tons/lakh bricks		Coal consumption, Avg t/m3	Production capacities (100000 kg bricks/year)		Production capacities Tons/yr/plant	Production capacities m3/year/plant Qx	No. of Plants Nx	Total production in m3/year/all plant types	Total coal consumption in tons for total production
	Range	Average	F avg	Range	Average	Avg x 100	Tons x 55.55		Prod $_T$ = Qx x Nx	F $_T$ = Prod $_T$ x F avg
BTK- fixed chimney	16.00 - 24.00	20.00	0.13	83 - 275	179	17900	994345	25000	24858625000	3226649525
High draft/ zig zag	13.00 - 16.00	14.50	0.09	83 - 138	110.5	11050	613827.5	200	122765500	11552847
Clamps	32.00 – 48.00	40.00	0.26	1.4 – 27.5	14.45	1445	80269.75	60,000	4816185000	1250281626
Vertical Shaft Brick Kiln	13.00 – 16.00	14.50	0.09	14 - 110	62	6200	344410	30	10332300	972321
TOTAL									29807907800	4489456319

Weighted average Specific coal consumption, $t/m^3 = F_T / Prod_T$ = 0.15061293

Specific heat consumption, k Cal/m^3 = 4500 x 0.15061293 x 1000 = 677758

Annual production specific emission factor, t CO_2/m^3 **= 677758 x 25.8 x 4.1858 x 3.666 / 10^9 = 0.2683**

In the context of applicability of above values it is to be clarified that baseline of brick manufacturing process is same as that of 500 years back. New technologies in clay brick such as VSBK would have caused reduction in energy consumption, but they could not penetrate due to various socio-logistical issues, and thus not widely used. These issues are emphasised and substantiated in the study conducted and documented under "Energy Efficiency Improvements in the Indian Brick Industry" by TERI in association with UNDP.
(http://www.resourceefficientbricks.org/background.php)

In the context of applicability of above values it is to be clarified that baseline of brick manufacturing process is same as that of 500 years back. New technologies in clay brick such as VSBK would have caused reduction in energy consumption, but they could not penetrate due to various socio-logistical issues, and thus not widely used. Hence the applicability of thermal energy data can be much accepted.

More over, as conservative approach, baseline with weighted average thermal energy is taken as the basis out of various technological options available in clay brick production. Therefore the energy baseline continues to be the same.

Coal is the main source of energy used for manufacturing burnt clay bricks in India. The second choice of fuel is biomass, including fuel wood. In one of the studies undertaken by the FAO[2] the annual use of fuel wood in the entire brick industry in the country is reported to be only 300,000 tons, while the use of coal is reported to be about 14,000,000 tons. Thus use of fuel wood represents less than 2% in terms of fuel inputs of the total fuel requirement of the brick industry in all of India. Since the values reported in the FAO report do not distinguish between the renewable biomass and nonrenewable biomass, the actual fraction of renewable biomass (with zero emissions) is likely to be lower.

Further the situation with biomass, which was earlier available as a cheaper fuel, is changing rapidly nation wide. The on going initiatives for biomass-based power plants have introduced competition in the market, increasing the cost of biomass. In the absence of any precise information on the use of biomass in brick industry, it is proposed to fix the biomass usage in brick production conservatively at 5% of the total energy input, for all the areas included in the project. This figure is higher than the national average figure of less than 2% reported in the FAO report. In order to account for the zero emissions from the use of biomass, the emissions in burnt clay brick production is adjusted appropriately by multiplying it with a "biomass adjustment factor" (0.95 = 1 - 0.05). The baseline emission thus derived would be conservative.

The project activity is a bundle consisting of small scale units scattered throughout the country, resulting in variations in quality and quantum of coal used. Hence the project activity takes energy baseline based on National average. The amount of CO_2 emissions from burning of coal depends largely on the type of coal and its calorific value. Different types of coal are used in India for brick making. In order to address the variability in coal quality, the IPCC default carbon emission factor for Indian coal as 25.8 tC/TJ (IPCC) has been used to estimate the CO_2 emissions associated with burning of coal in the baseline.

The total net emissions from the baseline scenario are estimated to be 63,449 tonnes of CO_2 equivalent per annum out of 42 plants included in the project. Ex-ante calculations vide Table under B6.3 may be referred for details.

[2] Source: FAO Field Document No. 35, "Regional Wood Energy Development Programme in Asia", GCP/RAS/154/NET.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

A small scale CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would occur in the absence of the registered project activity, and the project activity is facing one or more barriers as defined in Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities.

It is expected that, in the absence of the project activity, the burnt clay brick production deploying conventional technologies will continue to meet the walling material demand in the country resulting in substantial CO_2 emissions. The project activity is therefore considered additional and would result in abatement of emissions that would have otherwise occurred if the equivalent amount of clay bricks were to be produced.

However clay brick is an age-old product with irresistible receptivity in Indian market due to which introduction of any alternate product or technology gets stiff competition and challenge. In this background, FaL-G technology looked at CDM revenue as an opportunity to meet the costs in upholding the quality and to maintain the price line that can withstand the price competition from clay brick market. Efforts to get registered as CDM project were initiated as early as in 2000, and the following events are evident in this direction.

Chronology of Events

S. No.	Timeline (dd/mm/yyyy)	Description of Events	Stakeholders involved and notes
CN1	07.09.2000	The earliest discussion on record concerning FaL-G Project in India, well before India ratified Kyoto Protocol.	World Bank Carbon Funds and Project developer in India INSWAREB, Visakhapatnam.
CN2	03.01.2003	Following ratification of Kyoto Protocol by India, submission of first Project Idea Note (PIN) even before the Community Development Carbon Fund (CDCF) was operational	As above
CN3	09.09.2003	Official submission of PIN to the CDCF, which was eventually accepted in the portfolio.	As above
CN4	20.09.2003	INSWAREB's Resolution No. 42/I to launch special drive to promote FaL-G bricks plants highlighting the contribution of CDM Revenue to overcome the impediments with regard to price competition with clay bricks, market promotion etc. Thus the new units would be encouraged to take CDM revenue for budgeting their projects. Such projects would be bundled as per the norms and offered as CDM project to the World Bank. During the meeting it was also ratified that INSWAREB encourages activities of Eco	INSWAREB and ECPL

		Carbon Pvt. Ltd., (ECPL), to enable the latter's participation in commercial pursuits with the World Bank.	
CN5	20.01.2004	Submission of Project Concept Note (PCN) together with financial workings to CDCF for FaL-G Brick Units in tiny sector- multiple units to be bundled under CDCF. It was envisaged that suitable number of Micro Industrial Plants (MIPs) would be roped into these bundles. PCN amply explained the various barriers faced by the project activity and clearly indicated that CDM revenue would be of help in overcoming the barriers.	International Bank for Reconstruction and Development (IBRD) as trustee of CDCF, INSWAREB and ECPL, Visakhapatnam, India.
CN6	01.02.2004	The start date of the project is the earliest date of establishment occurred among all the 42 FaL-G units in this project activity. (Annex 7)	
CN7	03.06.2004	Letter of Intent signed for purchase of potential ERs from FaL-G Bricks and Blocks Project (consisting of Micro Industrial Plants (MIPs) or FaL-G units in small scale bundles.	IBRD and Eco Carbon Pvt. Ltd., in its own right and on behalf of the Entrepreneurs to be bundled in the project (Project Entity).
CN8	25.08.2004	Scheme For Project Finance (Term Loan) and Working Capital Loan to Micro Industrial Plants of FaL-G Bricks/Blocks under Bundling of CDM.	--
CN9	10.01.2005	Submission of Financial scheme after meeting with SBI, Corporate Office, at Mumbai and presentation on FaL-G MIPs seeking bank finance at National level against carbon credit revenue.	
CN10	21.01.2005	Draft of ERPA sent by World Bank to ECPL	IBRD and ECPL
CN11	24.04.2005	First submission of New draft Methodology and PDD by World Bank to EB-CDM New Methodology was proposed because FaL-G avoids total thermal energy in the manufacturing process, and none of the approved methodologies were found suitable for FaL-G project activity.	SSC_014
CN12	13.02.2006	Final recommendation of SSC-WG at its 4th meeting, after protracted exchange of clarifications, to put the Project Activity under AMS-II.D with a conclusion that there is no need of New Methodology.	http://cdm.unfccc.int/methodologies/ SSC methodologies/clarifications/87033
CN13	28.06.2006	ERPA signed	IBRD as Trustee of CDCF and ECPL as Project Entity.
CN14	24.03.2008	Submission of the PDD for Bundle III for Validation, using AMS-II.D in convention to the earlier project, Bundle I that was duly registered. However, validation could not be taken up by DOE as Bundle II got stuck at validation and registration on the issues of	DNV, IBRD and ECPL

		methodology Revision and Deviation with regard to considering leakage due to raw material input.	
CN15	11.03.2009	Change in applicability of the Methodology from AMS-II.D to AMS-III.Z that covers all types of brick projects.	EB advised the PE to consider using AMS-III.Z that was approved at the EB48 in March 2009 (http://cdm.unfccc.int/Projects/deviations/31797)
CN16	03.04.2009	Following EB ruling, a request for revision to enable use of AMS-III.Z ver. 1 was submitted (SSC_297)	Methodology AMS-III.Z revised (http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_7UZF38D574Y74P8OL1ETOHWOA0COKU)
CN17	03.04.2009	Request for revision to AMS-III.Z ver1 was submitted (SSC_298)	Methodology revised and AMS-III. Z version 2 published (http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_02OBBFLWVV1LVC4VRN7K8SJFT6UUFZ)
CN18	24.09.2009	Request for revision submitted for AMS-III.Z (SSC_322)	Methodology not revised but clarification provided as a response from SSC-WG 22 in September 2009 (http://cdm.unfccc.int/Projects/Validation/DB/MRSZEJRVVC7YZWWCRQGTKS3ALLBKS8/view.html)
CN19	25.11.2009	Web hosting of the PDD using AMS-III.Z ver.2	(http://cdm.unfccc.int/Projects/Validation/DB/MRSZEJRVVC7YZWWCRQGTKS3ALLBKS8/view.html)

The analyses in the following paragraphs illustrate a number of barriers for the FaL-G technology.

Barrier due to prevailing practice

Burnt clay bricks continue to be the most popular form of walling material in the country. They are cheap and have traditionally been believed to be the most suitable walling material for building construction. Although alternative building materials, such as cement concrete block and fly ash bricks, have been introduced in the recent past, burnt clay bricks account for more than 95% of the total market for walling material in larger parts of the country. This can be seen from the data presented below (Source: A study on "Cost Effective Building Materials & Technologies" undertaken by Holtec Consulting Private Limited in the year 2004 on behalf of Building Materials Technology Promotion Council, Ministry of Housing and Urban Poverty Alleviation, Government of India).

Table 1.2 : Market share of different walling materials

Type of walling material	**Market size (Rs. Crores[3])**	**% of total market**
Burnt clay bricks	32825	95.3
Cement Concrete Blocks	1135	3.3
Fly ash bricks incl. FaL-G	485	1.4
Total	**34445**	**100**

Clay brick production is a simple activity and is practiced even at the tiny and cottage sector level, which, even at the brink of 21st century, is continued as a family trait that has been passed on from generation to generation. Small fired clay brick producers have no incentives to introduce alternate technologies, which require new investments, training to stabilize the operation, and a different business practice in long term perspective. Production and use of burnt clay bricks are therefore considered to be the most common practice at present and is expected to remain a common practice in the future unless significant regulatory mechanisms are evolved and enforced effectively.

In spite of various superiorities of the FaL-G brick over clay brick, the grey color (imparted by the color of fly ash) of FaL-G products creates a barrier in terms of low consumer acceptance. This is the common observation made by consumers during various informal explorations of market prospects for FaL-G bricks by different promoters. In addition to the color, the presence of ash in the product also creates negative and sentimental perception on the quality of the product.

FaL-G brick uses cost-intensive raw materials such as cement/lime and gypsum. The other raw material, stone dust is also costlier than clay used for clay bricks, as the latter is excavated without compliance to cess payment in majority of the cases. Hence FaL-G brick loses to clay brick on price front in various parts of the country. In his paper, Fly ash-Lime-Phosphogypsum cementitious binder: A new trend in bricks, Kumar from BIET, Jhansi, reports, “Some beneficiation is needed to increase the strength of FaL-G bricks. The Process of beneficiation increases the cost of bricks considerably compared to the burnt clay bricks”(http://www.springerlink.com/content/f376400212484564/).

To facilitate penetration, Union Government has exempted FaL-G brick from duties (http://indiabudget.nic.in/bspeech/bs199192.pdf), which, however did not help due to meagre relief at tiny sector level. Meanwhile, from fiscal year (2006), the product has been imposed with excise duty (http://indiabudget.nic.in/ub2006-07/cen/exnotecex.pdf). Moreover, fly ash bricks, which enjoyed tax exemptions till 2004, have been suffering taxes with implementation of VAT (Value Added Tax) by different states since 2004. Though duties and taxes are applicable for clay brick industry, the activity, being positioned in unorganised sector with socio-political overtones, does not comply with tax regime, as against that of FaL-G bricks in organised sector (http://www.fal-g.com/Lr_to_Editor_ET_on_Dr_Chand_article.pdf). Thus the price disparity has become one more barrier for the promotion of FaL-G technology.
In this background CDM revenue helps as follows:

- Part of the CDM revenue is used for technological upgradation and support from INSWAREB who also conduct programs for market development and capacity building, which benefits SPEs of this bundle in particular and FaL-G brick industry at large.
- Out of the revenue transferred to the SPEs, a portion of the revenue is utilised to meet the price competition with clay bricks and the remaining revenue is utilised to meet continued high-quality operation, production as well as product promotion.

[3] 1 crore = 10 million

Technological Barriers

FaL-G technology in particular, requires a recipe control of 3 main ingredients namely fly ash, lime/cement and gypsum plus water at the mixing step. This is followed by manual/mechanical casting and lining up the bricks on the platform or casting yard for drying for one or two days. The dried up bricks are stacked and cured with water for one to two weeks, depending on the ambient temperature upon which the product is ready for despatching to the market.

FaL-G is a proven technology in terms of the strength for use in walling material. However, the technology needs to be promoted among the entrepreneurs, and technical skills of artisans need to be developed for large scale implementation of technology.

Two important technical features that have led to high-risk perception of FaL-G are discussed below.

Sourcing of raw materials**:** In contrast to the clay brick industry, where the basic raw material is the soil and available in and around the production sites, FaL-G technology and products require fly ash, cement and/or lime and gypsum as key ingredients. These ingredients are required to be tested, selected and sourced from industrial facilities, where they are produced. FaL-G Plants are therefore required to be carefully located unlike the traditional clay brick plants, which require only the supply of adequate amount of soil.

Operating within the specified limits for right chemistry**:** FaL-G technology, unlike the traditional clay brick making, requires recipe control of 3 main ingredients namely fly ash, cement/ lime and gypsum plus water and fine aggregate at the mixing step. In case there are changes in the sources of the raw materials, the chemistry as well as the recipe needs to be reworked. This is perceived as an interruption to plant operation leading to production loss.

In this context the observations of Professor from University of California, Berkeley, Dr PK Mehta, at an International Conference, makes an interest reading to perceive the scientific values of FaL-G technology. He observes,

"Industrial fly ash and slags happen to differ widely in both the phase composition and particle size, which, of course, influence their reactivity. A particular application may require a relatively reactive material; others may not require high reactivity. Thus, instead of an outright rejection of byproduct materials on account of differences in reactivity, an integrated approach to safe and economical disposal of these materials would require innovative match-making to find suitable homes within the cncrete construction industry for every type of fly ash and slag produced. Bhanumathidas and Kalidas at the Institute for Solid Waste Research & Ecological Balance, Visakhapatnam, souther India, have developed the technology to make fly ash-lime-gypsum or fly ash-portland cement bricks and blocks. By disregarding the standard chemical and physical requirements for use of fly ash in the cement and concrete industries, the authors found that tailor-made blends of even non-standard fly ashes with lime and gypsum or with Portland cement produced adequate strength on normal curing." (ref: PK Mehta, *Role of Pozzolanic and Cementitious Material in Sustainable Development of Concrete Industry;* Proceedings of Sixth CANMET/ACI International Conference on fly ash, silica fume, slag in natural pozzolans in concrete at Bangkok, 1998 pp.9 and 10).

The above observations of Prof Mehta ratifies the barriers discussed above with regard to judiciousness in procurement of raw materials and then developing commensurate recipes to achieve tailor-made process to yield standard products of FaL-G. In this direction hand-holding of entrepreneurs is essential that is

possible only through systematic technology transfer. Wherever entrepreneurs have deviated from this disciplinary requirement, there are instances of quality abuse and criticism from market forces.

Though FaL-G is the Patented Technology, the promoters of the technology are working with the objective of promoting eco-friendly (green) product and are keen to support wide proliferation of this technology. The Licensors have not been rigorously enforcing the patent due to their vision that this technology has the potential to provide a large environmental benefit to the country by encouraging production of FaL-G bricks; and the associated high legal cost of enforcement of the patent on brick-makers across the country. However, a number of unlicensed plants were utilising pirated technology and producing poor quality fly ash bricks. To provide an incentive for all type of brick-makers to use genuine FaL-G technology and seek technical advice and support, this project was created with the following objectives:

- The first prerogative of a FaL-G plant desirous to participate in CDM is to become Licensee, practice the technology in a methodical manner and manufacture the product with quality standards.
- As the technology fee is taken care by the CDM-Revenue, this technology-interaction is possible primarily because of participation in CDM project.
- Moreover, these licensed plants get the benefit of receiving 'Improvement Information' of the technology from INSWAREB from time to time.

To accomplish this task, as resolved vide a special Resolution No. 42/I, INSWAREB keep conducting the Technology-awareness programs in order to sensitise entrepreneurs and market forces such as construction agencies, engineers, builders and contractors about the virtues and opportunities of this technology and its linkage to CDM. Much of the budget for these workshops is derived out of Technology fee.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As per approved methodology III-Z project activity emissions (PEy) consist of those emissions associated with the use of electricity or fossil fuel or both and are calculated in accordance with the "Tool to calculate baseline, project and /or leakage emissions from electricity consumption" (Version 01) and/or "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (tCO_2e) (Version 02).

FaL-G plants do use electricity and/or diesel. In general wherever electricity is available, the same is used in the plant and, in places where electricity is not available, diesel is used to run the plant. However, in a few cases, some of those who run the plants with electricity do keep provision to operate diesel based generators in order to overcome intermittent power breakdowns.

<u>Estimating emissions from electricity consumption</u>

"Tool to calculate baseline, project and /or leakage emissions from electricity consumption" (Version 01) discusses the applicability of three scenarios to adopt the tool. Out of these three 'Scenario A' as given below is applicable for project activity.

Scenario A*: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or. If any on-site captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption.*

As per the tool the project emissions from the electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor for transmission losses, as follows:

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1+TDL_{j,y})$$ **Eq.1**

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)

TDLj,y Average technical and transmission and distribution losses for providing electricity to source j in year y

For determining the emission factor for electricity generation the tool facilitates to use conservative default value of 1.3 tCO_2 / MWh under Option A2 if Scenario A applies only to project and/ or leakage electricity consumption sources but not to baseline electricity consumption sources. Project activity falls under Scenario A hence uses the recommended default value of 1.3 tCO_2/ MWh for emission factor for electricity consumption as against the IPCC default value of 0.9 tCO_2/MWh power generation. In the background of considering the conservative default value together with TDL, no additional TDL factor is considered in the project emissions due to electricity.

Thus project emissions due to electricity consumption are computed as below:

$$PE_{ECy,} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y}$$ **Eq.2**

$PE_{EC,y}$ 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)

In arriving to baseline emissions total (actual) electricity consumption without any deductions would be taken as a conservative approach.

The responsibility for calibration of power meters lies with the State Electricity Board. The State Electricity Board is required to follow the national standard set by the Central Electricity Authority, Ministry of Power, Government of India, Clause 18 of Gazette Notification No. 502/70/CEA/DP&D dt. 17.3.2006, to undertake calibration of power meters once in 5 years. The consumer does not have any control over the process. Currently, State Electricity Boards do not have established calibration schedules and the government regulation is also not enforced stringently, especially for domestic consumers and small scale industrial consumers, like the FaL-G plants.

In states like Tamil Nadu the calibration of electricity meters is not being done in consumer and SSI segments irrespective of the capacities of the meters. Some states such as Andhra Pradesh took an internal stand that meters with connected load of 20 HP and above would be calibrated, but even this practice is not adhered to due to operational complexities. The production units located in remote areas and having below 20 HP are the worst hit on this issue. The sealed meters of Service Provider cannot be touched, even if the SPE opts to get it calibrated by private accredited agency. In this background, in order to comply with MVM, any one of the following three alternate steps would be adopted:

1) The SPEs would approach their service providers insisting for calibration and, wherever they are successful, relevant calibration/testing certificates would be obtained.
2) If the Service Providers opt, the meter would be replaced by another tested meter, as provided by clause 18 (2) of Gazette Notification No. 502/70/CEA/DP&D dt. 17.3.2006 and relevant test certificate would be obtained.
3) Wherever the SPE feels that Service Providers are unavailable /inaccessible to attend for calibration, SPE would install another (supplementary) meter following the main meter of Service Provider, and this supplementary meter would be subjected for calibration by approved agency once in 3 years.

Upon Registration of the project, the SPEs would be insisted to get the Calibration certificate in the first year and once in three years thereupon during the Crediting Period.

<u>b). Estimating emissions from diesel consumption</u>

Wherever electricity supply is not available, diesel is used to run the equipments and machinery in the plant. Consumption of diesel in the plant is monitored and recorded on a monthly basis, from which the annual consumption is calculated.

As per “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 01) CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the default values of CO_2 emission factor of those fuels as follows:

$$PE_{FC,j,y,} = \sum_i FC_{i,j,y} \text{ x } COEF_{i,y}$$

$PE_{FC},_y$ = Project emissions from fossil fuel combustion in year y (tCO_2/yr)

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

$COEF_{i,y}$ = CO_2 emission coefficient of fuel type i in year y (t CO_2/ mass or volume)

i = fuel types combusted in process j during the year y

Tool suggests calculating CO_2 emission coefficient based either on chemical composition or on net calorific value multiplied with CO_2 emission factor of the fuel type. In the present calculation the latter approach is considered. Accordingly the equation is as follows:

$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$

Where:

COEFi,y = the emission coefficient of fuel typei in year y (t CO2/mass or volume unit)
NCVi,y = the weighted average of net calorific value of the fuel type I in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = the weighted average CO2 emission factor of fuel type I in year y (t CO_2/GJ)
i = the fuel types combusted in process j during the year

Tool suggests four alternates for emission factor of diesel out of which one recommendation is to use IPCC default value. This is recommended in the absence of invoices, providing emission factors by the fuel supplier. The project activity consists of small scale units those purchase the diesel from retail dealers in small quantities but not on contract basis. Under these conditions no suggested data would be available. Hence recommended IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC guidelines on National GHG Inventories are taken for emissions from diesel.

Based on above, project emissions due to diesel consumption are computed as below:

$$PE_{FC,y,} = \sum_i FC_{i,jy} \times NCV \times EF_{CO2y} \qquad \textbf{Eq.3}$$

$PE_{FC,y}$ = Project emissions from diesel consumed in year y (tCO_2/yr)

FC_y = Quantity of diesel consumed during the year y (litres/yr)

NCV_F = Net calorific value of diesel (GJ/t)

EF_{CO2y} = CO_2 emission factor (tCO_2/GJ)

The total project emissions PEy due to the project activities within the project boundary is thus represented by the formulae

$$PEy = \Sigma (PE_{ECy} + PE_{FC,y}) \qquad \textbf{Eq. 4}$$

c). Estimating emissions due to leakage:

As per AMS-III.Z leakage is applicable in the case of project activities involving change in production process or a change in type and quantity or raw and /or additive materials as compared with the baseline. The incremental emissions associated with the production/ consumption and transport of those raw materials consumed as compared to baseline, shall be calculated as leakage.

The activity outside the project boundary that leads to CO_2 emissions is the transport of raw materials to the FaL-G plants. Since substantial transport activity (for soil and coal) also occurs in the baseline to support clay brick activity (the baseline activity), as well as to support waste disposal activity (for various kinds of wastes - fly ash, gypsum etc.), net emissions associated with transport of raw materials, as per computation below, are observed to be insignificant and hence not included in the project emissions.

Emissions due to transport of raw materials

In the baseline activity

Production of bricks avoided, m^3/year	**4500**
Thermal energy requirement, GWhth/year @ 0.000725 GWhth/m^3	3.2625
Thermal energy requirement, kcal/year	2805245056
Thermal energy, kcal/year, after discounting for 5% use of biomass	2664982803
Calorific value of coal, kcal/kg	4500
Coal requirement, tons/year	592.2
Distance of availability of coal, kms	100-1000
Average distance of coal availability, kms	550
No. of trips @10 tons/trip	59.2
Diesel consumption, litres/year @ 4 litre/km	8143
CO_2 emission due to transport of coal, tCO_2/year@0.0032tCO_2/litre	**26.1**

In the project activity

For a typical FaL-G plant with production capacity of 4,500 m^3/ year

Lime route:

	Fly ash	**Lime**	**Gypsum**	**Stone dust**
Raw material requirement as % of product weight	14.50	8	2.50	75
Quantity in tons/year (FaL-G production @4,500 m^3/year)	1305	720	225	6750
Typical distance of raw material availability, kms	50-150	50-200	100-1000	10-50
Average distance of raw material availability, kms	100	125	550	30
Truck capacity, tons/trip	10	10	10	10
No. of trips per year	130.5	72	22.5	675
Distance travelled, kms/year	13050	9000	12375	20250
Fuel efficiency of trucks, km/litre	4	4	4	4
Diesel consumed, litres/year	3262.5	2250	3093.75	5062.5
CO2 emissions from diesel consumption @0.0032tons/litre(t CO_2/year)	10.44	7.2	9.9	16.2
CO_2 emissions due to transport of all raw materials = 10.44+7.2+9.9+16.2 t CO_2/ year	**43.74**			

OPC route

	Fly ash	**OPC**	**Gypsum**	**Stone dust**
Raw material requirement as % of product weight	15.2	4.0	0.8	80
Quantity in tons/year (FaL-G production @4,500 m^3/year)	1368	360	72	7200
Typical distance of raw material availability, kms	50-150	50-200	100-1000	10-50
Average distance of raw material availability, kms	100	125	550	30
Truck capacity, tons/trip	10	10	10	10
No. of trips per year	136.8	36	7.2	720

Distance travelled, kms/year	13,680	4500	3960	21600
Fuel efficiency of trucks, km/litre	4	4	4	4
Diesel consumed, litres/year	3420	1125	990	5400
CO_2 emissions from diesel consumption @0.0032tons/litre(t CO_2/year)	10.9	3.6	3.17	17.28
CO_2 emissions due to transport of all raw materials = 10.9+3.6+3.17+17.28 t CO_2/ year	**34.95**			

As per above computation of emissions due to transportation of the raw materials results as follows:

For baseline activity: 26.1 t CO_2
For project activity: 35 to 44 t CO_2 depending on the FaL-G recipe.

In the absence of data for energy consumption towards fly ash disposal, related leakage could not be computed. Otherwise, this is additional energy that the project conserves by consuming fly ash.

From above values it is evident that the net emissions out of transport are meagre and thus ignored.

In this project cement and lime are two inputs with significant emissions during their production and, thus need to be considered in the leakage computation.

As per AMS-III.Z cement and / or lime would be monitored as per purchase bills and taken for computing leakages vide equations 5 and 6 respectively as below:

Leakage due to cement:

$E_{L,x} = E_{x,OPC} = Q_{OPC} \times EF_{OPC}$ **Eq.5**

Where
Q_{OPC} = Quantity of OPC purchased (tons)
EF_{OPC} = CO_2 emission factor for OPC (tCO_2/ ton OPC)

Even though PPC is used the emission factor of which is lower in comparison to OPC, emission factor of OPC will be taken for computation as a conservative approach.

Leakage due to mineral lime:

$E_{L,x} = E_{x,ML} = Q_{ML} \times EF_{ML}$ **Eq.6**

Where
Q_{ML} = Quantity of mineral lime purchased (tons)
EF_{ML} = CO_2 emission factor for mineral lime (tCO_2/ ton mineral lime)

EF_{ML} is arrived based on lime purity, which is tallying with IPCC default value

The total emissions due to leakage E_L is represented by the formulae

$$E_L = \sum_x E_{L,x}$$ **Eq.7**

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Estimating Baseline emissions:

Baseline Emissions are computed based on production of bricks and blocks in terms of m^3 as follows:

$BEy = EF_{BL} * P_{PJ,y}$ **Eq .8**

where

BEy = The annual baseline emissions from fossil fuels displaced by the project activity in t CO_2e in year (of the crediting period)

EF_{BL} = The annual production specific emission factor for year y, in t CO_2/kg or m^3

$P_{PJ,y}$ = The annual net production of the facility in year y, in kg or m^3
The annual production specific emission factor (EF_{BL}) can be calculated ex ante as follows:

$EF_{BL} = (FC_{BL,i,j} \times NCV_{j} \times EF_{CO2,j}) / P_{Hy}$ **Eq .8 (i)**

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 units

NCV_{j} = Average net calorific value of fuel type *j* combusted, TJ per unit volume of mass unit

$EF_{CO2,j}$ = CO_2 emission factor for fuel type j combusted in the process *i* in t CO_2/TJ

P_{Hy} = Average annual historical baseline brick production rate in units of weight or volume, kg or m^3

While Eq 8 gives gross emission in the baseline, biomass correction factor of 0.05 is taken for emissions and are deducted from gross emissions to be more conservative as already discussed under B.4. Thus net baseline emissions are computed as below and shown in ex-ante calculations of emission reductions.

Net BEy,x = BEy (1-0.05) **Eq. 8 (ii)**

The total emissions $BE_{y,\ total}$ in the baseline is represented by the formula

$BE_{y,\ total} = \Sigma$ Net BEy,x **Eq 9**

Emission Reductions:

Emission reduction generated by the project consisting of 42 plants (x=42) as computed by Eq.10 below is the difference between the baseline emissions, as represented by Eq.9 and, the project emissions as per Eq.4 and emissions due to leakage vide Eq.7

$ER = \sum(BEy,_{total} - PEy - E_{L,x})$ **Eq. 10**

Various assumptions and values used in the above calculations are given in Annex 3

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**EF_{BL}**
Data unit:	t CO_2/ m^3
Description:	The parameter is Annual production specific emission factor. The units are derived based on the calorific value of fuel, which was duly documented by TERI.
Source of data used:	TERI (Emission Standards for Brick Kilns-an opportunity for technology upgradation. (http://www.brickindia.com/articledetail.asp?id=36&cat=5)
Value applied:	0.2683 t CO_2/ m^3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline coal consumption is determined considering different technologies used in the production of burnt clay bricks, as studied by TERI at national level. The results of the study are given vide Table 1.1. Since it is difficult to determine precisely a particular technology that would be used in the absence of project activity, a weighted average coal consumption of these technologies is considered to best represent the baseline coal consumption in lieu of the weighted average energy use suggested by methodology. The annual production specific emission factor is thus computed based on the weighted average coal consumption. Use of biomass represents less than 2% in terms of fuel input in the production of clay bricks, which is conservatively taken as 5%, keeping in view the periodical escalation that may take place in the future.
Any comment:	This value is fixed ex-ante. Whenever two different data are available, it is always safe to consider the data on higher side, as an approach of abundant conservation to avoid controversy.

Data / Parameter:	**EF_{EL}**
Data unit:	t CO_2/ MWh
Description:	The parameter is emission factor for electricity. The value for emission factor is taken from the Tool to make the project emissions due to electricity to be on higher side and ERs as conservative.
Source of data used:	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01)"
Value applied:	1.3 ton CO_2 per MWhe.
Justification of the choice of data or description of measurement methods and procedures actually applied :	AMS-III.Z recommends calculating the project emissions in accordance with the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01)". The tool has given options for determining the emission factor for electricity generation, and facilitated to adopt a conservative default value of 1.3 t CO_2/ MWh as one of the options. In this background the default value is taken for emission factor.
Any comment:	The emission factor for electricity is fixed ex-ante. As and when there is revision in this value the revised value will be taken for Verification.

Data / Parameter:	**EF_{CO2}**
Data unit:	**tCO_2/T J**
Description:	The parameter is emission factor for diesel which is taken from 2006 IPCC Guidelines.
Source of data used:	2006 IPCC Guidelines on National GHG Inventories:' Table 1.4 -Default CO_2 Emission factors for Combustion' of Chapter 1 of Vol 2. Default value at the

	upper limit of the uncertainty at a 95% confidence interval is taken as recommended.
Value applied:	74.8 t CO_2/ TJ
Justification of the choice of data or description of measurement methods and procedures actually applied:	AMS-III.Z recommends calculating the project emissions from fossil fuel in accordance to the "Tool to calculate project or leakage emissions from fossil fuels (Version 02)". The tool has given four options for emission factor from diesel out of which IPCC default value is one option. This can be adopted in the absence of invoices by fuel supplier containing the emission factors. Such data are not available with small scale units who purchase diesel in small quantities.
Any comment:	The emission factor taken from IPCC 2006 is fixed ex-ante. However should there be any revision in IPCC values in future the same would be taken for Verification.

Data / Parameter:	**NCV**
Data unit:	**T J/Gg**
Description:	The parameter is Net Calorific Value for diesel which is taken from 2006 IPCC Guidelines.
Source of data used:	2006 IPCC Guidelines on National GHG Inventories:' Table 1.2 -Default Net Calorific Values (NCVs)' of Chapter 1 of Vol 2. Default value at the upper limit of the uncertainty at a 95% confidence intervals is taken as conservative approach.
Value applied:	43.3 TJ/Gg
Justification of the choice of data or description of measurement methods and procedures actually applied:	NCV is used in the calculation of emission factor vide "Tool to calculate project or leakage emissions from fossil fuels (Version 02)" as recommended in AMS-III.Z. The tool has given four options for NCV of diesel out of which IPCC default value is one option. This can be adopted in the absence of invoices by fuel supplier containing the NCV. Such data are not available with small scale units who purchase diesel in small quantities.
Any comment:	The Net Calorific Value (NCV) of diesel, taken from IPCC 2006, is fixed ex-ante. However should there be any revision in IPCC values in future the same would be taken for Verification.

Data / Parameter:	ρ
Data unit:	**Kg/KL**
Description:	The parameter is density for diesel which is taken from Society of Indian Automobile Manufacturers (SIAM).
Source of data used:	Society of Indian Automobile Manufacturers
Value applied:	820 kg/KL
Justification of the choice of data or description of measurement methods and procedures actually applied:	Density of diesel is required for converting volume to mass units. "Tool to calculate project or leakage emissions from fossil fuels (Version 02)" as recommended in AMS-III.Z has given three option for this value out of which Regional or national default values can be used. This can be adopted in the absence of invoices by fuel supplier. Such data are not available with small scale units who purchase diesel in small quantities.
Any comment:	The density of diesel, taken from SIAM is fixed ex-ante. However should there be

	any revision in SIAM values in future the same would be taken for Verification. Default value of NCV is applicable on weight basis, whereas the data from SPEs is monitored on volume basis based on the purchase bills that are mentioned with units in litres. Hence litres would be multiplied by density of 820kg/KL (http://www.siamindia.com/scripts/Diesel.aspx) in order to arrive to weight-units (tons).

Data / Parameter:	**EF_{OPC}**
Data unit:	t CO_2/ ton of cement
Description:	The parameter is emission factor for OPC, which is on higher side for conservative approach
Source of data used:	National average based on prevailing production practices of cement production in the country
Value applied:	0.82 ton CO_2 per ton of cement as conservative approach.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The value is taken based on the technical coverage in Press Information Bureau, Government of India. http://www.pib.nic.in/release/release.asp?relid=55724 With more and more concern for energy efficiency and conservation of fuel, cement industry in India is striving to reduce the emission factor for OPC. This has resulted in emission factor at as low as 0.77 in some cement plants. However a factor of 0.82 is taken as a conservative value.
Any comment:	This value is fixed ex-ante.

Data / Parameter:	**EF_{ML}**
Data unit:	t CO_2/ ton of CaO
Description:	The parameter is emission factor for mineral lime and is taken based on the commercially available lime .
Source of data used:	2006 IPCC Guidelines for National Green House Inventories; Table 2.4 of Volume 3.
Value applied:	0.42 t CO_2/ ton of CaO
Justification of the choice of data or description of measurement methods and procedures actually applied:	In the general practice lime from mineral source is available with a purity of 30-45% in terms of CaO that results in lesser emissions. However to ensure conservativeness, the highest lime purity of 53% for commercial limes is taken into consideration, and emission factor is computed using the stoichiometric ratio of 0.785 tones CO_2/ ton of CaO as per above referred table.
Any comment:	The emission factor for lime is fixed ex-ante. However should there be any revision in IPCC values in future the same would be taken for Verification.

B.6.3 Ex-ante calculation of emission reductions:

Table below gives the computed net emission reductions after taking into consideration various assumptions and values as per Annex 3.

Ex-ante calculations of emission reductions

Sl. No.	Identification Number	Parameters to be monitored				Project Emissions estimate			Leakage emissions	Baseline Emissions			Net Emission Reductions
		Brick/Block Production	Consumption: Electricity	Consumption: Diesel	Consumption: OPC	Electricity consumption	Project Emissions			Gross Emissions	Less for Biomass	Net Baseline emissions	
		m^3/year	KWh_e/year	Litres/ year	Tons/ year	GWh_e/yr	tCO2/yr		t CO_2/ yr	tCO2/yr	tCO2/yr	tCO2/yr	tCO2/year
		A	B	C	D=Ax2x 0.04	E=B x 10^{-6}	F=E x 1.3 x 1000	G= C x 0.0032	H=Dx 0.82	I=A x 0.2683	J=I x 0.05	K = I - J	L=K-(F+G+H)
1	AP/RNG/III/1	2,930	3,516	**	234	0.00352	4.571	**	192.208	786.12	39.31	746.81	550.03
2	AP/NGD/III/2	6,000	7200	**	480	0.00720	9.360	**	393.600	1609.80	80.49	1529.31	1126.35
3	AP/NGD/III/3	10,000	12000.	**	800	0.01200	15.60	**	656.000	2683.00	134.15	2548.85	1877.25
4	AP/WRG/III/4	10,000	12000.	**	800	0.01200	15.60	**	656.000	2683.00	134.15	2548.85	1877.25
5	AP/GTR/III/5	5,000	6000	**	400	0.00600	7.800	**	328.000	1341.50	67.08	1274.43	938.63
6	AP/GTR/III/6	4,500	5400	**	360	0.00540	7.020	**	296.200	1207.35	60.37	1146.98	844.76
7	AP/GTR/III/7	4,000	4800	**	320	0.00480	6.240	**	262.400	1073.20	53.66	1019.54	750.90
8	AP/KRIS/III/8	4,000	4800	**	320	0.00480	6.240	**	262.400	1073.20	53.66	1019.54	750.90
9	AP/KRIS/III/9	4,000	4800	**	320	0.00480	6.240	**	262.400	1073.20	53.66	1019.54	750.90
10	AP/KRIS/III/10	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
11	AP/KRIS/III/11	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
12	AP/KRIS/III/12	8,000	9600	**	640	0.00960	12.480	**	524.800	2146.40	107.32	2039.08	1501.80
13	AP/KRIS/III/13	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
14	AP/KRIS/III/14	7,500	9000	**	600	0.009	11.700	**	492.000	2012.25	100.61	1911.64	1407.94

Ex-ante calculations of emission reductions

Sl. No.	Identification Number	Parameters to be monitored				Project Emissions estimate			Leakage emissions	Baseline Emissions			Net Emission Reductions
		Brick/Block Production	Consumption: Electricity	Consumption: Diesel	Consumption: OPC	Electricity consumption	Project Emissions			Gross Emissions	Less for Biomass	Net Baseline emissions	
		m^3/year	KWh_e/year	Litres/ year	Tons/ year	GWh_e/yr	tCO2/yr		t CO_2/ yr	tCO2/yr	tCO2/yr	tCO2/yr	tCO2/year
		A	B	C	D=Ax2x 0.04	E=B x 10^{-6}	F=E x 1.3 x 1000	G= C x 0.0032	H=Dx 0.82	I=A x 0.2683	J=I x 0.05	K = I - J	L=K-(F+G+H)
15	AP/KRIS/III/15	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
16	AP/KRIS/III/16	15,000	18000	**	1200	0.01800	23.400	**	984.000	4024.50	201.23	3823.28	2815.88
17	AP/KRIS/III/17	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
18	AP/KRIS/III/18	10,000	12000	**	800	0.01200	15.600	**	656.000	2683.00	134.15	2548.85	1877.25
19	AP/KRIS/III/19	9,000	10800	**	720	0.01080	14.040	**	590.400	2414.70	120.74	2293.97	1689.53
20	AP/KRIS/III/20	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
21	AP/KRIS/III/21	10,000	12000	**	800	0.01200	15.600	**	656.000	2683.00	134.15	2548.85	1877.25
22	AP/WG/III/22	9,500	11400	**	760	0.0114	14.820	**	623.200	2548.85	127.44	2421.41	1783.39
23	AP/WG/III/23	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
24	AP/WG/III/24	2,700	3240	**	216	0.00324	4.212	**	177.120	724.41	36.22	688.19	506.86
25	AP/EG/III/25	2,600	3120	**	208	0.00312	4.056	**	170.560	697.58	34.88	662.70	488.09
26	AP/VSP/III/26	5,400	8316	**	432	0.00832	10.811	**	354.240	1448.82	72.44	1376.38	1011.33
27	AP/VSP/III/27	5,000	6000	**	400	0.006	7.800	**	328.000	1341.50	67.08	1274.43	938.63
28	AP/VSP/III/28	5,400	6480	**	432	0.00648	8.424	**	354.240	1448.82	72.44	1376.38	1013.72

Ex-ante calculations of emission reductions

Sl. No.	Identification Number	Parameters to be monitored				Project Emissions estimate			Leakage emissions	Baseline Emissions			Net Emission Reductions
		Brick/Block Production	Consumption: Electricity	Consumption: Diesel	Consumption: OPC	Electricity consumption	Project Emissions			Gross Emissions	Less for Biomass	Net Baseline emissions	
		m^3/year	KWh_e/year	Litres/ year	Tons/ year	GWh_e/yr	tCO2/yr		t CO_2/ yr	tCO2/yr	tCO2/yr	tCO2/yr	tCO2/year
		A	B	C	D=Ax2x 0.04	E=B x 10^{-6}	F=E x 1.3 x 1000	G= C x 0.0032	H=Dx 0.82	I=A x 0.2683	J=I x 0.05	K = I - J	L=K-(F+G+H)
29	AP/VSP/III/29	15,000	18000	**	1200	0.01800	23.400	**	984.000	4024.50	201.23	3823.28	2815.88
30	AP/VSP/III/30	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
31	AP/VSP/III/31	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
32	AP/VZM/III/32	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
33	AP/SKL/III/33	4,500	5400	**	360	0.0054	7.020	**	295.200	1207.35	60.37	1146.98	844.76
34	AP/SKL/III/34	2,700	3240	**	216	0.00324	4.212	**	177.120	724.41	36.22	688.19	506.86
35	AP/SKL/III/35	10,000	12000	**	800	0.012	15.600	**	656.000	2683.00	134.15	2548.85	1877.25
36	TN/SLM/III/36	6,000	7200	**	480	0.00720	9.360	**	393.600	1609.80	80.49	1529.31	1126.35
37	TN/SLM//III/37	6,000	7200	**	480	0.00720	9.360	**	393.600	1609.80	80.49	1529.31	1126.35
38	ORS/KRD/III/38	3,500	4200	**	280	0.00420	5.460	**	229.600	939.05	46.95	892.10	657.04
39	CG/RAIP/III/39	4,500	5400	**	360	0.00540	7.020	**	295.200	1207.35	60.37	1146.98	844.76
40	CG/RAIP/III/40	5,000	6000	**	400	0.00600	7.800	**	328.000	1341.50	67.08	1274.43	938.63
41	CG/RAIP/III/41	3,100	3720	**	248	0.00372	4.836	**	203.380	831.73	41.59	790.14	581.95
42	CG/RAIP/III/42	3,100	3720	**	248	0.00372	4.836	**	203.380	831.73	41.59	790.14	581.95
	TOTAL	**248,930**	**300,552**	**	**19914**	**0.30055**	**390.718**	**	**16329.81**	**66787.92**	**3339.40**	**63448.52**	**46728.00**

OPC is popularly used in FaL-G production and in some cases OPC + lime are also used. As the emissions from OPC are certainly higher than those from lime, ex-ante calculations are done based on OPC.

B.6.4 Summary of the ex-ante estimation of emission reductions:

The table below summarises the results of ex-ante estimation of emission reductions for all the years of crediting period.

YEARS	Estimation of project activity emissions, (t CO_2 e)	Estimation of baseline emissions, (t CO_2 e)	Estimation of leakage (t CO_2 e)	Estimation of overall emission reductions, (t CO_2 e)
01/07/2012-30/06/2013	391	63,449	16,330	46,728
01/07/2013-30/06/2014	391	63,449	16,330	46,728
01/07/2014-30/06/2015	391	63,449	16,330	46,728
01/07/2015-30/06/2016	391	63,449	16,330	46,728
01/07/2016-30/06/2017	391	63,449	16,330	46,728
01/07/2017-30/06/2018	391	63,449	16,330	46,728
01/07/2018-30/06/2019	391	63,449	16,330	46,728
01/07/2019-30/06/2020	391	63,449	16,330	46,728
01/07/2020-30/06/2021	391	63,449	16,330	46,728
01/07/2021-30/06/2022	391	63,449	16,330	46,728
Total t CO_2 e	**3,910**	**634,490**	**163,300**	**467,280**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	**Production-**$P_{PJ,y}$
Data unit:	m^3 bricks/ blocks
Description:	SPE maintains the actual quantities of production in number on daily basis, based on each size of brick/block, which is duly converted to volume (m^3) to facilitate computations.
Source of data to be used:	Stock registers of SPE.
Value of data	248,930 m^3; used in ex-ante calculations
Description of measurement methods and procedures to be applied:	SPEs record the production of bricks/ blocks on daily basis. These are made available to PE once in a month.
QA/QC procedures to	Upon receipt of the monthly data on brick/ block production and fuel use

be applied:	(electricity and or /diesel) from the plants, PE will review the data. The personnel of PE will make periodical visits to SPEs' plants to check the diligence of record keeping and the accuracy for ultimate diligence of emission computations.
Any comment:	None

Data / Parameter:	**Electricity-$EC_{PJ,j,y}$**
Data unit:	kWh
Description:	The electricity consumption is monitored continuously by the Electricity Meter and recorded by the Service Provider (State Electricity Department) monthly or bimonthly based on which the Electricity bills are provided..
Source of data to be used:	Electricity bills provided by the service provider (state electricity department).
Value of data	300,552 kWh; used in ex-ante calculations
Description of measurement methods and procedures to be applied:	SPEs submit to PE the electricity bill as provided by the Service Provider. The information is verified and tallied with the records of SPE by the personnel of ECPL periodically. For this purpose ECPL personnel are imparted with in-house training.
QA/QC procedures to be applied:	Refer to Section B 6.1
Any comment:	NA

Data / Parameter:	**Diesel-FC_y**
Data unit:	Litre
Description:	Daily consumption of diesel would be provided by SPEs to PE on monthly basis.
Source of data to be used:	Stock register.
Value of data	0 litres; used in ex-ante calculations
Description of measurement methods and procedures to be applied:	SPEs record diesel consumption on daily basis and send the details to PE on monthly basis.
QA/QC procedures to be applied:	All the information is verified and tallied with the records of SPE by the personnel of ECPL periodically. For this purpose in-house training is imparted to ECPL personnel. Consumption is cross checked with the purchase bills.
Any comment:	NA

Data / Parameter:	**Cement-Q_{OPC}**
Data unit:	Tons
Description:	Purchase details are provided by the SPEs through monthly statement.
Source of data to be used:	Purchase bills of cement.

Value of data	19,914.40 tons; used in ex-ante calculations
Description of measurement methods and procedures to be applied:	Quantities of cement as per purchase bills would be taken for computation of leakages.
QA/QC procedures to be applied:	Upon receipt of the monthly data of purchase bills, the personnel of PE will make periodical visits to SPEs' plants to check the diligence of record keeping.
Any comment:	The leakage emissions for using Cement is derived based on the default values of national average.

Data / Parameter:	**Mineral Lime-Q_{ML}**
Data unit:	Tons
Description:	Purchase details are provided by the SPEs through monthly statement.
Source of data to be used:	Purchase bills of lime
Value of data	0 tons; used in ex-ante calculations
Description of measurement methods and procedures to be applied:	Purchase bills for mineral lime would be taken for computation of leakages.
QA/QC procedures to be applied:	All the information is verified and tallied with the records of SPE by the personnel of ECPL periodically. For this purpose in-house training is imparted to ECPL personnel.
Any comment:	The object of monitoring lime purchases is to compute the leakage emissions. Purchase bills may not be available when byproduct lime is procured. In such case delivery challans would be accepted for computing the quantity of procurement. The leakage is taken into account only when lime from mineral source is procured. In the case of by product lime, the data is recorded, but no leakages are accounted for as the same would not have any impact.

Data / Parameter:	**Performance of project brick/block in terms of Compressive Strength once in six months**
Data unit:	MPa
Description:	The brick/ block is tested in a Compressive strength Testing Machine (CTM) in any of the laboratories of polytechnics, engineering colleges, building centers, national laboratories etc., and the test certificates are provided by the laboratory.
Source of data to be used:	Test Certificate as provided by the testing laboratories
Value of data	NA
Description of measurement methods and procedures to be applied:	The test procedure is followed as per Annex 9
QA/QC procedures to be applied:	Calibration of CTM for strength test is taken care by respective laboratories and outside the project boundary.
Any comment:	NA

B.7.2 Description of the monitoring plan:

Day to day data wherever applicable will be recorded by the sub-project entity who sends monthly statements to project entity. These statements are reviewed for the diligence of data, which are then electronically archived for computation of emission reductions. All such archived data would be stored until two years after the end of the crediting period.

In order to ensure due diligence, the PE conducts periodical inspection of units randomly at any given time in a year. For this purpose the PE deploys monitoring personnel who visit the SPEs and inspect their records and tally with their monthly statements. Errors in data, if any, would be corrected at all points of archiving the data. The monitoring personnel would duly attest the records as a mark of inspection. The PE would randomly check the visits of monitoring personnel in order to ensure due compliance. Management structure for monitoring has been given in Annex 4.

Various templates are made to record the data to be monitored. The monitoring personnel of PE would be provided with such templates. As the steps involved in monitoring are simple, in-house training is imparted in recording the data and to translate the same into the computation of ERs.

Based on the monitoring requirements of AMS-III.Z as described under B.1, following records would be verified by Inspectors:

Production records:

- Stock register showing daily production

Raw materials inwards:

- Inward stock registers for fly ash, cement and/ or lime.
- Delivery Challans of thermal plants/boilers/Transporters for fly ash.
- Purchase bills of cement and lime
- Delivery Challans for byproduct lime in case of non-availability of purchase bills.

Diesel and/or Power Consumption data

The consumption of diesel is to be recorded on daily basis, and of power on monthly basis. In the case of diesel, the purchase bills would be verified for cross checking the consumption. In case of power, the meter reading and consumption as provided on the state electricity bill would be taken as record. .

The monitoring personnel keep inspecting the accredited units from time to time through checks and help the SPEs in optimum upkeep of the records in case any deviations are observed. The SPEs, who disregard the advice of monitoring personnel and prove continuously complacent in maintaining the stipulated records, would be dropped from the bundle and would not be entitled to receive carbon credits.

Performance criteria by testing Compressive Strength

The methodology requires making available the test certificates on the strength performance of bricks tested at six-month interval. In the context of testing of bricks/blocks, the SSC WG, at its 22nd meeting clarified that the testing can be undertaken based on the national/regional standards or guidelines applicable to the type of project activity bricks. Testing can also be undertaken as per the procedures provided by the technology provider as long as the testing methods can be substantiated with reference to peer reviewed literature i.e. relevant international journal publications, publications of

national/international building research centres etc. As long as the testing procedures in the guidelines/standards are met, the testing itself can be undertaken in polytechnics, engineering colleges, building centers, national laboratories etc.

Accordingly the test procedure vide Annex 9 shall be adopted and the bricks be tested for their compressive strength at six month interval.

The only code applicable for fly ash bricks in IS: 12894. However, this test procedure has erratically asked for strength test in the lines of tests applicable for clay bricks due to the nomenclature of bricks. As bricks are by and large sold in the market based on physical appearance, with out relying upon codes, there was no concern to challenge the code nor to propose amendment. In this background based on the recommendations of SSC WG at its 22nd meeting, INSWAREB, as the technology provider, has made available a test procedure considering the hydration chemistry, as applicable to that of cementitious products. Based on the above, the test certificates on the strength performance of bricks tested at six-month interval would be made available, as per test procedure vide Annex 9

Already there is a practice to procure the bricks/blocks at random from the SPEs and test them at the labs of INSWAREB-Building Centre. Also there is a practice to visit the SPE with mobile testing facility and conduct the tests on the product in as in where in condition on site. Hereafter, tests would be done in accordance to the procedure of Annex 9 and INSWAREB-Building Centre would provide certificates to the extent of possible. Wherever INSWAREB is unable to visit SPE with mobile testing facility, the SPEs shall be asked to furnish the test certificates from the labs of polytechnics, engineering colleges or local building centres.

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of Completion: 5th April 2006.

Name of person/entity determining the baseline:

Institute for Solid Waste Research & Ecological Balance
FaL-G Mansion
35. Shri Venkateswara Colony
Visakhapatnam 530012

Name of Contact person:
N Kalidas
Phone: ++91-891-2516411
Fax: ++91-891-2517429
Mobile: ++91-98481-91453

The entity, Institute of Solid Waste Research and Ecological Balance is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

01/02/2004

C.1.2. Expected operational lifetime of the project activity:

20 Years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

N.A

C.2.1.1. Starting date of the first crediting period:

N.A

C.2.1.2. Length of the first crediting period:

N.A

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/07/2012

C.2.2.2. Length:

10 years.

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

FaL-G plants, being very small industrial activities, do not require any environmental impact assessment study. However, the Project Entity has carried out an environmental and social review of the project. The analysis reveals that FaL-G activity is environmentally benign and has several positive impacts. The principal beneficiaries of the project include

- Local communities: due to reduced negative environmental impacts from the traditional clay brick manufacturing process, such as land degradation and heavy air pollution, as well as reduced waste from better fly ash utilisation options.
- The global community, due to the expected reduction in GHG emissions and contribution for reduction to climate long-term change.
- Industrial and utility sectors, which would benefit from the reduced cost of waste disposal due to increased off-take by the FaL-G manufacturers.

The significant positive impacts on environment associated with the project largely outweigh the few negative impacts, which are mostly linked to the simple operational practices that are followed in small and micro scale FaL-G plants. These impacts are however manageable. The Project Entity has developed

an Environment Management Plan/Good Practice Manual, which will be implemented at all the FaL-G plants. In addition, a specific Community Benefit Program has also been designed for the benefit of the workers**.** All these issues are documented as Environment & Social Review (ESR), which is an exhaustive document. Hence the salient features of ESR have been made into an action-plan document called Environment Monitoring and Community Benefit Plan (EMCBP), which is attached as Annex 5.

The EMCBP is included in Sub-Project Agreement already signed between PE and SPEs. Accordingly all the SPEs have to implement EMCBP, which would be periodically monitored by Project Entity. Disciplinary action would be taken if SPEs prove as non-compliant.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

N.A

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

The yardsticks adopted in seeking stakeholders' comments on environmental impacts for scheduled industries in medium and large-scale sector are of different dimension. This project being an agglomeration of tiny sector units scattered over a large geographical area, no special process has been adopted to invite the comments at National level.

Extensive consultations, involving a wide spectrum of stakeholders, have been carried out in the form of promotional workshops during the past years by INSWAREB on FaL-G technology. While some of these workshops were at district level, some were relatively big events. The one conducted in 2001(October 18-19) and the two in 2003 (19.04.2003 at Cuddapah, and September 26-27 at Hyderabad) were some such events. The recent workshops include those conducted in Visakhapatnam & Hyderabad (Andhra Pradesh) and Bhubaneswar (Orissa) in Aug 2007, at Raipur (Chhatisgarh), Tatanagar (Jharkhand) and Vijayawada (Andhra Pradesh) in 2008 and at Pune (Maharashtra), Coimbatore (Tamil Nadu) and Visakhapatnam (Andhra Pradesh) in 2009.

The workshops were conducted under knowledge dissemination program, therefore no registration fee was collected and the workshops were open to all interested participants. Government engineers, civil and structural consultants, builders, construction houses, researchers, and faculty from academic institutes and engineering colleges attended the workshops, in addition to the entrepreneurs practicing FaL-G technology and those who have interest to set up the units.

The project sponsors also carried out several formal and informal consultations at different sites, targeting a range of stakeholders since 2003 that included

a) The entrepreneurs
b) The brick consumers
c) The local residents
d) The workers, manufacturing FaL-G blocks at FaL-G plants.
e) The suppliers of raw materials.

E.2. Summary of the comments received:

It may be noted that brick entrepreneurs, brick consumers, the local residents, the brick workers and the raw material suppliers are the principal stakeholders associated with the FaL-G activity. The response by the stakeholders has been generally positive about the product and the technology. However, certain concerns of these stakeholders are summarised below.

FaL-G Entrepreneurs

These entrepreneurs felt that carbon credits would help them in giving discounts in order to face stiff price competition from clay bricks.

They consider that the credits would be certainly an incentive to enthuse them in order to produce more FaL-G bricks and blocks and abate more CO_2.

Several of them reflected the positive contribution of the project activity in contributing to the environment.

Some of them questioned the authenticity of price and striking the deal at specified price.

FaL-G consumers

The consumers wondered whether they would get reduction in price of FaL-G blocks to the extent of credits received by their supplier. They argued that consumers were equally responsible for the generation of credits and, hence, it would be fair that the entrepreneurs share the benefits with them.

Some of them admitted that, whether they get carbon benefits or not, FaL-G bricks were their product of choice for avoiding at least 10-15% wastage, which is unavoidable with clay bricks produced with poor quality of clay and insufficient sintering.

Some of the builders hoped that, encouraged by carbon credit mechanism, more and more entrepreneurs would take up the production to increase the supply position so that their projects do not suffer scarcity, more so while their construction project based on FaL-G were halfway through.

Local residents:

Local folks desired that the raw materials in bulk, such as fly ash and stone dust, be handled in wet state so that there would not be dust emanation.

Some of them wished to get more and more plants so that employment potential to the youth would brighten up.

Giving reference to the proximity of the plant, many of them ascertained that they would be getting more qualitative product over clay brick for their constructions with least transportation cost.

Some of them have shown interest to become entrepreneurs and get into FaL-G activity, if they were assured of the technology support and carbon credit incentive.

Brick Workers:

Some of the workers argued that they are part of the production process and, thereby, they deserve to get a portion of the carbon benefit?

One section of the workers expressed that, as long as they get wages promptly with no interruption of work, they would wish their employer to get more and more such incentives.

Raw material suppliers:

Almost all of them hoped that carbon incentive would ease the financial crunch of entrepreneurs and, in turn, may help in resolving undue payment-delays, which is a menace in construction industry.

E.3. Report on how due account was taken of any comments received:

As can be seen from the previous section, the comments received from various stakeholders are largely positive. The concern on dust emanation from FaL-G units is addressed by requiring the FaL-G units handle fly ash and stone dust in wet condition. The thermal plants do operate hydra-mixers so that the fly ash is delivered into the trucks of entrepreneurs without dust emanation. It is same with stone dust also.

With regard to workers' comments, FaL-G offers them continuity of work and wage-earnings, which is the basic need of a worker that could not be made possible with clay brick industry. In addition, a Community Benefit Plan comprising of welfare measures such as group insurance for accidents and death, and safe sanitation for workers will be implemented to enhance the workers' benefits.

Annex 1

CONTACT INFORMATION OF PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Eco Carbon Pvt. Ltd	
Street/P.O.Box:	I Floor, 32-10-55, Shri Venkateswara Colony, Sheila Nagar	
Building:	INSWAREB Laboratory Building	
City:	Visakhapatnam	
State/Region:	Andhra Pradesh	
Postfix/ZIP:	530012	
Country:	India	
Telephone:	++91-891-2516411	
FAX:	++91-891-2517429	
E-Mail:	info@co2credits.biz	
URL:	www.co2credits.biz	
Represented by:		
Title:	Mg. Director	Executive Director
Salutation:	Dr	Mr
Last Name:	Bhanumathidas	Kalidas
Middle Name:		
First Name:	Nateri	Nateri
Department:	Research & Development.	Business Development
Mobile:	++91-98483-69930	++91-98481-91453
Direct FAX:	++91-891-2517429	++91-891-2517429
Direct tel:	++91-891-2516411	++91-891-2516411
Personal E-Mail:	bhanukali@vsnl.com	bhanuintl@sify.com

Organization:	International Bank for Reconstruction and Development as Trustee of the Community Development Carbon Fund (CDCF)
Street/P.O.Box:	1818 H street NW
Building:	MC
City:	Washington
State/Region:	DC
Postcode/ZIP:	20433
Country:	USA
Telephone:	1202 458-1873
FAX:	1202 522 7432
E-Mail:	IBRD-carbonfinance@worldbank.org
URL:	www.carbonfinance.org
Represented by:	
Title:	Manager, Carbon Finance
Salutation:	Ms
Last Name:	Chassard
Middle Name:	
First Name:	Joelle
Department:	ENVCF
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Government of Italy acting through the Ministry for the Environment, Land and Sea
Street/P.O.Box:	Via C. Colombo, 4400147
Building:	
City:	Roma
State/Region:	
Postfix/ZIP:	
Country:	Italy
Telephone:	
FAX:	
E-Mail:	clini.corrado@minambiente.it
URL:	
Represented by:	
Title:	
Salutation:	Mr
Last Name:	Clini
Middle Name:	
First Name:	Corrado
Department:	Department for Sustainable Development, Climate Change & Energy
Mobile:	
Direct FAX:	+39 06 572 28 173
Direct tel:	+39 06 572 22 248
Personal E-Mail:	

Organization:	The State of the Netherlands acting through the Netherlands' Ministry of Infrastructure and the Environment(lenM)
Street/P.O.Box:	Rijnstraat 8
Building:	
City:	The Hague
State/Region:	
Postfix/ZIP:	2515 XP
Country:	The Netherlands
Telephone:	0031-70-339.5199
FAX:	0031-70-339.1306
E-Mail:	cdm.dna@minvrom.nl
URL:	
Represented by:	
Title:	
Salutation:	Ms.
Last Name:	Gerards
Middle Name:	
First Name:	Marisa
Department:	International Environmental Affairs
Mobile:	
Direct FAX:	0031-70-339.1306
Direct tel:	0031-70-339.5199
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No Public funding is availed.

Annex 3

BASELINE INFORMATION

Sl. No.	Parameter	Variable	Values	Units	Remarks
	Project related parameters				
	Emission factor of diesel	EF_{diesel}	74.8	tCO_2/GJ	IPCC 2006 default value vide Table 1.4 of Chapter 1/ Vol .2
	Emission factor for electricity	EF_{elec}	1.3	tCO_2/MWh_e	Methodological tool**
	Baseline related parameters				
	Density of conventional clay brick	$D_{clay\ brick}$	1.80	Tons/m^3	
	Annual Production specific emission factor	EEy	0.2683	t CO_2/ m^3	TERI Document
	Carbon Emission Factor for Coal	CEF_{coal}	25.8	tC/TJ	IPCC default
	Fraction of energy supplied by biomass in brick kilns	$R_{biomass}$	0.05		
	Carbon to CO_2 conversion factor	CC	3.666	tCO_2/tC	

** Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01)

Annex 4

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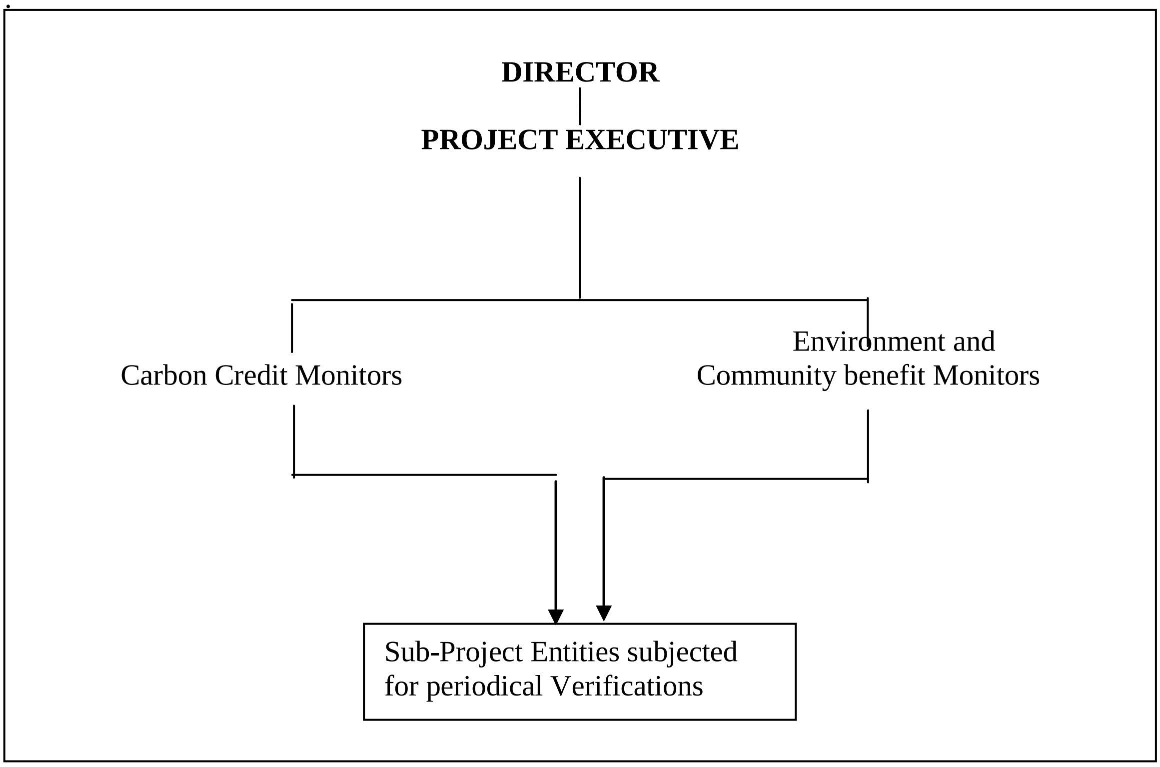
MONITORING INFORMATION

Management structure for monitoring activity



Annex 5:

Salient features of Environment Monitoring & Community Benefit Plan (EMCBP)

All the SPEs should have concern for the welfare of environment, workers and community while carrying on their production.

Measures under this plan, as notified in the table below, would be executed by SPEs, under due supervisory coordination from Project Entity.

Activity	Intensity of compliance	
Environment Monitoring Plan:		
To ensure covering raw materials with Plastic sheets, to prevent flying of dust.	Compulsory	
To increase the height of stack to a height of 2.0 mtr from workers-standing level, wherever diesel engines are used.	Compulsory	
To provide booklet to each worker on material handling and occupational health.	Compulsory	
Raw materials should be transported duly covered.	Compulsory	
Raw materials should be kept in closed conditions or wherever it is stored in open yards, it has to be duly covered.	Compulsory	
Bulk materials such as stone dust should be sprinkled with water to prevent dusting, during its storage in open yard.	Compulsory	
All internal roads may be paved and kept clean.		Optional, as good practice.
Minimise spillage of oils and grease through suitable preventive maintenance.	Compulsory	
Wherever DG sets are used, SPE should obtain necessary guidelines and adhere to them.	Compulsory	
SPE should avoid leakage and wastage of water. If possible, the surplus of the cured water may be recycled.		Optional, as good practice.
Community Benefit Plan:		
Insurance to Workers:		

Basis: 12 workers per SPE Janata Personal Accident To cover death, bodily injuries or permanent disability as a result of accident, upto Rs. 1.00 lakh. Swasthya Beema Individual Health Insurance policy to cover 24 hours of the day and not limited to place of employment.	Compulsory Compulsory	
Personal Protection Gadgets: Gum Boots, hand gloves and nose masks need to be given to workforce.	Compulsory.	
Health Check up for Workers: Each worker needs to be checked up for health once in a year.	Compulsory	
Toilets and bathing facility to workers together with taps, flush and overhead water tank:	Compulsory	
HIV Awareness program: All the workers need to be explained with virtues of safe sex and implications of AIDS.	Compulsory	
Protected Drinking water	Compulsory	
Do not employ child labour	Compulsory	
Ensure wage parity between male and female workers.	Compulsory	

Annex 6: List of SPEs

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output /yr in m^3	ERs achieved tCO_2/ year
Andhra Pradesh State		**North**	**East**					
Ranga Reddy Dist.								
Sri Venkateswara Fly Ash Products S. No. 612 (Pedda Amber pet) Laxmareddy Palem(V) Hayathnagar Mandal, Ranga Reddy Dist.	Major D. Bhushan Rao Proprietor 98485 92330	17.32	78.64	AP/RNG/III/1	June-07	2012-22	2,930	550.03
Nalgonda Dist.								
Chandra Fly Ash Bricks S. No. 11, Mahadev Pur (V) – 508 126 Bibinagar Mandal, Nalgonda Dist.	Ms. Y.Sita Mahalakshmi Proprietrix 98496 86666	17.48	78.83	AP/NGD/III/2	Sept-07	2012-22	6,000	1126.35
Sri Lakshmi Fly ash Brick Industry Ramapuram (V) Mellacheruvu Mandalam, Nalgonda Dist-508 246	Mr.Mekala Guru Prasad Proprietor 98481 87567	16.92	79.98	AP/NGD/III/3	Feb-04	2012-22	10,000	1877.25
Warangal Dist.								
Sri Hiranmai Bricks H.No 2-39/2, Kummarigudem Road, Madikonda Warangal Dist.	Mr. Pramod Kumar Mg. Partner 98490 30906	17.97	79.58	AP/WRG/III/4	Nov-07	2012-22	10,000	1877.25
Guntur Dist.								
Sri Lakshmi Venkateswara FaL-G Brick Industries D No: 446-2,Nelapadu (P)-522 201 Tenali (Mandal), Guntur Dist.	Mr. A Venkateswara Rao Mg. Partner 08644 – 651331 94402 63589	16.25	80.63	AP/GTR/III/5	May-05	2012-22	5,000	938.63
Sri Durga Fly ash Brick Industry Survey No .70/IB, G.T Road Opp. Anjaneyalu Tractor Shed, Near Selam Narayana Rice mill Mangalagiri – 522 503, Guntur Dist.	Mr. Ch.Durga Venkata Rama Rao Proprietor 94414 52524 08645-234735	16.40	80.57	AP/GTR/III/6	Apr-07	2012-22	4,500	844.76
Sri Venkata Triveni Fly Ash Brick Industry 11-277, S.No 777/4. Near Janakamma Temple Yerrabalem (P) Mangalagiri (M) Guntur Dist.	Mr. B. Srinivasa Rao Proprietor 94402 57228 08645-232808	16.43	80.55	AP/GTR/III/7	Sept-07	2012-22	4,000	750.90

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output/yr in m^3	ERs achieved tCO_2/ year
Andhra Pradesh State		**North**	**East**					
Krishna Dist.								
Sri Sai Raghava Fly Ash Bricks Industries D.No 14-448, Raju Peta, Tiruvuru (P), Krishna Dist.	Mr. E.Srinivasa Reddy Manager 98858 87707	17.10	80.62	AP/KRIS/III/8	Apr-04	2012-22	4,000	750.90
Sri Sai Bhargava Fly Ash Bricks Industries Patapadu (Post)- 521 212 Vijaywada (Rural), Krishna Dist.	Ms. E Jyothi Proprietrix 98858 87707	16.27	80.65	AP/KRIS/III/9	Aug-05	2012-22	4,000	750.90
Sri Sai Siva Brick Products RS No. 674/4, NH-9, New Bypass Road Nandigama, Krishna Dist	Mr. R.Ramesh 99632 70539	16.75	80.27	AP/KRIS/III/10	May-07	2012-22	4,500	844.76
Sri Sai Tulasi Brick Products RS No. 278/3, NH-9, Bypass Road Kanchikacherla (V)521 180 Krishna Dist	Mr. Y.Sambasiva Rao Manager 99083 31275	16.68	80.35	AP/KRIS/III/11	June-07	2012-22	4,500	844.76
Sri Venkateswara Fly ash Products. R.S No 44/1: Kachavaram (V) Ibrahimpatnam (Mandal), Krishna Dist	Mr. D.Srinivasa Rao Partner 98481 06236/ 98497 92032	16.60	80.47	AP/KRIS/III/12	Apr-07	2012-22	8,000	1501.80
Sri Sai Baba Fly ash Products R. S. No. 115/1A, NH-9 Road, Ibrahimpatnam (V) Krishna Dist	Mr. K. Krishna Kishore Partner 98480 47659	16.60	80.47	AP/KRIS/III/13	Jan-07	2012-22	4,500	844.76
Gayatri Brick Products RS No. 112/4A&5, S.M. Pet X-Road, Jaggaiah Pet - 521 175, Krishna Dist	Mr. D. Srinivasa Rao Manager 98661 23183/ 08654-226301	16.88	80.10	AP/KRIS/III/14	Oct-05	2012-22	7,500	1407.94
Sai Build Products 3-10, Kodalivari Street Enikepadu - 521 108, Vijayawada Rural (M) Krishna Dist.	Mr. K.V. Subba Rao Manager 93929 41458	16.52	80.70	AP/KRIS/III/15	Mar-05	2012-22	4,500	844.76

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output/ yr in m^3	ERs achieved tCO_2/ year
Andhra Pradesh State		**North**	**East**					
Perfect Concrete Products (P) Ltd S. No. 307/2, Paritala (V) Kanchikacharla (M), Krishna Dist.	Mr.V. Mahidhar Mg. Director 94408 01867	16.63	80.43	AP/KRIS/III/16	Sept-07	2012-22	15,000	2815.88
Sri Venkata Sai Fly ash Products R.S.No.779/2, NH-9 Road Paritala (V) Kanchikacherla (M), Krishna Dist.	Mr.K.Krishna Kishore Manager 98480 47659	16.63	80.42	AP/KRIS/III/17	Nov-07	2012-22	4,500	844.76
Sri Sai Fly ash Products R.S.No.777, NH.No.9 Road, Paritala (V), Beside Uma Holyday Inns Kanchikacherla (M), Krishna Dist.	Mr.K.Krishna Kishore Manager 98480 47659	16.63	80.42	AP/KRIS/III/18	Dec-07	2012-22	10,000	1877.25
Sri Venkata Ramana Fly ash Products R.S.No.780, NH-9 Road, Paritala (V) Kanchikacherla (M), Krishna Dist.	Mr.K.Krishna Kishore Manager 98480 47659	16.63	80.42	AP/KRIS/III/19	Nov-07	2012-22	9,000	1689.53
Sri Sai Krishna Fly ash Products R.S.No.779/2, NH-9 Road, Paritala (V) Kanchikacherla (M), Krishna Dist	Mr.K.Krishna Kishore Manager 98480 47659	16.63	80.42	AP/KRIS/III/20	Dec-07	2012-22	4,500	844.76
Suneetha Fly ash Products R.S.No.777, NH-9 Road, Paritala (V) Beside Uma Holyday Inns Kanchikacherla (M), Krishna Dist.	Mr.K.Krishna Kishore Manager 98480 47659	16.63	80.42	AP/KRIS/III/21	Nov-07	2012-22	10,000	1877.25
West Godavari dist.								
Sri Vasavi Fly Ash Concrete Pavers Canal Road, Ramachandra Rao Peta, Penugonda-534 320; WG Dist.	Mr. S.Peddi Reddy Manager 9440385229	16.65	81.73	AP/WG/III/22	Apr-04	2012-22	9,500	1783.39

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output/yr in m^3	ERs achieved $tCO_{2/}$ year
Andhra Pradesh State		**North**	**East**					
Sri Kanaka Durga Hydraulic Fal-G Brick Industry, Opp: Kakatiya Kalayana Mandapam, Bypass Road Chivatam,(Tanuku), WG dist.	Mr. S. Kanaka Durga Rao Manager 92474 98789 08819-224139	16.75	81.68	AP/WG/III/23	Apr-07	2012-22	4,500	844.76
Sri Kanaka Durga FaL-G & Cement Works Plot No.A-3 Industrial Estate Tetali (Via) Tanuku. WG Dist.	Mr. S. Kanaka Durga Rao Manager 94402 35955	16.75	81.67	AP/WG/III/24	Apr-07	2012-22	2,700	506.86
East Godavari Dist.								
Subha FaL-G Brick Industry D.No 1-215/C, Yanam Road, Uppalanka Karapa Mandalam, EG Dist.	Mr. T. Ramakrishna Reddy Manager 98486 25389	16.90	82.23	AP/EG/III/25	Jan-06	2012-22	2,600	488.09
Visakhapatnam Dist.								
Simhadri FaL-G Products, NH-5, Salapuvanipalem, Parvada Mandal, Visakhapatnam Dist.	Ms. A. Devika Rani Proprietrix 98661 88290	17.68	83.07	AP/VSP/III/26	Jun-06	2012-22	5,400	1011.33
Neela Krishna FaL-G Center, Plot No.104, IDA, Paravada. Visakhapatnam Dist.	Visakhapatnam Dist. Proprietrix 93931 01098	17.63	83.08	AP/VSP/III/27	Jun-05	2012-22	5,000	938.63
Mayuri Brick Industries Dakammarri village, Tagarapuvalasa(P) Bheemunipatnam Mandal Visakhapatnam Dist	Mr. K. Sambasiva Rao Proprietor 94401 94499	18.00	83.40	AP/VSP/III/28	Feb-07	2012-22	5,400	1011.33
Visakha FaL-G Bricks S. No. 305, Kunchangi (V) 530.132 Anakapalli (M) Visakhapatnam dist.	Mr. V. Suresh Proprietor 98499 43377	17.67	82.92	AP/VSP/III/29	Dec-07	2012-22	15,000	2815.88

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output/yr in m^3	ERs achieved tCO_2/ year
Andhra Pradesh State		**North**	**East**					
Aditya FaL-G Products Rebaka (V), Anakapalli (M)Visakhapatnam Dist.	Mr. V. Suresh Proprietor 98499 43377	17.73	83.05	AP/VSP/III/30	May-06	2012-22	4,500	844.76
Prudvi Buildmate Koondram (V), Anakapalli(M) Visakhapatnam Dist.	Mr. Y.V. Rao Mg. Partner 98661 93624	17.65	82.92	AP/VSP/III/31	Oct-06	2012-22	4,500	744.76
Vizianagaram Dist.								
Mayuri Industries, Shed No.F-2, A.P. Industrial Estate, V.T. Agraharam, Vizianagaram-535 004, Vizianagaram Dist.	Mr. K. Sambasiva Rao Proprietor 94401 94499	18.10	83.38	AP/VZM/III/32	Aug-05	2012-22	4,500	844.76
SRIKAKULAM DIST.								
Sree Satya Enterprises R.S. No 109/Part Chilakapalem (V)-532 403 Etcherla (M), Srikakulam Dist	Mr. R.R.. Satyanarayana Raju Proprietor 98495 23335	18.27	83.80	AP/SKL/III/33	Dec-05	2012-22	4,500	844.76
M.K.Brick Industries, NH-5 Road, Santhoshipuram (V), Devipuram Grama Panchayati Nandigam Mandal, Srikakulam Dist.	Ms. M. Meena Kumari, Proprietrix 92904 42117	18.73	84.40	AP/SKL/III/34	May-07	2012-22	2,700	506.86
Chandanam Fly ash Industry Abotulapeta (V) Anandapuram Panchayat G. Sigadam - 532 168, Srikakulam Dist	Mr. P. Ram Mohan Rao Manager 98851 16426	18.35	83.77	AP/SKL/III/35	Mar-07	2012-22	10,000	1877.25

Name & Address of the MIP	Name & relation of Authorized Signatory	Geographical Co-ordinates, deg		SPE ID. No.	Established in	Crediting Period	Output/yr in m^3	ERs achieved tCO_2/ year
Tamil Nadu State		**North**	**East**					
Salem dist.								
Hari Eco Building Materials SF No. 108/3, Thalaivar Thottam D.Perumapalayam Main Road, Pallipatty Valapady Taluk Salem - 636 122, Salem Dist.	Mr. K. M. Siva Kumar Proprietor 98943 51024	11.70	78.23	TN/SLM/III/36	Aug-07	2012-22	6,000	1126.35
Mass Bricks SF No. 7/1, Thottiyan Kadu Santhiyur Attayampatti (P), Mallur (Via)Salem Taluk Salem Dist - 636 203	Ms. A. Shanthi Proprietrix 94434 82123	11.53	78.05	TN/SLM/III/37	Aug-07	2012-22	6,000	1126.35
Orissa State								
Khurda Dist								
Biswakarma Bricks & Blocks Plot No: 329/639/764 At Alkar, P.0-Janla - 752 054, Khurda Dist, Orissa.	Mr. N.Gangadhar Reddy, Proprietor 94371-23235	22.20	85.70	ORS/KRD/III/38	Sept-06	2012-22	3500	657.04
Chhattisgarh State								
Raipur Dist.								
A-1 Bricks 28-Part ,Phase II, Industrial Growth Centre, Siltara-Raipur (C.G)	Ms Abha Pandey 94242- 02637	21.30	81.63	CG/RAIP/III/39	Apr-05	2012-22	4,500	844.76
Bansal Retreaders 18, Industrial area, Korba-495686, Raipur Dist.	Mr. Radhashyam Bansal 94252-24313	22.35	82.73	CG/RAIP/III/40	Apr-05	2012-22	5,000	938.63
Alok Bricks Chhuiya(V), Baloda Bazar Raipur - 493 332	Mr. Amit Franklin 98267 42638	21.65	82.15	CG/RAIP/III/41	Sept-07	2012-22	3,100	581.95
Umiya Industries Limahi Village, Baloda Bazar Raipur Dist	Mr. Vikram Patel 98264 21061	21.65	82.15	CG/RAIP/III/42	Jan-08	2012-22	3,100	581.95

Annex 7: Small Scale Industries' Registration of SPEs -Date of Commencement of Production – Date of Establishment

Sl No.	Name of the SPE	SPE ID No.	Provisional/ Part-I	Date of Commencement of production as per SSI	Date of Establishment as mentioned in Agreement
1	Sri Venkateswara Fly Ash Products	AP/RNG/III/1	10.05.2007	15-12-2007	June-2007
2	Chandra Fly Ash Bricks	AP/NGD/III/2	-	08-09-2007	Sept-2007
3	Sri Lakshmi Fly Ash Brick Industry	AP/NGD/III/3	--	10-02-2004	Feb-2004
4	Sri Hiranmai Bricks	AP/WRG/III/4	27-09-2007	29-12- 2007	Nov-2007
5	Sri Lakshmi Venkateswara FaL-G Brick Industry	AP/GTR/III/5	-	01-06-2005	May-2005
6	Sri Durga Fly Ash Brick Industry	AP/GTR/III/6	-	Not Available	Apr-2007
7	Sri Venkata Triveni Fly Ash Brick Industry	AP/GTR/III/7	-	14-09-2007	Sept-2007
8	Sri Sai Raghava Fly Ash Brick Industries	AP/KRIS/III/8	-	29-04-2004	Apr-2004
9	Sri Sai Bhargava Fly Ash Brick Industries	AP/KRIS/III/9	-	03-08-2005	Aug-2005
10	Sri Sai Siva Brick Products	AP/KRIS/III/10	01-05-2007	11-08-2007	May-2007
11	Sri Sai Tulasi Brick Products	AP/KRIS/III/11	14-03-2007	18-06-2007	June-2007
12	Sri Venkateswara Fly Ash Products	AP/KRIS/III/12	24-04-2007	15-09-2007	Apr-2007
13	Sri Sai Baba Fly Ash Products	AP/KRIS/III/13	-	22-02-2007	Jan-2007
14	Gayatri Brick Products	AP/KRIS/III/14	-	15-10-2005	Oct-2005
15	Sai Build Products	AP/KRIS/III/15	-	20-04-2005	Mar-2005
16	Perfect Concrete Products (P) Ltd	AP/KRIS/III/16	26-10-2007	26-04-2008	Sept-2007

Annex 7: Small Scale Industries' Registration of SPEs -Date of Commencement of Production – Date of Establishment					
Sl No.	Name of the SPE	SPE ID No.	Date of SSI Registration	Date of	
			Provisional /Part-1	Commencement of Production as per SSI	Establishment as mentioned in Agreement
17	Sri Venkata Sai Fly Ash Products	AP/KRIS/III/17	05-12-2007	15-04-2008	Nov-2007
18	Sri Sai Fly ash Products	AP/KRIS/III/18	05-12-2007	25-02-2008	Dec-2007
19	Sri Venkata Ramana Fly Ash Products	AP/KRIS/III/19	02-11-2007	15-02-2008	Nov-2007
20	Sri Sai Krishna Fly ash Products	AP/KRIS/III/20	05-12-2007	25-05-2008	Dec-2007
21	Suneetha Fly Ash Products	AP/KRIS/III/21	02-11-2007	05-05-2008	Nov-2007
22	Sri Vasavi Fly Ash Concrete Pavers	AP/WG/III/22	--	28-04-2004	Apr-2004
23	Sri Kanaka Durga Hydraulic FaL-G Brick Industry	AP/WG/III/23	25-04-2007	21-10-2007	Apr-2007
24	Sri Kanaka Durga FaL-G & Cement Works	AP/WG/III/24	30-08-2006	01-06-2007	Apr- 2007
25	Subha FaL-G Brick Industry	AP/EG/III/25	20-09-2005	08-02-2006	Jan-2006
26	Simhadri FaL-G Products	AP/VSP/III/26	16-06-2006	17-06-2006	June-2006
27	Neela Krishna FaL-G Center	AP/VSP/III/27	24-06-2005	07-09-2007	June- 2005
28	Mayuri Brick Industries	AP/VSP/III/28	09-02-2007	13-02-2007	Feb-2007
29	Visakha FaL-G Bricks *	AP/VSP/III/29	13.8.2007	Dec 2007	Dec-2007
30	Adithya FaL-G Products *	AP/VSP/III/30	22.5.2006	May 2006	May-2006

Annex 7: Small Scale Industries' Registration of SPEs -Date of Commencement of Production – Date of Establishment

Sl No.	Name of the SPE	SPE ID No.	Date of SSI Registration	Date of	
			Provisional /Part-1	Commencement of Production as per SSI	Establishment as mentioned in Agreement
31	Prudvi Build Mate *	AP/VSP/III/31	28.04.2005	Oct, 2006	Oct-2006
32	M/s Mayuri Industries	AP/VZM/III/32	23-08-2005	18.12.2006	Aug-2005
33	M/s Sree Satya Enterprises	AP/SKLM/III/33	22.12.2005	03-11-2006	Dec-2005
34	M/s M.K Brick Industries	AP/SKLM/III/34	21-12-2006	18-05-2007	May-2007
35	M/s Chandanam Fly ash Industry	AP/SKLM/III/35	14-12-2006	26-08-2007	Mar-2007
36	M/s Hari Eco Building Materials	TN/SLM/III/36	-	29.08.2007	Aug-2007
37	M/s Mass Bricks	TN/SLM/III/37	26-02-2007	24-08-2007	Aug-2007
38	M/s Biswakarma Bricks & Blocks	ORS/KRD/III/38	13-09-2006	08-07-2007	Sept-2006
39	M/s A-1 Bricks	CG/RAIP/III/39	-	05-05-2005	Apr-2005
40	M/s Bansal Retreaders	CG/RAIP/III/40	-	15-07-2005	Apr-2005
41	M/s Alok Bricks	CG/RAIP/III/41	23-03-2007	29-02-2008	Sept-2007
42	M/s Umiya Industries *	CG/RAIP/III/42	19.02.2007	Jan, 2008	Jan-2008

Note:

* The date of commencement of these four units has been sourced from the date of establishment as per the Agreement Signed with the SPEs and , however, these units have not submitted further documents or continued their activity.

Annex 8: Recommendation of CDM-EB on Methodology

Request for Deviation - Registration: Including leakage from production of one of the raw materials input to an energy efficiency project

The Board agreed not to accept the proposed deviation. Reasons include, *inter alia*:

- Comparable level of service: project bricks use different input raw materials and have different characteristics as compared to baseline bricks, therefore, convincing proof that baseline and project bricks have comparable strength characteristics would be required;
- Project emissions: the Fal-G method of brick production also involves the use of fossil fuel/electricity for mixing equipment and vibrators; these emissions need to be accounted for as project emissions;
- Leakage: consideration of potential leakages due to the use of raw/additive materials that are not used in the baseline would be required.

The project proponent may evaluate if AMS-III.Z is applicable to the proposed project activity.

Annex 9: Test Procedure for bricks and blocks based on Hydration Chemistry

Bricks and blocks shall be tested for their strength class as per the procedures below.

Step 1: Identify the product type; ceramic product or hydraulic product.
This procedure is applicable only to hydraulic product.

Step 2: Identify the national standard for strength-class
Table 1 of IS: 12894-2002 Pulverized Fuel Ash-Lime Bricks Specifications.

Step 3: Follow the appropriate national standard for recording their grade strength at 28-day.
IS: 516 -1959: Method of Test for Strength of Concrete

Step 4: Sampling shall be based on relevant standard
IS: 516-1959: Methods of Test for Strength of Concrete, which suggests testing of three specimens under field conditions. As per this standard, three specimen bricks/blocks are randomly selected from a 28-day lot at each production site.

Step 5: Submerge the specimen in water for 24-hours before subjecting for compressive strength test.

Step 6: The specimens are capped with high-grade strength mortar for even surface. Alternately, for quick tests, the specimen surfaces can be dressed with sand evenly.

Step 7: Use testing equipment such as hydraulic compressive strength testing machines.

Step 8: Repeat this procedure every 6 months (e.g., March and September of each year) or at a specified interval for seasonally operating units.

Step 9: Test Certificate should be provided for each production unit, specifying the following:

a) Name and address of production unit
b) Date and location of testing
c) Type of product tested
d) Name and number of Testing standard
e) Results of the test