

# A Case Example of a Programmatic Small-Scale CDM Project: The FaL-G Brick Project in India

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## Project Description

The FaL-G project aims to promote fly ash bricks as an alternative to burnt clay brick within the construction sector in India. Fly ash, the key ingredient of FaL-G technology, is a waste product from thermal power plants and is abundantly available in India. Fly ash is mixed with two other ingredients available as industrial byproducts: lime from the acetylene industry, and gypsum from chemical plants. This is proving to be a revolutionary invention that produces bricks without the sintering process; only a fraction of fossil energy is required in this process and consequently almost no greenhouse gases are emitted.<sup>1</sup>

Brick production using FaL-G technology is still a tiny fraction of the total clay brick production (about 4 billion FaL-G bricks a year versus hundreds of billions of clay bricks a year). However, with the help of carbon financing from the Community Development Carbon Fund, CDCF, the sponsors will – hopefully – facilitate setting up of about 200 to 400 very small sector units and replace clay bricks with FaL-G brick production, with expected carbon emission reductions of about 100,000 tons CO<sub>2</sub> annually.

## The Proposed Project: A Programmatic Project Model

The ultimate objective of the proposed FaL-G project in India is to catalyze the fly ash brick market by leveraging this technology's carbon credits earning potential. The project aims to facilitate implementation of about 200-400 micro industrial plants in different parts of India by the micro enterprises to manufacture fly ash bricks using the FaL-G technology.

Despite being small-size operations, the plants to be proposed under the project vary in size, with a production capacity ranging between 2-6 millions bricks/yr. Some of the unique project features that require critical thinking and analysis to bring the project to reality are summarized in the table below. The small-scale plants are being specifically promoted by the project with a view to create business opportunity for small enterprises.

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<sup>1</sup> The FaL-G technology revolves around fly ash, lime and gypsum chemistry. FaL-G bricks/blocks are superior in quality compared to bricks produced from fly ash and lime. In fly ash-lime (FaL) mixes, the strengths are mainly from calcium silicate hydrates (CSH). In the case of fly ash-lime-gypsum (FaL-G) mixes, the early strengths are imparted by calcium aluminosulphate hydrates (CASH) supplemented by CSH for late-age and ultimate strengths. As a result, the strengths of FaL in the range of 60-80-120 kg/cm<sup>2</sup> get boosted to 200-250-350 kg/cm<sup>2</sup> as FaL-G. Because of high ultimate strengths, the one-day strengths are sufficient to handle the product for stacking. Since FaL-G technology does not involve any sintering process, it contributes to significant fuel savings as well as avoidance of pollution associated with burning of fuels. In spite of significant benefits, the market penetration of the technology remains low (less than 1%).

Sl. No.	Parameters	Values
1	Plant Capacity	2-6 million bricks/year
2	Land area required	0.5 acre (minimum)
3	Capital Investment	Rs. 1.2 – 1.5 Million (US\$ 28,000–35,000 approx.)
4	Workers involved	12-15 persons/shift (machine specific)
5	Power Requirement	15-25 kW (machine specific)
6	Emission Reductions to be generated	About 690 tons CO <sub>2</sub> /yr (for a 2 million capacity plant)
7	Net profit	Rs. 0.2-0.3 Mil/yr (without carbon credit)

A FaL-G plant requires a minimum of half acre of land, an investment of approximately US\$ 28,000-35,000, and about 12-15 workers. The investment per plant is linked to the choice of machinery; the more sophistication and mechanization, the higher the investment.

The following photographs illustrate the operation of a typical low-end FaL-G plant.



10 workers working in a plant produce about 2 million bricks per year on single shift operation



FaL-G bricks displaces coal for sintering

## Dispersed Locations across India

The project proposes to target the following Indian states: Tamil Nadu, Andhra Pradesh, Karnataka, Orissa, Uttar Pradesh, Delhi, Punjab and Madhya Pradesh. FaL-G plants are likely to be set up in the vicinity of thermal power plants in order to have an easy supply of fly ash. (The numbers of plants that can be set up in each state will depend on the economic, social and environmental factors in each state with respect to the brick industry). The geographically dispersed nature, the small plant size, and the high number are expected to impose additional burdens on project monitoring. Importantly, it is not possible to identify the potential participants at the outset because the participating plants will be enrolled in the project over time.

## Low CO<sub>2</sub> Reductions per Plant

The volume of ERs generated by an individual plant is clearly not sufficient to treat individual plant as a separate small-scale CDM project – the transaction costs largely outweigh the expected CDM benefits. On average, each single FaL-G plant with a capacity of 2 million bricks/yr is expected to earn a carbon revenue (not including the upfront and recurring transaction costs) of approximately US\$ 3,500–4,000 annually. The carbon revenue is inadequate to absorb the transaction cost if each plant is to be validated, registered, and verified as a small-scale CDM project. In addition to the significant initial project preparation and validation costs, there are several other administrative costs of a recurring nature. In sum, only by bundling a large number

of these tiny plants will it be possible to enable poor entrepreneurs in India to benefit from carbon finance. A bundle of small-scale CDM projects should be allowed to exceed the relevant threshold for its category (i.e., 15MW capacity; annual energy savings up to 15GWh; 15,000 tonne CO<sub>2</sub> of direct project emissions annually); importantly, each small-scale CDM project in the bundle should not exceed the threshold.<sup>2</sup>

## Need for Extended Enrollment Period

Given that the project concept is new, the number of plants that could be set up in the initial years is expected to be modest. The materialization of an actual flow of carbon revenues to initial few projects coupled with the execution of the various communication programs planned in the project are expected to have multiplier effects on the growth in number of plants in the subsequent years. The project aims to achieve the target of enrolling 300-400 plants in a 2-3 year time frame.

*Immediately after official approval of the Project Idea Note by CDCF, in early 2004, the sponsors have gone ahead with the enrollment of entrepreneurs under the project and have already facilitated settling up of about 60 plants in the country (as of July, 2005).*

## Resource-Constrained Entrepreneurs

The Indian brick industry is a very informal and unorganized sector. Most of the brick production happens in very small-scale brick kilns. What are required is a few acres (4-5 acres) of land and an investment of about Rs. 4- 5 lakh (approximately US\$ 9,000-12,000) to install the chimney and pay advance to the laborers. Brick manufacturing falls under the domain of small-scale industries (SSI) sector. The economic profiles of the entrepreneurs expected to be involved in the FaL-G project will most likely be similar to those involved in the traditional brick manufacturing activity. In some cases the entrepreneurs are expected to have no prior brick manufacturing experience. Clearly, the entrepreneurs are unfamiliar with the complexities of the CDM and how to access the CDM benefits. Also in the present buyer-driven carbon market, small entrepreneurs will not have the capacity and sophistication required to deal with large corporate and public buyers and bargain an appropriate emission reduction price.

## The Key Role of Bundling and Intermediation for Programmatic CDM Projects

The penetration of this environment-friendly and low GHG intensive technology will most likely only be possible if the carbon benefits can be tapped efficiently and directed to the sector. Considering the various key factors described above, the sponsors intend to follow a programmatic approach. The sponsors not only propose to play the role of an intermediary for the carbon transaction, but also to make a more collaborative intervention to make the FaL-G project become a reality. The sponsors intend to insulate the small and tiny enterprises from any complexities by a providing proven technology with ensured technical back-up and maximize their returns by tapping carbon benefits with minimum transaction cost. Moreover, by virtue of this bundling arrangement, it is possible for the sponsors to contribute to marketing through technical workshops, awareness programs to engineers and masons, and meetings with large-scale consumers for enhancing the acceptability for the FaL-G bricks as an alternative building material.

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<sup>2</sup> For an analysis of the applicable simplified modalities and procedures, see “Annex 3: Bundles of small-scale CDM projects vs. large-scale CDM projects” submitted on April 24, 2005, to the Working Group on Methodologies for Small Scale CDM projects.

## The Proposed Project Implementation Framework

### *Project Participants*

The Institute for Solid Waste Research & Ecological Balance (INSWAREB) and Eco Carbon Private Limited (ECPL) are jointly promoting the project. INSWAREB is a non-profit, non-governmental organization (NGO), based at Visakhapatnam in the state of Andhra Pradesh in India. It is engaged in research and development in the field of building materials. INSWAREB, the inventors and promoters of FaL-G technology, will provide technology know-how, O&M, and logistical support to the micro enterprises under the project.

ECPL, a commercial entity based in Hyderabad, Andhra Pradesh, will be responsible for the carbon transaction aspects of the project. ECPL will play the role of a bundling agency (on behalf of individual entrepreneurs) and will be responsible for finding a buyer for the carbon credits in the international market and passing on the benefits to individual micro enterprises. ECPL will provide services along with INSWAREB to catalyze the bundling of production plants, supervise their operations, coordinate the monitoring and verification procedures with the accredited agency and transfer the Emission Reductions (ERs) to the buyer. In order to act as a bundling agency and have rights to trade the emission reductions achieved by individual entrepreneurs, ECPL proposes to acquire the rights to these emission reductions by entering into legal agreement with individual entrepreneurs.

The Community Development Carbon Fund (CDCF) of the World Bank intends to purchase the ERs generated from the bundled activity and has already entered into an agreement with ECPL in this regard.

The individual micro-enterprises are responsible for mobilizing the required resources to set up their individual plants. The micro-enterprises will be responsible for marketing their brick output. To assist the enterprises in overcoming the initial market barriers, INSWAREB will conduct regional awareness programs and hold workshops involving different brick user groups.

Summary of roles of different institutions involved in the FaL-G project:

Agency	Areas	Specific Responsibilities
INSWAREB	Technology provider	<ul style="list-style-type: none"> <li>• Provide technology know how</li> <li>• Provide logistical support for procuring equipment, machinery and raw materials</li> <li>• Provide guarantee to enterprises against technical failure</li> </ul>
	Market Facilitator	<ul style="list-style-type: none"> <li>• Conduct programs to encourage entrepreneurs</li> <li>• Conduct awareness programs and workshops for brick users</li> </ul>
ECPL	Carbon Transaction Coordinator	<ul style="list-style-type: none"> <li>• Enroll micro enterprises under the project</li> <li>• Find a potential buyer and negotiate price</li> <li>• Coordinate carbon transaction activities with the buyer and the CDM Executive Board</li> <li>• Obtain host country endorsement</li> <li>• Undertake monitoring as per the CDM requirements and requirements of the World bank</li> <li>• Pass on the carbon benefits to the micro enterprises as per the terms mutually agreed</li> </ul>
CDCF (The World Bank)	Purchasing emission reductions	<ul style="list-style-type: none"> <li>• Coordinate with the CDM executive Board</li> <li>• Register the project with CDM Executive Board</li> <li>• Make payments to ECPL as per the terms mutually agreed</li> <li>• Monitor the implementation of specific communication programs by ECPL</li> </ul>

		<ul style="list-style-type: none"> <li>• Monitor the implementation of specific community development components of the project</li> </ul>
The micro enterprises	Setting up and operating FaLG plants	<ul style="list-style-type: none"> <li>• Mobilize resources</li> <li>• Procure equipment and machinery</li> <li>• Market the products</li> <li>• Keep data and records as per the monitoring requirements of CDM</li> <li>• Implement the community developments components as agreed between ECPL and the CDCF</li> <li>• Implement environment management plans as agreed between ECPL and CDCF.</li> </ul>

## ***Key Steps in Project Implementation***

### ***Enrollment of Enterprises***

The project starts with the enrolment of potential enterprises. INSWAREB will publicize the FaL-G project through various means, such as paper advertisements, workshops and web announcements. Specific and targeted workshops are conducted for the clay brick manufacturers to encourage them to shift to the FaL-G technology. On receipt of enquiries from potential entrepreneurs, specific workshops and discussions are held on the project details and the specific terms of participation. A tripartite project participation agreement is signed between ECPL, INSWAREB, and the enterprise. The terms and conditions pertaining to participation in the project, including the modalities of payments for the carbon benefits, are defined in the agreement. The agreement also includes the technology collaboration aspects, especially the type of support and guarantee provided by INSWAREB.

### ***Technology Counseling***

Upon enrollment, INSWAREB carries out one-on-one technology counseling with the member entrepreneur. Guidelines on selecting appropriate location for the plant are provided. Once the site for the plant and raw material sources are identified for the entrepreneur, INSWAREB undertakes relevant testing and advises on the technology, including the type of equipments and machineries that are appropriate for the site.

### ***Raising Finance***

It is the responsibility of the individual entrepreneur to mobilize the resources required to put up the plant. However, wherever required ECPL facilitates the financing arrangements by providing a feasibility report, responding to Banker's queries and sharing information on the carbon transaction arrangements and agreements so as to assist the entrepreneur in achieving financial closure.

### ***Plant Commissioning***

INSWREB provides assistance during the plant installation phase and directly supervises the trial production. After successful commissioning of the plant INSWAREB provides a plant commissioning certificate.

### ***Performance Monitoring***

Each entrepreneur is required to keep records of raw material procurement, production and sales registers and other parameters required for the purpose of verification of emission reductions. ECPL will send on a periodic basis its officers to monitor the performance of each plant. ECPL will maintain a record for each individual member enterprise.

Each enterprise is made aware of their obligations under the CDM and the specific requirements of the Community Development Carbon Fund of the World Bank. The membership under the program can be terminated anytime if the plants do not comply with these requirements.

### ***Routing of Carbon Benefits***

ECPL operates a project account with a Designated Bank (DB) to which the proceeds are transferred by CDCF once in a year. Each Enterprise operates an account with scheduled bank of its choice in accordance to their project finance arrangements. ECPL will maintain a record of individual bank accounts of member enterprises. The DOE will determine emission reductions achieved by member enterprises on an annual basis. ECPL will prepare "Claim Form" of such earnings once in a year and transfer the ER proceeds to individual member enterprises.

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