

## **TERMS OF REFERENCE**

### **ENERGY EFFICIENCY AND GHG EMISSION STANDARDS FOR NFB PRODUCTION**

Project:	Promotion of non-fired brick (NFB) production and utilization in Viet Nam
Assignment:	<i>Energy efficiency and GHG emission Standards for NFB production</i>
Selection Method:	National Consultant
Location:	Hanoi and travel to the other provinces as required
Duration:	Estimated 134 days during 8 months starting from May 2017
Direct supervision:	Project Manager

#### **1. Background**

On 29 August 2008, the Prime Minister issued Decision No. 121/QĐ-TTg approving the “Master Plan on development of building materials up to 2020”. Later on, this was replaced by Decision No. 1469/QĐ-TTg dated 22 August 2014 on “Master Plan on building materials development up to 2020 with vision to 2030”.

According to Decision No. 567/QĐ-TTg dated 28 April 2010 by the Prime Minister on NFB development programme up to 2020, major objectives of the programme are as follows:

- Market share of NFB will increase by 20%-25% by 2015 and 30%-40% by 2020, respectively;
- Utilization of around 15-20 million tonnes of industrial waste (ash) from coal-fired power generation and other industries to produce non-fired building materials, saving around 1,000 hectares of agriculture land annually;
- All traditional fired clay brick (FCB) making plants will be gradually replaced by NFB production facilities.

On 19 September 2014, the Prime Minister issued Decision No. 1686/QĐ-TTg on approval of Project “Promotion of Non-Fired Brick (NFB) Production and Utilization in Viet Nam” which is funded by the GEF/UNDP and co-financed by Vietnamese agencies/institutions. Executing Entity is Ministry of Science and Technology (MOST).

The objective of the NFB Project is to reduce the annual growth rate of GHG emissions by displacing the use of fossil fuels and the usage of good quality soil for brick making through the increased production, sale and utilization of non-fired bricks in Viet Nam. This objective will be achieved by removing barriers to increase production and utilization of NFBs through 4 components:

- Component 1: Policy support for NFB technology development.

- Component 2: Technical capacity building on NFB technology application and operation and use of NFB products
- Component 3: Sustainable financing support for NFB technology application
- Component 4: NFB technology demonstration, investment and replication.

The Project will be implemented over a 5-year period and is expected to generate GHG emission reductions through the displacement of coal-fired clay brick kilns. Direct GHG reduction is estimated at 383 ktonnes CO<sub>2</sub>. Indirect emission reduction is estimated at 13,409 ktonnes CO<sub>2</sub> that is cumulative for a 10-year period after the end of the Project. During 2015&2016, the project implemented demonstration projects in three Cement Concrete Block (CCB) production facilities and in 2017 will implement a demonstration project in a Autoclaved Aerated Concrete(AAC) production facility.

Component No. 1 of the project on “Policy support for NFB Technology Development”, is led by the Ministry of Construction who is a Co-implementing Partner (CIP) for the project. This Terms of Reference relates to developing TOR for outputs 1.5 under Component No.1: “*Energy efficiency and GHG emission standards for NFB production*”

## **2. Objective of the assignment**

This assignment has the objective of delivering two outputs:

### **2.1 Comparison of energy and GHG emission performance of Concrete Brick and of Fire Clay Brick production in Vietnam:**

This study will compare the energy consumption and the GHG emission and removal per functional unit to be defined, in major CB and FCB production facilities in Vietnam to establish and verify the potential reduction in energy consumption and net GHG emissions, due to a major shift towards NFB production and use in Vietnam.

### **2.2 Product based standard for energy efficiency and GHG emissions for Concrete Brick in Vietnam:**

This “cradle to gate” study will establish near and longer term targets for energy and net GHG emissions per functional unit of CCB product, that can be achieved in the Vietnamese context. This will give clarity and help set realistic targets for Vietnamese CCB manufacturers and the Government of Vietnam.

## **3. Deliverables**

The following products are to be submitted, all in good quality English and Vietnamese:

### **3.1 Comparison of energy and GHG emission performance of Concrete Brick and of Fire Clay Brick production in Vietnam**

- a) Draft and final version of the scope and methodology of the study, and the structure of the reports
- b) Draft and final version of the criteria for selection of the production facilities where the studies would be carried out
- c) Draft and finalised list of production facilities to be studied

- d) Draft and final version of the questionnaires to be sent to all the selected production facilities, tailored to the requirements of each of the selected production facility (six questionnaires)
- e) Draft and final version of the unit level, report of the detailed energy audit and GHG accounting, for each of the production facilities studied (six reports)
- f) Draft and final version of the national level, report comparing the energy and net GHG emissions of CCB and FCB production facilities in Vietnam (one report)

### **3.2 Product based standard for energy efficiency and GHG emissions for Concrete Brick in Vietnam**

- a) Draft and final version of the scope and methodology of the study, and the structure of the reports
- b) Draft and final version of the criteria for selection of the CCB production facilities where the studies would be carried out
- c) Draft and finalised list of production facilities to be studied
- d) Draft and final version of the questionnaires to be sent to all the selected production facilities, tailored to the requirements of each of the selected production facility (number of questionnaires depending on the number of production facilities selected)
- e) Draft and final version of the report on the unit level, “cradle to gate” energy consumption and net GHG emission targets for CCB for each of the production facilities studied (number of reports depending on the number of production facilities selected)
- f) Draft and final version of the report on the national level, “cradle to gate” energy consumption and net GHG emission targets for CCB (one report)
- g) Draft and final versions of the agenda, presentation materials, background documents and report of the consultation meeting

## **4. Scope of Services**

### **4.1 Comparison of energy and GHG emission performance of Concrete Brick and of Fire Clay Brick production in Vietnam**

- a) Consult and finalise with the PMU the expectations from the study, the scope and methodology of the study, and the structure and quality of the reports. The linkages with the other part of this assignment (Product based standard for energy efficiency and GHG emissions for CB) should be clarified with the PMU, to ensure coordination between the 2 studies and to avoid duplication. The methodology will account for and normalize (chuẩn hóa) the influence of production levels/capacity utilization, product type and quality, raw material type and quality, climate etc. The materiality threshold<sup>1</sup> for the study should also be defined to agree beforehand if any smaller sources of GHG emissions could be excluded from the study. The GHG accounting will follow the methodology recommended by **Corporate** GHG Accounting standards, that are recognised internationally such as the GHG

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<sup>1</sup> “A materiality threshold establishes an acceptable percentage (or absolute quantity) difference between the company’s emissions inventory and the verifier’s belief of what the company’s emissions would be if all omitted sources were accounted for. For example, if a company does not include a certain set of sources that the verifier thinks should be included, and those sources are estimated to emit more than the materiality threshold, this would be material discrepancy and emissions from at least some of those sources would need to be inventoried”, GHG Protocol, <http://www.ghgprotocol.org/calculation-tools/faq#materiality>

Protocol<sup>2</sup>, while the energy accounting will adapt the guidance given in Annexure 1 as per requirements

- b) Develop and finalise criteria for selection of the production facilities where the studies would be carried out (3 CB and 3 Tunnel Kiln FCB production facilities)
- c) Based on the criteria, select 3 CB and 3 Tunnel Kiln FCB production facilities, and with the support of the PMU get agreement of the production facilities to participate in the study
- d) Develop questionnaires to be sent to all the selected production facilities, tailored to the requirements of each of the selected production facility. Once finalised, send the questionnaires to all the production facilities preferably at least 2 weeks before the site visits
- e) Conduct site visit to each of the selected production facility, and conduct detailed energy and GHG accounting, including required measurements, performance trials and data collection. The data collected at few comparable production levels and should take into , to normalise the impact of capacity utilisation on . The findings of the study needs to be confirmed with the Management of the production facilities.
- f) Prepare and finalise the detailed energy audit and GHG accounting report, for each of the production facilities studied.
- g) Prepare and finalise a report comparing the energy and GHG emissions of CB and FCB production facilities in Vietnam. This report should first determine the range and average energy consumption and GHG emission in the production facility, per functional unit of product, separately for CB and FCB, and then establish the difference in performance between the 2 types of production facilities.

#### **4.2 Product based standard for energy efficiency and GHG emissions for Concrete Brick in Vietnam**

- a) Consult with the PMU the expectations from the study, the general scope and methodology of the study, and the structure and quality of the reports. The linkages with the other part of this assignment (Comparison of energy and GHG emission performance of CB and FCB production) should also be clarified with the PMU, to ensure coordination between the 2 studies and to avoid duplication. The quality and scope of the GHG accounting will follow the methodology recommended by Product based GHG Accounting standards that are recognised internationally such as the GHG Protocol<sup>3</sup>, while that of the energy audit is given in Annexure 1.
- b) Consult with PMU, and decide on the boundary (đường biên, ranh giới) for the study in terms of what part of the product life cycle should be covered by the study and to what extent, including the time period and the decision to include any land use change related GHG emissions or removals. This should also take into consideration, the availability of data at the production facility, as well as from their suppliers.
- c) In consultation with the PMU, finalise the detailed methodology for the study, including the materiality threshold for the study, the functional units, the allocation methods if there are any co-products or recycling/reuse, the method for recalculation of the Life Cycle Inventory(LCI), and the threshold and the context that would trigger the recalculation of the baseline LCI
- d) Develop and finalise criteria for selection of the CCB production facilities where the studies would be carried out

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<sup>2</sup> <http://ghgprotocol.org/standards>

<sup>3</sup> <http://ghgprotocol.org/standards>

- e) Based on the criteria, select the CCB production facilities which will form part of the study, and with the support of the PMU get agreement of the production facilities to participate in the study
- f) Develop questionnaires to be sent to all the selected production facilities, tailored to the requirements of each of the selected production facility. Once finalised, send the questionnaires to all the production facilities preferably at least 2 weeks before the site visits. The questionnaire should cover the following:
  - Energy consumption and GHG emission data from the production facility. The typical energy data needed is indicated in Annexure 1, which needs to be adapted as per the specific requirements of the study.
  - Energy consumption and GHG emission and removal data related to raw material extraction and its transportation to the production facility, which might need to be collected from the suppliers to the production facility.
  - The history of the plant, the changes made to the installed capacity, production technology and infrastructure, product and product quality, and future plans regarding these issues in the near and longer term.
  - Existing and future plans in the near and longer term, to reduce energy consumption and/or GHG emissions.
  - Assessment of the capacity of each of the production facility to monitor, assess and report product based energy consumption and GHG emissions and removals, and any training needed.
- g) Conduct site visit to each of the selected production facility, and conduct detailed energy audit, GHG accounting and required measurements, performance trials and data collection. The findings of the study needs to be confirmed with the Management of the production facilities
- h) Prepare and finalise unit-level reports for each of the production facilities studied containing the following information, and clearly indicating all assumptions made:
  - existing/baseline “cradle to gate” range and average values of the energy consumption and net GHG emissions associated per functional unit of CCB manufactured from each of the production facilities. The final result should include the following:
    - a. Total inventory results in CO<sub>2</sub>eq per unit of analysis, which includes all GHG emissions and removals included in the boundary from biogenic sources, non-biogenic sources, and land-use change impacts.
    - b. The amount of carbon stored by the product or any intermediate product
    - c. Percentage of total inventory results by life cycle stage
    - d. Biogenic and non-biogenic GHG emissions and removals separately when applicable
    - e. Land-use change impacts separately when applicable emission reduction potential in the near and longer term, based on techno-economic analysis (wherever necessary, life cycle costing is expected) of major energy and GHG emission reduction and removal measures that could be implemented<sup>4</sup>.

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• <sup>4</sup> The possible measures could be in terms of: energy management (energy efficiency, energy conservation, cleaner energy, renewable energy); avoidance or reduction of releases or leakages of substances with a high Global Warming Potential; process productivity and product quality improvements; use of alternate raw materials; changes in product or product design; improved process automation, instrumentation and optimization; sustainable/green procurement

- f. Set ambitious, but realistic and progressive targets for energy consumption and net GHG emission per functional unit of CCB for 2020, 2025, and 2030 for each of the production facility, based on the emission reduction potential identified, existing status and future plans of the CB production facilities, and government policies and plans related to Non-Fired Brick production in Vietnam. This should include among others, the reduction targets and the threshold and context that could trigger a recalculation.
- Prepare a report compiling the energy and GHG emissions and removal data and analysis of all the CCB production facilities that was studied, to set sector/national level standards and targets for the whole of Vietnam. This report should establish the “cradle to gate” range and average values of the energy consumption and net GHG emission of CCB production in Vietnam. The report should set ambitious, but realistic and progressive sector level targets for energy consumption and net GHG emission per functional unit of CCB, for 2020, 2025, and 2030, based on the emission reduction potential identified, existing status and future plans of the CCB production facilities, and government policies and plans related to Non-Fired Brick production in Vietnam. This should include among others, the reduction targets and the threshold and context that could trigger a recalculation. The report should clearly indicate all assumptions used for the analysis and for setting targets, as well as any support needed by the CCB manufacturers to achieve the energy consumption and net GHG emission targets. The report should also describe the elements and institutional structure of a national level system to update the product based standard, conduct Quality Assurance and Quality Control (QA&QC), and the periodic reporting of the data.
- i. In coordination with the PMU, organise and lead a consultation meeting with the CB manufacturers and other relevant stakeholders, to get a consensus on the energy consumption and GHG emission standards and other recommendations from the study.
  - ii. Revise and finalise the report, based on feedbacks received.

## **5. Approach and Methodology**

Duration of the assignment: Estimated 134 days during 8 months starting from May 2017

The 2 studies will have the following general approach and methodology, while the more specific details will be developed as part of the assignment:

### **5.1 Comparison of energy and GHG emission performance of Concrete Brick and of Fire Clay Brick production in Vietnam:**

This study will be based on detailed energy and GHG accounting at 3 CB and 3 Tunnel Kiln FCB production facilities. The standards for the energy and GHG accounting will follow internationally recognized standards, and will be decided in consultation with the Project Management Unit (PMU).

The production facilities to be studied will be selected based on criteria to be developed and will include among others, the size of the plant and the production technology used. The methodology will account for and normalize the influence of production levels/capacity utilization, product type and quality, raw material type and quality, climate etc.

### **5.2 Product based standard for energy efficiency and GHG emissions for Concrete Brick in Vietnam:**



The product based standard will be based on a study on the existing baseline energy consumption and GHG emissions of CB produced in Vietnam, and potential reductions to it in the near and longer term. The study will be in the form of a partial Life Cycle Assessment(LCA), covering “cradle to gate” part of the product life cycle, focussing on GHG emissions and removals of all the 7 Greenhouse Gases covered by the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC). The definition of the boundary of the study and the methodology of the study will follow internationally recognized product based GHG accounting standards, and will be decided in consultation with the PMU. The production facilities to be studied will be selected based on criteria to be developed, and will include among others, the size of the plant and the production technology used. The methodology will account for and normalize the influence of production levels/capacity utilization, product type and quality, raw material type and quality, climate etc.

## 6. Work plan

Details of the work plan are provided on the following table:

<b>Activity No.</b>	<b>Deliverables</b>	<b>Deadline</b>
<b>1</b>	<b>Comparison of energy and GHG emission performance of Cement Concrete Block and of Fire Clay Brick production in Vietnam</b>	<b>30 August 2017</b>
	Final version of the scope and methodology of the study and structure of the reports	
	Final version of the criteria for selection of the production facilities where the studies would be carried out	
	Final list of production facilities to be studied	
	Final version of the questionnaires to be sent to all the selected production facilities	
	Site visits and data collection	
	Final version of the unit level, report of the detailed energy audit and GHG accounting, for each of the production facilities studied.	
	Final version of the national level, report comparing the energy and net GHG emissions of CCB and FCB production facilities in Vietnam	
<b>2</b>	<b>Product based standard for energy efficiency and GHG emissions for Cement Concrete Blocks in Vietnam</b>	<b>30 November 2017</b>
	Final version of the scope and methodology of the study, and structure of the reports	
	Final version of the criteria for selection of the CCB production facilities where the studies would be carried out	
	Final list of production facilities to be studied	
	Final version of the questionnaires to be sent to all the selected production facilities	
	Site visits and data collection	
	Final version of the report on the unit level, “cradle to gate” energy consumption and net GHG emission targets for CCB for each of the	

	production facilities studied	
	Final versions of the agenda, presentation materials, background documents	
	Final version of the report of the consultation meeting	
	Final version of the report on the national level, “cradle to gate” energy consumption and net GHG emission targets for CB	
<b>3</b>	Final report on assignment	<b>15 December 2017</b>

## 7. Required Expertise

- Degree or Postgraduate degree in engineering, energy and/or environmental science/technology, building material technology/equipment or other relevant field. The academic requirements can be lowered/waived if possessing greater experience in this area.
- A minimum of 5 years direct experience in GHG accounting in industry, preferably product based and corporate GHG accounting. Expertise in Life Cycle Assessment and working with international standards such as the GHG Protocol and ISO, is highly desirable.
- A minimum of 5 years direct experience in energy audits, preferably in industry. Should have strong expertise in energy efficiency in both thermal and electro-mechanical aspects, and in life cycle costing. Should have access to and should know how to use sufficient numbers of high accuracy, recently calibrated portable instrumentation.
- Strong analytical skills
- Strong communication, networking, and writing skills in Vietnamese and English
- Experience working with international consultants is considered an asset.

## 8. Remuneration

- Consultants will be paid on basis of competence and experience of each individual under cost norms issued by UN Agencies in Vietnam, the EU Delegation to Viet Nam and Ministry of Planning and Investment of Viet Nam.
- Other costs will be applicable under the provisions of UN-EU Guidelines for Financing of Local Costs in Development Cooperation with Vietnam (HPPMG) and cost norms issued by the UN organizations in Vietnam, Delegation of the European Union and Viet Nam Ministry of Planning and Investment.

### ANNEX 1: Tentative list of data to be collected through the Energy Audit

A list of typical data to be collected and analysed at the initial stage of the energy audit, as well as related field activities is given below. This should be adapted to the actual scope, boundaries and materiality thresholds defined for the assignment:

- Process details, including process flow diagram, process design values, process control measures



- Major changes made to the production process or major equipments/systems
- Major energy or GHG management measures undertaken
- Current practices and systems for energy and GHG accounting and targeting
- Organization structure for operation, maintenance, procurement and energy/GHG/environmental management
- Operation, maintenance and procurement principle and practices, from the point of view of energy and GHG management
- Key production performance data for last 3 years (or for a period agreed with the PMU) for the whole plant, and for the various sub-sections, including production volumes, raw material inputs/proportion and capacity utilization. For the same period identify if any significant variations have occurred in process parameters, operation or maintenance practices, in raw materials used, or any other relevant factors that could affect energy use or GHG emissions.
- Energy data for last 3 years (or for a period agreed with the PMU), including: energy demand, consumption, production, import/export, load profiles; contractual conditions, tariff, taxes, incentives and penalties for using or producing energy. This could cover all kinds of fuels, grid and self generated electricity, hot or cold energy carriers such as steam/hot water/thermic fluids/chilled water etc
- Energy quality: Coal (and any other fuel used) quality data for last 3 years; typical values of power factor
- Energy storage and distribution information, such as: fuel storage, preparation and distribution; electricity distribution; steam/hot water/chilled water distribution
- Inventory of significant energy transforming/consuming/producing equipments and their relevant data such as: rated and key operating parameters, age, load factor, utilization<sup>5</sup> etc. These could include any thermal and heat recovery systems, chillers, heat exchangers, fans/pumps/compressors, steam/gas turbines, diesel generating sets, etc
- Relevant weather data that could influence energy consumption or production such as temperature, humidity etc
- Motor load survey, to identify underloaded or overloaded motors. This will involve measuring the instantaneous power consumption and other parameters such as voltage, current, power factor for motors.
- Major non-energy sources of GHG emissions in the plant.

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<sup>5</sup> Utilization and operating hours of equipments, and sections of the plant should be established as realistically as possible, in close consultation with plant managers