South Asia

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# Validation Report

**Lucky Cement Limited.**

VALIDATION OF THE CDM-PROJECT:

WASTE HEAT RECOVERY AND UTILIZATION FOR POWER GENERATION AT LUCKY CEMENT LIMITED, KARACHI PLANT

REPORT NO. 1363207

**19 February, 2013**

TÜV SÜD South Asia Pvt. Ltd.
Environmental Technology
Carbon Management Service
Solitaire, I.T.I. Road, Aundh
Pune- 411007
INDIA

| Report No. | Date of first issue | Revision No. | Revision Date | Certificate No. |
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| 1363207 | 02-11-2010 | 7 | 19-02-2013 | - |

**Subject:** Validation of the CDM Project "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant"

**Accredited TÜV SÜD Unit:**
TÜV SÜD South Asia Pvt. Ltd.
Environmental Technology
Carbon Management Service
Solitaire, I.T.I. Road, Aundh
Pune- 411007
INDIA

**Project Participants:**
1. Lucky Cement Limited (Contracting Company)
   A. Aziz Hashim, Tabba Street,
   6-A M. Ali Housing Society,
   Sindh, Karachi, Pakistan
2. Carbon Services Private Limited
   19 Davis Road 2nd Floor,
   Al Maalik, Lahore, Punjab, Pakistan
3. First Climate (Switzerland) AG
   Stauffacherstr.45,
   Zurich, 8004, Switzerland

**Project Site(s):**
Lucky Cement Factory,58 km Milestone, Super Highway, Nooriabad, Karachi, Sindh, Pakistan.
GPS coordinates are as follows;
Latitude: 25º 3' 14" (25.053889)
Longitude: 67º 25' 53" (67.431389)

**Project Title:** Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant

**Applied Methodology / Version:** AMS.III.Q/ Version 4

**Scope(s):** 4
**Technical Area(s):** 4.1

**First PDD Version (GSP):**

| | |
|---|---|
| Date of issuance: | 22-07-2009 |
| Version No.: | 01 |
| Starting Date of GSP | 25-07-2009 |
| Starting Date of re-GSP | 20-05-2011 |
| Date of issuance: | 18-05-2011 |
| Version No: | 05 |

**Final PDD version:**

| | |
|---|---|
| Date of issuance: | 19-02-2013 |
| Version No: | 11 |

**Estimated Annual Emission Reduction:** **42,992** $tCO_2e$

**Assessment Team Leader:**
Khalid Mahmood

**Assessment Team Members:**
Robert Mitterwallner
Paula Auer *
Georgios Agrafiotis

**Technical Reviewers:**
Thomas Kleiser, Nikunj Agarwal

***:** The TA's of this project were covered during the on-site mission by Ms. Paula Auer as per the appointments valid at that time. She is not appointed yet as per new accreditation system

**Summary of the Validation Opinion:**

☒ The review of the project design documentation and the subsequent follow-up interviews have provided TÜV SÜD with sufficient evidence for the determination of the project's fulfilment of all stated criteria. In our opinion, the project meets all relevant UNFCCC requirements for the CDM. Therefore, TÜV SÜD recommends the project for registration by the CDM Executive Board if the letters of approval of all Parties involved will be available before the expiring date of the applied methodology (ies) or the applied methodology version respectively.

☐ The review of the project design documentation and the subsequent follow-up interviews have not provided TÜV SÜD with sufficient evidence for the determination of the project's fulfilment of all stated criteria. Therefore, TÜV SÜD will not recommend the project for registration by the CDM Executive Board and will inform the project participants and the CDM Executive Board of this decision.

## Abbreviations

| | |
|---|---|
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **AM** | Approved Methodology |
| **VVM** | Validation and Verification Manual version 1.2 |
| **BM** | Build Margin |
| **CAR** | Corrective Action Request |
| **CDM** | Clean Development Mechanism |
| **CDM EB** | CDM Executive Board |
| **CER** | Certified Emission Reduction |
| **CM** | Combined Margin |
| **CMP** | Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol |
| **CR / CL** | Clarification Request |
| **DNA** | Designated National Authority |
| **DOE** | Designated Operational Entity |
| **PP** | Project Participant |
| **EIA / EA** | Environmental Impact Assessment / Environmental Assessment |
| **ER** | Emission Reduction |
| **FAR** | Forward Action Request |
| **FSR** | Feasibility Study Report |
| **GHG** | Green House Gas(es) |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **IRL** | Information Reference List |
| **IRR** | Internal Rate of Return |
| **KP** | Kyoto Protocol |
| **MP** | Monitoring Plan |
| **NGO** | Non Governmental Organisation |
| **OM** | Operating Margin |
| **PDD** | Project Design Document |
| **TÜV SÜD** | TÜV SÜD South Asia Pvt Ltd |
| **NWFP** | North West Frontier Province |
| **LCL** | Lucky Cement Limited |
| **WECM** | Waste Energy Carrying Medium |

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# 1 INTRODUCTION

## 1.1 Objective

The objective of the validation process is to provide an independent assessment by a third party, a Designated Operational Entity (DOE), of a proposed project activity. The assessment involves the evaluation of the project basis and design identified in the Project Design Document (PDD) using the defined criteria outlined by the registration under the Clean Development Mechanism (CDM). Validation is part of the CDM project cycle and results in a conclusion by the executing DOE on whether or not a project activity is valid to be submitted for registration to the CDM Executive Board (CDM-EB). The ultimate decision on the registration of a proposed project activity rests with the CDM-EB and the Parties involved.

The project addressed in this validation report has been submitted under the following project title:

Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant

## 1.2 Scope

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities. In the case of CDM project activities, the scope is set by:

- The Kyoto Protocol, in particular § 12 and modalities and procedures for the CDM
- Decision 2/CMP1 and Decision 3/CMP.1 (Marrakech Accords)
- Further COP/MOP decisions with reference to the CDM (e.g. decisions 4 – 8/CMP.1)
- Decisions and specific guidance outlined by the EB which are published under http://cdm.unfccc.int
- Guidelines for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodology (CDM-NM)
- Baselines and monitoring methodologies (including GHG inventories)
- Management systems and auditing methods
- Environmental issues relevant to the applicable sectoral scope
- Applicable environmental and social impacts and aspects of CDM project activity
- Sector specific technologies and their applications
- Current technical and operational knowledge of the specific sectoral scope and information on best practice

The validation process is not meant to provide any form of consulting for the project participant (PP). However, stated requests for clarifications, corrective actions, and/or forward actions may provide input for improvement of the project design.

Once TÜV SÜD receives the PDD, it is made publicly available on the UNFCCC website and on TÜV SÜD's website, which initiates a 30 days global stakeholder consultation process (GSP). In special circumstances, such as when a project design changes, the GSP may need to be repeated. Information on the PDDs is presented on page 1 of this report.

The purpose of a validation is to demonstrate compliance or non-compliance of the project with all stated and valid CDM requirements. Additionally, the purpose of validation is to enable the registration of CDM projects, which is only a part of the total CDM project cycle.

# 2 METHODOLOGY

The project assessment is based on the "Clean Development Mechanism Validation and Verification Manual" version 1.2 and is conducted using standard auditing techniques to assess the correctness of the information provided by the project participants. Before the assessment begins, members of the team covering the technical scope(s), sectoral scope(s), and relevant host country experience for evaluating the CDM project activity are appointed. Once the project is made available for the stakeholder consultation process, members of the team carry out the desk review, follow-up actions, resolution of issues identified, and the preparation of the validation report. The prepared validation report and other supporting documents then undergo an internal quality control by the CB " Environment and Energy" before being submitted to the CDM-EB.

In order to ensure transparency, assumptions must be clear and stated explicitly and background material must also be referenced. TÜV SÜD has developed a methodology-specific protocol customized for the project. The protocol demonstrates, in a transparent manner, the project criteria (requirements), discussion on each criterion by the assessment team, and the results from validating the identified criteria.

The validation protocol serves the following purposes:

- To organize the details and provision of clarifications on the requirements of which a CDM project is expected to meet
- To elucidate how a particular requirement has been validated as well as to document the results of the validation and any adjustments made to the project design document.

The validation protocol consists of three tables. The different columns in these tables are described in the tables below.

| **Validation Protocol Table 1: Conformity of Project Activity and PDD** | | | | |
|---|---|---|---|---|
| **Checklist Topic / Question** | **Reference** | **Comments** | **PDD in GSP** | **Final PDD** |
| *The checklist is organised in sections following the arrangement of the applied PDD version. Each section is then subdivided. The lowest level constitutes a checklist ques-* | *The section gives reference to documents in which the answer to the checklist question or item is found in case the comment* | *The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is used to explain the conclusions reached. In some cases sub-checklists are applied indicating yes/no decisions on* | *The section is used to present conclusions based on the assessment of the first PDD version. The PDD is either acceptable based on evidence provided (☑) or a **Corrective Action Request (CAR)** is issued due to non-compliance with the checklist question (See below). **Clarification Request (CR)** is used when the validation team has identified a need* | *Conclusions are presented in the same manner based on the assessment of the final PDD version and further documents including assumptions presented in the docu-* |

| | | | | |
|---|---|---|---|---|
| *tion / criterion.* | *refers to documents other than the PDD.* | *the compliance with the stated criterion. Any **Request** has to be substantiated within this column.* | *for further clarification. **Forward Action Request** is issued to highlight issues related to project implementation that require review during the first verification.* | *mentation.* |

| **Validation Protocol Table 2: Compilation and Resolutions of CARs, CRs and FARs** | | | |
|---|---|---|---|
| | Comments and Results | Ref | Conclusion and IRL |
| Issue | *Corrective Action, Clarification or Forward Action Requests.* | *Reference to the checklist question number in Table 1* | *Final conclusions and relevant references.* |
| Response | *The responses given by the client or other project participants during communication with the validation team.* | | |
| Assessment | *Summary of the discussion and revision of project documentation together with the validation team's responses* | | |

In case of a denial of the project activity more detailed information on this decision will be presented in Table 3.

| **Validation Protocol Table 3: Unresolved Corrective Action and Clarification Requests** | | |
|---|---|---|
| **Clarifications and corrective action requests** | **Id. of CAR/CR** | **Explanation of the Conclusion for Denial** |
| *Referenced request if final conclusions from table 2 resulted in a denial.* | *Identifier of the Request.* | *Detailed explanation of why the project is considered non-compliant with a criterion and a clear reference to the criterion* |

The completed validation protocol is enclosed in Annex 1.

## 2.1 Appointment of the Assessment Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body "Environment and Energy".

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates four qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL)
- Greenhouse Gas Auditor (GHG-A)
- Greenhouse Gas Auditor Trainee (T)
- Experts (E)

It is required that the sectoral scope(s) and the technical area(s) linked to the methodology and project have to be covered by the assessment team.

**Assessment Team:**

| Name | Qualification | Coverage of scope | Coverage of technical area | Coverage of financial expertise | Host country experience |
|---|---|---|---|---|---|
| **Khalid Mahmood** | **ATL** | | | | ☑ |
| Robert Mitterwallner | GHG-A | ☑ | ☑ (4.1) | | |
| Ms. Paula Auer* | GHG-A | | | | |
| Georgios Agrafiotis | GHG-A | | | ☑ | |

*: -The TAs of this project were covered during the on-site mission by Ms. Paula Auer as per the appointments valid at that time.

- Not appointed yet as per new accreditation system

- Onsite was performed on September 29th, 2009 and all audit team members were onsite.

**Technical Reviewers:**

- Thomas Kleiser, Nikunj Agarwal

## 2.2 Review of Documents

The first version of the PDD was submitted to the DOE on July 22nd, 2009 with AM0024 but later during the validation process, the PPs changed the methodology and submitted the PDD version 4 with AMS.III.Q for re-GSP in May 2011. Actually it became clear during the validation that existing captive power plant used more than one type of fuels for which AM0024 was not applicable. The PPs kept waiting for result of revision request AM_REV_0141 for AM0024 (covering multiple fuels) until November 2010. The decision was taken to merge AM0024 with ACM0012. However, the revision draft for ACM0012, did not address the issue of multiple fuel consumption in the captive power plant. Consequently, the PPs decided to switch over to small scale methodology. A request for revision of AMS III Q V3 (SSC_497) was submitted in December 2010 which was finally approved (as AMS III Q Version 4) in EB 60 meeting and became effective on April 15, 2011.The PP submitted the revised SSC PDD for the project activity to TÜV SÜD on May 18, 2011 which became available for repeat GSP on May 20, 2011. The submitted PDD by the PP and additional background documents related to the project design and baseline have been reviewed to verify the correctness, credibility, and interpretation of the presented information. The repeat GSP PDD does not affect the project description, project boundary or additionality aspects of the project activity which stay the same both in first GSP PDD and repeat GSP PDD. Furthermore, a cross-check between information provided and information from other sources (if available) has been done as an initial step of the validation process. A complete list of all documents and evidence material reviewed is attached as annex 2 to this report.

## 2.3 Follow-up Interviews

On 29 September 2009, TÜV SÜD performed interviews, telephone conferences, and physical site inspections with project stakeholders to confirm relevant information, and to resolve issues identified in the first document review. The following table provides a list of all persons interviewed in this process.

**Persons Interviewed:**

| Name | Organisation |
|---|---|
| Qazi Sabir | Senior Project Manager, Carbon Services (private) Limited |
| Feroz Baig | Project Engineer, Carbon Services (Private) Limited |
| Mohammad Qutubuddin Baig | Technical Director (Lucky Cement Limited) |
| Intisar Haqqi | Director Power Generation (Lucky Cement Limited) |
| Hassan Mazhar | Deputy General Manager, Power generation (Lucky Cement Limited) |
| Muhammad Shahid Patel | Deputy Manager , costing and budgeting (Lucky Cement Limited) |
| Muhammad Faisal Panawala | Senior Account officer (Lucky Cement Limited |

## 2.4 Cross-check

During the validation process the team has made reference to available information related to similar projects or technologies as the CDM project activity. Project documentation has also been reviewed against the approved methodology applied to confirm the appropriateness of formulae and correctness of calculations.

## 2.5 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD`s conclusion on the project design. The CARs and CRs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the validation process, the concerns raised and responses that have been given are documented in more detail in the validation protocol in Annex 1.

The final PDD version submitted in February 2013 serves as the basis for the final assessment presented. Additional changes to the project during the validation process are not considered to be significant with respect to the main CDM objectives. The two CDM main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

## 2.6 Internal Quality Control

Internal quality control is the final step of the validation process and is conducted by the CB “Environment and Energy” which checks the final documentation, which includes the final validation report and all necessary documents. The completion of the quality control indicates that each submitted report has been approved by the CB Committee. In projects where one of the CB Committee members is part of the assessment team, the approval is given by the rest of the committee.

After confirmation by the PP, the validation opinion and relevant documents are submitted to the EB through the UNFCCC web-platform.

# 3 SUMMARY

The assessment work and the main results are described below in accordance with the VVM version 1.2 reporting requirements. The reference documents indicated in this section and Annex 1 are stated in Annex 2.

## 3.1 Approval

The project participants are Lucky Cement Limited & Carbon Service (Private) Limited of the Islamic Republic of Pakistan and First Climate (Switzerland) AG of Switzerland. The host Party Pakistan and further participant party Switzerland meet the requirements to participate in the CDM.

The DNA of Pakistan has issued a LoA (IRL 42) on October 14th, 2009 authorizing Lucky Cement Limited (Pakistan), Carbon Services (Private) Limited (Pakistan), and First Climate (Switzerland) AG (Switzerland) as project participants. The DNA of Switzerland has also issued LoA (IRL 43) on November 25$^{th}$, 2010, authorizing First Climate (Switzerland) AG (Switzerland) as a project participant. TÜV SÜD received these letters from the project participants directly and considers the provided letters as authentic.

The Pakistan LoA has further been double-checked with the CDM project webpage sponsored by the Ministry of Environment, Government of Pakistan, in this way the DOE confirms that the LoA has been issued by the host country (http://cdmpakistan.gov.pk/cdm_prjtapproval.html).

Furthermore, after checking the provided LoAs, TÜV SÜD confirms that both letters refer to the precise proposed CDM project activity title in line with the title in the PDD “Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant”.

Both LoA letters also indicate that each participating Party is a Party to the Kyoto Protocol, and that the participation in the Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant project is voluntary. The Pakistan LoA also confirms that the proposed CDM project activity contributes to the sustainable development of Pakistan (host country). Based on the information given in these letters, TÜV SÜD considers the approval as unconditional with respect to these items.

Both LoAs have been issued by the respective Party’s DNA, the Ministry of Environment of Pakistan and the Federal Office for the Environment of Switzerland.

TÜV SÜD considers that the requirements of VVM (§§ 45-48) have been met.

The LoAs do not specify a version number of the PDD or validation report. The corresponding references included in LoA, PDD and validation report are consistent.

## 3.2 Participation

The participants of the project activity have been approved by the corresponding Parties, which is confirmed by the issued LoAs.

The means of validation used are similar to the ones described in Section 3.1, specifically in regard to the approval process of the project activity.

## 3.3 Project design document

The PDD is compliant with relevant form and guidance as provided by UNFCCC.

The most recent version of the PDD form was used.

TÜV SÜD considers that the guidelines for the completion of the PDD in their most recent version have been followed. Relevant information was provided by the participants in the applicable PDD sections. Completeness was assessed through the protocol included in Annex 1.

## 3.4 Project description

The following description of the project as per PDD was verified during the on-site audit:

The objective of the project is to generate electricity by using waste heat from three clinker production lines at the Lucky Cement Limited (LCL) in Sindh province, Pakistan. The waste heat will come from three dry clinker production lines (Kiln E, F and G) with a capacity of 3300 tons per day (TPD) for each line. To utilize the recovered waste heat, the Project activity installs a steam turbo generator with 15 MW of rated power output. (As per UNFCCC categories, project lie in Type III- other project activities). Lucky Cement Limited has no grid connection for electricity important or export.

The electricity generated by the Project activity will partly displace the electricity which would have been produced by the existing Captive Power plant. The cement plant has a captive power plant with total capacity of 80.35 MW which has twelve engines. Two of these engines are HFO (Heavy Fuel Oil) based while remaining nine are natural gas based; diesel fuel is used for back up purposes. In the baseline scenario of the project, almost all the waste heat from the clinker production process was vented to atmosphere; only a small portion of the waste heat from the feed ends of clinker production kilns is recycled to heat up incoming raw material. All the power demand is met by a captive power plant as there is no grid connection. Although, paragraph 3 of AMS-III.Q, version 04 requires that “no waste heat was recovered from the project activity source prior to the implementation of the project activity”, it has been clarified by Annex 20 of EB 61 report that project activities that recover waste heat in the baseline are eligible to AMS-III.Q anyway subject that “the current practice of recovering small amounts of waste energy continues during the crediting period”. Hence, the project activity on hand is eligible for AMS-III.Q, version 04.

The project installed six (two on each kiln) Heat Recovery Steam Generators (HRSGs) to recover the waste heat from the kilns to generate electricity by a 15 MW steam turbo generator, leading to net electricity production of 87,437 MWh per year (gross power generation - auxiliary consumption) and expected are emission reduction of 42,992 t $CO_2$.

The project will contribute to sustainable development by improving energy efficiency of the cement industry in Sindh province, reducing global emissions of greenhouse gases and creating employment opportunities for local residents.

The information presented in the PDD on the technical design is consistent with the actual planning and implementation of the project activity as confirmed by:

- Review of data and information (see Annex 2 e.g. equipment capacity and performance/ life time).
- An on-site visit has been performed and relevant stakeholder and personnel with knowledge of the project were interviewed.

- Finally, information related to similar projects or technologies as the CDM project activity (e.g. load factor of the project, electricity and thermal energy indicators) have been used to validate the accuracy and completeness of the project description.

In conclusion, TÜV SÜD confirms that the project description, as included in the PDD, is sufficiently accurate and complete in order to comply with the requirements of the CDM.

### 3.4.1 Debundled component of a large scale project activity

Based on its local and sectoral expertise and based on a research on all CDM projects of this type, TÜV SÜD confirms that the proposed project is not a debundled component of a larger project activity because there is no small scale CDM project activity, or an application registered by Lucky Cement Limited in the same project category in the last two years within 1 km of the project boundary of the proposed small-scale project activity.

## 3.5 Baseline and monitoring methodology

### 3.5.1. Applicability of the selected methodology

The used version 4 of the selected baseline and monitoring methodology AMS.III.Q is valid. In respect to this version, no specific EB guidance has been identified." Compliance with each applicability condition as listed in the chosen baseline and monitoring methodology AMS-III.Q Version 4 and relevant tools have been demonstrated:

- Corresponding section of ACM0012 (version 04.0.0, to estimate the capping factor)

The project uses the waste heat from clinker production process to generate electricity. The recovery of waste heat in the Project activity is new initiative. Historically major portion of the waste heat from clinker production process was vented to the atmosphere with a small portion recovered to preheat raw materials for clinker production. After the implementation of the WHR project the raw material shall be pre-heated with the waste heat. It has been clarified by Annex 20 of EB61 report that project activities that recover waste heat in the baseline are eligible to AMS-III.Q anyway subject to the condition that “the current practice of recovering small amounts of waste energy continues during the crediting period”. Hence, the project activity on hand is eligible for AMS-III.Q, version 04.The assessment was carried out for each applicability criteria and included, among other checks, the compliance check of the local project setting with the applicability conditions in regard to baseline setting and eligible project measures. This assessment also included the review of secondary sources, which further demonstrate that applicability conditions have been complied with the methodology specific protocol, included in the annex 1, documents the assessment process. The protocol also includes the steps taken in the assessment process. The results of the compliance check as well as relevant evidence are detailed in annex 1.

TÜV SÜD confirms that the chosen baseline and monitoring methodology is applicable and valid for the project activity.

Emission sources, which are not addressed by the applied methodology, and which are expected to contribute more than 1% of the overall expected average annual emission reductions, have not been identified.

In the course of the information and reporting check, the following remark was raised by EB:

**3: The DOE is requested to describe how it has validated that the selected baseline methodology (ies) applies(y) correctly to the project boundary, baseline identification and algorithms and formulae used to determine emission reductions as per VVM v1.2, paragraphs 67. The DOE shall clarify how it validated the project to be applicable under III-Q version 4 which states that "category is for project activities that utilize waste gas and/or waste heat at existing facilities". The DOE may refer to footnote 1 for the definition of "existing facility" and note that Kiln G started operation in January 2009 whereas the start date of the project is May 2008**.

TÜV SÜD would like to clarify this issue as follows:

The definition of "existing facility" as provided in footnote 1 of AMS.III.Q requires the existence of the facility before starting date of project activity.

This is evident from SSC WG response to SSC-352 requiring a definition of existing facility under AMS III Q:

"A facility that is existing on the starting date of the CDM project activity (definition shall be in accordance with paragraph 67 of the EB 41 meeting report) such that all the options for demonstrating the use of waste energy in the absence of the project activity are based on historic information and not on a hypothetical scenario. ***The facility may not be considered as an existing facility if it does not exist on the starting date of the project activity.****"*

The fact that commissioning/operation of existing facility is not intended in the definition provided either in footnote 1 of AMS III Q or SSC WG response to SSC 352. This can be confirmed from the definition of "existing facility" provided earlier by the SSC WG in its response to SSC 187 where it is stated that:

*"The SSC WG agreed that the definition of existing facilities in the paragraph 1 of the AMS III.Q is the same as defined in footnote 4 at page 3 of ACM0012 (Version 02) i.e. "Facilities where the commercial production had begun at the time when the Project Activity is submitted for validation"*

It may be important to mention here that the definition of existing facility as provided in footnote 4 of ACM0012 Version 2 still appears exactly same in footnote 18 of the most recent version (Version 4.0.0) of ACM0012.

In the light of the SSC WG clarifications discussed above, it can be concluded that the existing facility corresponds to a facility which existed on or before the start date of the project activity and where the commercial operation production had begun at the time when the project activity is submitted for validation.

Table: Timeline for Kiln Line G

| Parameter | Date | Source |
|---|---|---|
| Contract for Supply of Kiln G between Lucky Cement Limited & HCRDI China | August 11, 2007 | IRL (79) |
| Opening of LC (letter of credit ) for Kiln G | August 22, 2007 | IRL (80) |
| Kiln G Equipment Shipped from China | January 9, 2008 | IRL (81) |
| Delivery of Kiln G Equipment and auxiliary material at site | February 14, 2008 | IRL (82) |
| Commissioning of Kiln G | January, 2009 | IRL (20) |

In view of the information provided in Table above, TÜV SÜD confirms that

- The Kiln G existed (it was part of the existing facility, Lucky Cement Plant, IRL 82) before the start date of the project activity, May 07, 2008 (IRL 14).
- Kiln G started commercial production (January 2009, IRL 20) before the project activity was submitted for validation (July 2009, IRL 1, IRL 41).

Furthermore, TÜV SÜD validated the use of waste heat in the absence of project activity based on the following information:

- The contract with the equipment supplier for Waste Heat Recovery Plant, clearly states that "According to the technical data submitted by the owner and site measurement data by SINOMA EC, the waste heat of the three cement production lines are mainly from the cooler and the Preheater". The fact that waste heat from all three kiln lines is considered in the contract (IRL 14) proves that the Kiln G existed at site (although it was not operational at that time, it was part of the existing facility) before the start date of the project activity and shows that the fate of waste heat from Kiln E, F and G is based on historic information (technical data submitted by project owner and site measurements conducted by waste heat recovery equipment supplier) rather than hypothetical scenario.

During the site visit TÜV SÜD confirmed that all the waste heat from clinker production (Kiln E, F and G was vented to atmosphere and only small portion was recovered for pre-heating of fuel (Coal) and raw materials for clinker production (IRL 3a, 19, 20); the historical use of waste heat was further cross-checked against annual financial reports of Lucky Cement (2007 to 2009, IRL 72).

Based on discussion and review of the documents referred above, TÜV SÜD confirms that the methodology, AMS III Q Version 4, is fully applicable to the project activity.

***During the course of request of registration of the project, the following question (Request for Review) was raised by EB:***

***2) The DOE shall clarify how it validated the project to be applicable under A.M.S III-Q version 4 which states that "A facility that is existing on the starting date of the project activity (see definition in paragraph 67 of the EB 41 meeting report) as per footnote 1 of the methodology given that Kiln G started operation in January 2009 which is after the start date of the project is May 2008. Please refer to Footnote 1, AMS III-Q version 04.***

TÜV SÜD would like to clarify this issue as follows:

The definition of "existing facility" as provided in footnote 1 of AMS.III.Q requires the existence of the facility before starting date of project activity.

This is evident from SSC WG response to SSC-352 requiring a definition of existing facility under AMS. III. Q:

"A facility that is existing on the starting date of the CDM project activity (definition shall be in accordance with paragraph 67 of the EB 41 meeting report) such that all the options for demonstrating the use of waste energy in the absence of the project activity are based on historic information and not on a hypothetical scenario. ***The facility may not be considered as an existing facility if it does not exist on the starting date of the project activity.***"

The commissioning/operation of the existing facility is not covered neither by the definition provided in the footnote 1 of AMS.III. Q nor by the SSC WG response to SSC-352. This can be confirmed from the definition of "existing facility" provided earlier by the SSC WG in its response to SSC-187 where it is stated that:

*"The SSC WG agreed that the definition of existing facilities in the paragraph 1 of the AMS.III.Q is the same as defined in footnote 4 at page 3 of ACM0012 (Version 02) i.e. "Facilities where the commercial production had begun at the time when the Project Activity is submitted for validation"*

It may be important to mention here that the definition of existing facility as provided in footnote 4 of ACM0012 Version 2 still appears exactly same in footnote 18 of the most recent version (Version 4.0.0) of ACM0012.

In the light of the SSC WG clarifications discussed above, it can be concluded that the existing facility corresponds to a facility which existed on or before the start date of the project activity and where the commercial operation production had begun at the time when the project activity is submitted for validation.

Table: Timeline for Kiln Line G

| Parameter | Date | Source |
|---|---|---|
| Contract for Supply of Kiln G between Lucky Cement Limited & HCRDI China | August 11, 2007 | IRL (79) |
| Opening of LC (letter of credit ) for Kiln G | August 22, 2007 | IRL (80) |
| Kiln G Equipment Shipped from China | January 9, 2008 | IRL (81) |
| Delivery of Kiln G Equipment and auxiliary material at site | February 14, 2008 | IRL (82) |
| Commissioning of Kiln G | January, 2009 | IRL (20) |

In view of the information provided in Table above, TÜV SÜD confirms that

- The Kiln G existed (it was part of the existing facility, Lucky Cement Plant, IRL 82) before the start date of the project activity, May 07, 2008 (IRL 14).
- Kiln G started commercial production (January 2009, IRL 20) before the project activity was submitted for validation (July 2009, IRL 1, IRL 41).

***<u>During the course of request of registration of the project, the following question (Request for Review) was raised by EB:</u>***

***3) The DOE is requested to clarify how it validated the baseline emissions as per Footnote 1 of AMS III-Q ver 4 which states that "all options for demonstrating the use of waste energy in the absence of a CDM project activity shall be based on historic information and not on a hypothetical scenario" given that the baseline emissions for the kilns is not based on historical data but is a hypothetical figure based on design capacity. Please refer to footnote 1 of AMS III-Q version 04.***

***The PDD and the VR states that Kiln E,F and G has a clinker production capacity of 3300 Tons per Day (TPD) whereas all excel worksheet calculations refer to the capacity as 3000 Tons per Day (TPD). Please refer to Footnote 1, AMS III-Q version 04.***

TÜV SÜD would like to clarify this issue as follows:

**3)** Footnote 1 of AMS.III.Q additionally requires that all options for the use of the waste energy in the absence of the CDM project activity shall be based on historical information and not on a hypothetical scenario.

TÜV SÜD validated the use of waste heat in the absence of project activity based on the following information:

- The contract with the equipment supplier (SINOMA EC ) for Waste Heat Recovery Plant, clearly states that "According to the technical data submitted by the owner and site measurement data by SINOMA EC, the waste heat of the three cement production lines are mainly from the cooler and the Preheater". The fact that waste heat from all three kiln lines is considered in the contract (IRL 14) proves that the Kiln G existed at site (although it was not operational at that time, it was part of the existing facility) before the start date of the project activity and shows that the design of waste heat installation from Kiln E, F and G is based on historic information (technical data submitted by project owner and site measurements conducted by waste heat recovery equipment supplier) and not on hypothetical scenario.

  Baseline emissions are thus based on electricity produced by the WHR system using waste energy from kilns (determined by the equipment supplier based on test data) and the emission factor and efficiency of the existing captive power plant which is determined based on historical data.

  During the onsite visit, TÜV SÜD confirmed that almost all the waste heat from clinker production (Kiln E, F and G) was vented into the atmosphere and only a very small portion (less than 1%) was recovered for pre-heating of fuel (Coal) and raw materials for clinker production (IRL 3a, 19, 20); the fact that there was no use of waste heat was further cross-checked against the annual financial reports of Lucky Cement (2007 to 2009, IRL 72) which do not mentioned anywhere any waste heat recovery installations. On the contrary, in annual financial report of Lucky Cement from 2011, the start of operation of waste heat recovery for power generation is clearly stated.

**Second part of question 3 of Request for Review:**

**The PDD and the VR states that Kiln E,F and G has a clinker production capacity of 3300 Tons per Day (TPD) whereas all excel worksheet calculations refer to the capacity as 3000 Tons per Day (TPD). Please refer to Footnote 1, AMS III-Q version 04.**

TÜV SÜD would like to clarify this issue as follows:

The IRR calculation and the excel worksheet for emission reduction calculations contained initially a capacity value of 3000 TPD for all kilns, because this value was necessary as per the methodology that was applied at that time (AM0024). This value was initially adopted by the PP to estimate the annual clinker production. However, with the adoption of AMS.III.Q, the capacity of the clinker lines is not relevant any more as far as the emission reduction calculations are concerned. The ER calculations are not based on clinker production capacity of the kilns but on the expected electricity production by the WHR plant (the value was provided by the equipment supplier and has also been used to determine *fwcm*, *fcap*, emission factor of the existing captive power plant and its efficiency). Furthermore, the estimation of the indirect income from electricity production from WHR (instead of the captive power plant) is based again on the possible electricity generation as per manufacturer of the steam turbine of the WHR equipment. Thus, the clinker production is not used anywhere in this calculation as well.

The PP has submitted revised PDD version, ER calculation-sheet and IRR calculation-sheet by taking out completely the kilns capacity. The calculations themselves have not been modified by any means.

Summary:

Based on above discussion and review of the documents referred above, TÜV SÜD confirms that the project activity complies with the definition of existing facility as provided in footnote 1 of AMS. III. Q, Version 4 and further elaborated by SSC WG from time to time. Furthermore, TÜV SÜD also confirmed that the baseline emissions (including those from Kiln G) are based historical as well as measured data and cannot be regarded as hypothetical.

TÜV SÜD confirms that the clinker production capacity of the kilns is not relevant for the ER calculation sheet and IRR calculation and does not affect the additionality and ER calculation of the project activity.

## 3.5.2. Project boundary

The project boundary was assessed considering information gathered from the physical site inspection, interviews, and secondary evidence received on the design of the project.

According to the applied methodology (AMS III.Q version 04) the project boundary is defined as ''the physical, geographical site of the facility where the waste heat is produced and transformed into useful energy''. The project boundary of the project activity includes the facility that involves fuel consumption and electricity generation by the captive power plant, clinker production process at kilns (Kiln E, F and G) and electricity generated by the waste heat recovery project are part of the project boundary that is in line with AMS.III Q version 4 § 7 (a).

The most relevant documents assessed in order to confirm the project boundary are the following:

- Initial Environmental Examination Report prepared by "Environmental Consultancy & Services" dated May 1st, 2009 (IRL 45)
- Decision on Initial Environment Examination (IEE), issued by Environment Protection Department, Government of the Sindh, Karachi (IRL18);
- Equipment purchase contract of Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant (IRL 14)

Details and observations are listed in Annex 1.

The documents have been validated during the validation process using standard audit techniques. Further details of any observation are transparently presented in Annex1.

Therefore, TÜV SÜD confirms that the identified boundary, the selected sources and gases as documented in the PDD are justified for the project activity and fully in line with the requirements set by the applied methodology.

### 3.5.3. Baseline identification

The PDD defines the following baseline scenario

- *AMS-III.Q; The waste heat would continue to be vented to the atmosphere, apart from the heat already used for pre-heating the raw material.*

The baseline scenario equals the scenario prior to the implementation of this project activity. This scenario involves the continued venting of the waste heat into the atmosphere by the pre-heater and clinker cooler of the kilns and the production of electricity in the Captive power plant by using diesel, Heavy Fuel Oil and natural gas as fuel. It has been clarified by Annex 20 of EB 61 report that project activities that recover waste heat in the baseline are eligible to AMS-III.Q anyway subject that "the current practice of recovering small amounts of waste energy continues during the crediting period". Hence, the project activity on hand is eligible for AMS-III.Q, version 04.

During the on-site visit it was checked and confirmed by the audit team that there is a captive power plant and that there is no waste heat recovery from the kilns except the common practice of utilizing a small portion of it for preheating the raw material in the raw mill and preheating the coal.

The information presented in the PDD has been validated by an initial document review of all data related to baseline (i.e. historical data as per energy bills for 2006 (IRL 28, 29, 32, 46). Further confirmation of baseline scenario validated as per para 5h, (iii) of AMS.III. Q version 04 has been made based on the on-site visit (confirmation of raw mill and coal preheating and no existing waste heat recovery) and a review of information from similar projects and/or technologies.

Baseline data from October 2006 till April 2008 has been checked by the audit team. Since the Lucky Cement Karachi Plant started its operation in October 2006, therefore historical data for only 19 months is available and emission reductions are done based on data of 19 months from October 2006 to April 2008. Since kiln G started operation in January 2009, therefore no historical data before the starting date of the project activity (May 07, 2008) is available for kiln G. However, as kiln G is identical to the existing kilns E & F, all the parameters of kiln G (like fuel consumption and clinker production) have been calculated by taking average of the parameters of kiln E and kiln F. The historical data is given in Annex 3 of PDD on page 49 till 51 of PDD. It is clear that three years historical data for the project activity is not available. However, use of all historical data that is available (minimum of 1 year historical) has been accepted by the SSC WG (SSC WG 31) in its response to the revision request SSC_531. "As regards to the revision request on the requirement of three years

historical data to determine baseline for electricity (equation 1), the SSC WG agreed to align the requirements of AMS-III.Q with the provisions of other approved SSC methodologies (such as AMS-III.B, AN, AM) for example, all relevant parameters shall be available for the immediately prior three years to the start date of the project activity. For facilities with less than three years operational data, all historical data shall be available (a minimum of one year data would be required)."

Based on the validated assumptions used for project activity calculations, TÜV SÜD considers that the identified baseline scenario is reasonable.

Taking the definition of the baseline scenario into account, TÜV SÜD confirms that all relevant CDM requirements, including relevant and/or sectoral policies and circumstances, have been identified correctly in the project PDD.

A verifiable description of the baseline scenario has been included in the PDD.

In regard to item 87 of VVM Version 1.2, TÜV SÜD confirms the following statements:

(a) All the assumptions and data used by the project participants are listed in the PDD, including their references and sources;

(b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD;

(c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence, and can be deemed reasonable;

(d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD;

(e) The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario, and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

## 3.5.4. Algorithm and/or formulae used to determine emission reductions

TÜV SÜD has assessed the calculations of baseline emissions and emission reductions. Corresponding calculations have been carried out based on calculation spreadsheets (IRL 37). The parameters and equations presented in the PDD, and further documentation have been compared with the information and requirements presented in the methodology and respective tools. An equation comparison has been made explicitly following all the formulae presented in the calculation files.

The assumptions and data, parameters used to determine the emission reductions are listed in the PDD and all the sources have been checked. The baseline methodology has been applied correctly according to requirements. Based on the information reviewed; TÜV SÜD can confirm that the data and parameters and their sources used are correctly quoted and interpreted in the PDD and applied data and parameters are conservative.

The values presented in the PDD are considered reasonable based on the documentation reviewed, further references and the results of the interviews. The baseline methodology has been applied correctly according to requirements. The estimated baseline emissions can be confirmed, as the same have been replicated by the audit team using the information provided.

More detailed information on the verification of the parameters used in the emission reduction calculations can be found in Annex 1 of this report. The algorithms for the determination of the baseline, project, and leakage emissions are discussed in the following sections.

## 3.5.5. Baseline Emissions

TÜV SÜD has assessed the calculations of project emissions, baseline emissions, leakage emissions and emission reductions. Corresponding calculations were carried out based on calculation spread sheet (IRL 13). The parameters and equations presented in the PDD and further documentation have been compared with the information and requirements presented in the methodology and respective tools. The equation comparison has been made explicitly following all the formulae presented in the calculation files. The calculation of the baseline emissions have been conducted using procedures described in the methodology AMS.III.Q Version 04, ACM0012 version 4.0.0 (for calculation of Fcap) and in the tool to calculate the emission factor for an electricity system.

The waste heat from the clinker production process has been released to the atmosphere with only a small portion utilized for preheating the incoming raw material and coal.

The situation has been confirmed by audit team during on site visit.

According to the methodology baseline emissions for year y are calculated as:

The formula is;

$$BE_{elec,y} = f_{cap} * f_{wcm} * \sum_{j}\sum_{i}(EG_{i,j,y} * EF_{Elec,i,j,y})$$

Where:

| | |
|---|---|
| $BE_{elec,y}$ | Baseline emissions due to displacement of electricity during the year y in tons of $CO_2$ |
| $EG_{i,j,y}$ | The quantity of electricity supplied to the recipient *j* by generator, that in the absence of the project activity would have been sourced from $i^{th}$ source (in the project activity is existing captive power plant) during the year *y* in MWh |
| $EF_{elec,i,j,y}$ | The $CO_2$ emission factor for the electricity source, displaced due to the project activity, during the year *y* in tons $CO_2$/MWh |
| $f_{wcm}$ | Fraction of total electricity generated by the project activity using waste energy. For the project activity this fraction is 1 because the electricity generation is purely from the use of waste heat |
| $f_{cap}$ | Capping factor to exclude increased waste energy utilization in the project year y due to increased level of activity of the plant, relative to the level of activity in the base years before the project start. The ratio is 1 if the waste energy generated in the project year y is same or less than generated in base years. $F_{cap}$ will be estimated according to the corresponding section of ACM0012. |

As the baseline generation source is an identified existing plant, the parameter EGi, j, y corresponds to $EG_{is,y}$ and the emission factor $EF_{elec,i,j,y}$ corresponds to $EF_{elec,is,y}$. The $CO_2$ emission factor shall be determined as follows:

$$EF_{Elec,is,j,y} = \frac{EF_{CO2,i,j}}{\eta_{Plant,j}} \times 3.6 * 10^{-3}$$

Where:

| | |
|---|---|
| $EF_{CO2,i,j}$ | The $CO_2$ emission factor per unit of energy of the fossil fuel used in the baseline generation source i in ($tCO_2$/TJ), obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC default emission factors |
| $\eta_{Plant,j}$ | The overall efficiency of the existing plant that would be used by $j^{th}$ recipient in the absence of the project activity |
| $3.6*10^{-3}$ | Conversion factor, expressed as TJ/MWh |

The emission factor is fixed ex-ante. In the baseline, the captive power plant consumes more than one type of fossil fuel (HFO, NG, and diesel) therefore $CO_2$ emission factor per unit of energy of the fossil fuels used in the baseline shall be weighted emission factor calculated by using the following equation;

$$EF_{CO2,i,j} = \frac{\sum_i (FC_{i,y} \times NCV_i \times COEF_i)}{\sum_i (FC_{i,y} \times NCV_i)}$$

Where:

| | |
|---|---|
| $EF_{CO2,i,j}$ | The $CO_2$ emission factor per unit of energy of the fossil fuels used in the baseline generation source *i* in ($tCO_2$/TJ), obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC default emission factors |
| $FC_{i,y}$ | Consumption of fossil fuel (mass or volume unit) in project situation at captive power plant |
| $NCV_i$ | Net calorific value (energy content per unit mass or energy content per unit volume units) of fossil fuel used in baseline |
| $COEF_i$ | Coefficient of fossil fuel ($tCO_2$/TJ) used in baseline situation |
| *i* | Fossil fuel type |

In the course of the information and reporting check, the following remark has been raised by EB:

***2: The PP/DOE are requested to list the data and parameters used to calculate the emission reductions as per EB 48 Annex 60 paragraph 10 (a).***

1. *Further information is required how the DOE validated the baseline emissions from the electricity displaced by the project activity based on historical generation in accordance with III-Q version 4 which states:"The proportion of electricity that would have been sourced from the ith source to the jth recipient plant should be estimated based on historical data of the proportion received...". In doing so, the DOE shall transparently detail the documented evidence in the Validation Report.*

*TÜV SÜD would like to clarify this issue as follows:*

The cement plant started commercial operation in October 2006. Hence, historical data of the proportion received from each fuel source during the three most recent years is not available. The PP selected 19 months data (October 2006 – April 2008 (IRL 19) for determination of baseline emissions which represents maximum power generation on natural gas (66.06%) and minimum on HFO (33.94%), which is conservative. Diesel is used in minor quantities (less than 1%) only as an auxiliary fuel.

PP's selection of 19 months historical data is in line with the SSC WG clarification in response to SSC_531 which states that:

*"As regards to the revision request on the requirement of three years historical data to determine baseline for electricity (equation 1), the SSC WG agreed to align the requirements of AMS-III.Q with the provisions of other approved SSC methodologies (such as AMS-III.B, AN, AM) for example, all relevant parameters shall be available for the immediately prior three years to the start date of the project activity. For facilities with less than three years operational data, all historical data shall be available (a minimum of one year data would be required)."*

In view of the above, TÜV SÜD confirms that PP's selection of the historical data is appropriate; furthermore, PP's approach that in the absence of the project activity, all the electricity to the cement plant would have been supplied by existing captive power plant (whose efficiency corresponds to the most efficient engine (Rolls-Royce B35:40V-20AGS, IRL 85) using the historical fuel mix available (i.e. 66.06% NG and 33.94% HFO) is conservative.

Steps involved in determination of baseline emissions are elaborated below:

The PP has selected the weighted average approach for determination of the emission factor of the fuel mix which is in line with the following para on page 6 of the methodology which states that

"*In case, in the baseline situation, more than one type of fossil fuel is used in the captive plant, the relative contribution to the total output of each fossil fuel shall be considered and the formulas for baseline emissions shall be adjusted accordingly.*"

The steps carried out for the calculation of emission factor of the electricity system are mentioned below:

i. Share of each fuel type in the total electricity generation of the plant is calculated using the historical electricity generation data.

| | | | |
|---|---|---|---|
| Electricity Generation on HFO (Oct 2006 – April 2008) | 108,341.00 | MWh/yr | IRL 19, 37 |
| Electricity Generation on Natural Gas (Oct 2006 – April 2008) | 210,839.17 | MWh/yr | IRL 19, 37 |
| Total Electricity Generation (Oct 2006 – April 2008) | 319,180.17 | MWh/yr | IRL 19, 37 |
| Share of HFO in total generation | 33.94% | | IRL 19, 37 |
| Share of NG in total generation | 66.06% | | IRL 19, 37 |

ii. Specific fuel consumption is calculated using the electricity generation and fuel consumption of each fuel type.

| | | | |
|---|---|---|---|
| Electricity Generation on HFO (Oct 2006 – April 2008) | 108,341.00 | MWh/yr | IRL 19, 37 |
| HFO Fuel Consumption (Oct 2006 – April 2008) | 22,650.53 | Tons | IRL 19, 37 |
| Specific Fuel Consumption of HFO | 0.2091 | Tons/MWh | IRL 37 |
| Electricity Generation on Natural Gas (Oct 2006 – April 2008) | 210,839.17 | MWh/yr | IRL 19, 37 |
| Natural Gas Consumption (Oct 2006 – April 2008) | 67,593,239.24 | $Nm^3$ | IRL 19, 37 |
| Specific Fuel Consumption of NG | 320.591 | $Nm^3$/MWh | IRL 37 |

iii. The net electricity displaced by the project activity is 87,437 MWh/yr. This is based on Gross Capacity of WHR Plant (IRL12, IRL 14), 80% Load Factor, 8% auxiliaries and 330 days of Operation (FSR of the project activity, IRL 46). 15 x 0.8 x 330 x 0.92 = 87,437 MWh/yr.

iv. The share of Project Electricity that would have been generated on HFO and NG in the baseline situation is determined using their historical ratios (33.94% HFO and 66.06% NG) determined earlier.

| | | | |
|---|---|---|---|
| Total Electricity Generation by the Project Activity | 87,437 | MWh/yr | IRL12,14, 37 |
| Share of Project Electricity that would have been generated on HFO | 29,679.13 | MWh/yr | IRL 19, 37 |
| Share of Project Electricity that would have been generated on NG | 57,757.67 | MWh/yr | IRL19, 37 |

v. The amount of fuel that would have been consumed in the baseline scenario, to produce the same electricity as displaced by the project activity, is calculated using the specific fuel consumption

vi.

| | | | |
|---|---|---|---|
| Share of Project Electricity that would have been generated on HFO | 29,679.13 | MWh/yr | IRL19, 37 |
| Share of Project Electricity that would have been generated on NG | 57,757.67 | MWh/yr | IRL 19, 37 |
| Fuel Consumption of HFO | 6,204.93 | Tons | IRL 19, 37 |
| Fuel Consumption of NG | 18,516,615.68 | $Nm^3$ | IRL 19, 37 |

| | | | |
|---|---|---|---|
| Additional Diesel Consumption in absence of the project activity<br>Although Diesel is used only for auxiliary consumption related to operation of power plant, the PP has still considered it for determination of emission factor of power plant which is appropriate as well as conservative. | 46,457.80 | Ltr | IRL 19, 37 |

vii. The emission factor of the electricity system is calculated by using the following equations already discussed above:

$$EF_{Elec,is,j,y} = \frac{EF_{CO2,i,j}}{\eta_{Plant,j}} \times 3.6 * 10^{-3}$$

Where

$$EF_{CO2,i,j} = \frac{\sum_i (FC_{i,y} \times NCV_i \times COEF_i)}{\sum_i (FC_{i,y} \times NCV_i)}$$

The emission factor is calculated as 0.4917 $tCO_2$ / MWh which is used for *ex ante* calculation of baseline emissions. Fuel (HFO and NG with Diesel being auxiliary fuel) consumption of captive power plant and fuel NCVs will be monitored for *ex post* calculation of emission factor of the captive power plant.

The weighted average method approach shows the emission factor calculation is based on the proportion of fuel type contributing to the total electricity generation and thus is in line with the methodology.
In conclusion, the emission factor of the proposed project will be monitored ex-post.

Based on discussion above and its local and sectoral expertise and knowledge, TÜV SÜD confirms that the assumptions made and algorithms used to calculate baseline emissions are correct.

According to AMS-III.Q / Version 04, efficiency of the power plant *($\eta_{plant,j}$)* has been determined using option (i) of paragraph 8(a) as provided below.

- Assume a constant efficiency of the captive plant and determine the efficiency, as a conservative approach, for optimal operation conditions i.e., design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc.), representative or favourable ambient conditions (ambient temperature and humidity).

The existing captive power plant has five types of gensets as listed in Table B.6.1.1 of PDD. The highest designed efficiency (45.79%) among the four types of gensets is of Rolls-Royce gensets. As a conservative approach, a constant efficiency of 45.79% for the captive power plant is selected as per option (i) for efficiency of power plant. Hence $\eta_{plant,j}$ = 45.79%.

***2: The PP/DOE are requested to list the data and parameters used to calculate the emission reductions as per EB 48 Annex 60 paragraph 10 (a).***

2. *The DOE is requested to provide further details on how it validated the efficiency calculation in accordance with option (i) of AMS III-Q. In doing so the DOE shall transparently document the sources from which the values have been taken and how it ensured that such values are accordance with Option (i) of the methodology.*

TÜV SÜD would like to clarify this issue as follows:

It is clearly stated in the PDD that in the absence of the project activity, the project electricity used by cement plant would be supplied by the existing fossil fuel based captive power plant. The existing captive power plant comprises 5 types of captive power generators. As per Paragraph 8(a) (i) of AMS III.Q./Version 04, the PP has determined the efficiencies of these engines based on optimal operation conditions, representative or favorable ambient conditions.

Details of the engines, i.e. fuel types used by each engine, their types, rated capacities, and efficiencies along with the sources from where the values are taken are given in the table below:

**Characteristics of Captive Power Generators**

| | Engine Type | Rated Capacity | Fuel Type | Efficiency | Source |
|---|---|---|---|---|---|
| Engine type 1 | CatMak 16CM32C DF | 7,300 kW | HFO | 44.78% | Technical Specification/ Test Data of Caterpillar Engines, Type 16CM32C DF (IRL 83) |
| | CatMak 16CM32C DF | 7,300 kW | HFO | | |
| Engine type 2 | CatMak 16CM34 | 5,700 kW | Natural Gas | 43.62% | Technical Specification/ Test Data of Caterpillar Engines Type 16CM34 (IRL 84) |
| | CatMak 16CM34 | 5,700 kW | Natural Gas | | |
| | CatMak 16CM34 | 5,700 kW | Natural Gas | | |
| | CatMak 16CM34 | 5,700 kW | Natural Gas | | |
| | CatMak 16CM34 | 5,700 kW | Natural Gas | | |
| Engine type 3 | Rolls-Royce B35:40V-20AGS | 8,500 kW | Natural Gas | **45.79%** | Technical Specification/ Test Data of Rolls-Royce Engine Type B35:40V-20AGS (IRL 85) |
| Engine type 4 | Rolls-Royce B35:40V-16AGS | 6,800 kW | Natural Gas | 45.45% | Technical Specification/ Test Data of Rolls-Royce Engines Type 40V-16AGS (IRL 86) |
| | Rolls-Royce | 6,800 kW | Natural Gas | | |

| | | | | | |
|---|---|---|---|---|---|
| | B35:40V-16AGS | | | | |
| | Rolls-Royce B35:40V-16AGS | 6,800 kW | Natural Gas | | |
| Engine type 5 | Wartsila 20V34SG | 8,350 kW | Natural Gas | 44.16% | Technical Specification/ Test Data of Wartsila Engine Type 20V34SG (IRL 87) |

The efficiency of the captive power plant ($\eta_{Plant}$) that is applied for calculation of baseline emissions has been defined as the highest among the 5 types of engines in order to be conservative. The efficiency values of the 5 generator types are (engine type 1 has 44.78%, engine type 2 has 43.62%, engine type 3 gas **45.79%, e**ngine type 4 has 45.45% and **e**ngine type 45 has 44.16%) that operate on the optimal operation (design) and existing in the pre-project scenario. For determination of baseline emissions, the value of 45.79% (IRL 85) is chosen as the efficiency of the electricity system. This is in line with Paragraph 8(a) (i) of AMS III.Q./Version 04 which states that:

*"Assume a constant efficiency of the captive plant and **determine the efficiency, as a conservative approach, for optimal operation conditions** i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc.), representative or favorable ambient conditions (ambient temperature and humidity)".*

After review of the efficiency calculations (IRL 37) and referred documents (IRL 82, 87), TÜV SÜD confirms that all the values taken for determination of efficiency of the baseline plant are correct and conservative and. The efficiency calculations are in line with Paragraph 8(a) (i) of AMS III.Q./Version 04.

**Calculation of $f_{wcm}$**

According to the methodology $f_{wcm}$= 1 because the electricity generation of the project is purely from use of waste heat.

**Calculation of $f_{cap}$**

Since there is no historical data on parameters of the waste energy from the cement clinker production and it's not possible to measure it due to different technical reasons Method-3 for fcap calculation was chosen. Since there is only one heat exchange process (with in only one heat exchanger) in the project scenario where waste energy is transferred from WECM to water for steam generation and further production of electricity case 1 of Method-3 for $f_{cap}$ calculation has been chosen. Due to lack of historical information, on the waste heat content of the WECM (and additionally, the fact that heat in the heated air of cement kilns cannot be measured directly in a continued way, and also cannot be correlated in a reliable way with the clinker production – due to variability of the clinkerisation process inputs) method 1 and 2 are not applicable. The detail description has been provided in PDD.

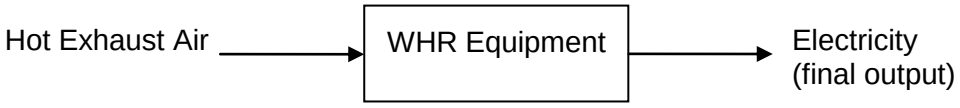
**According to Case 1 Method 3:** *The energy is recovered from WECM and converted to final output energy through waste heat recovery equipment.*

In the proposed project, the following definitions apply:
- The WECM is the hot exhaust air from the kilns, which carries the waste heat

- The waste heat recovery equipment is the set composed of the WHR boilers and the STG (steam turbine generator)
- The final output energy is the electricity provided by the generator

Hot air exits the kiln and comes directly into contact with the water through a heat exchanger. At this point a heat exchange takes place, the water is heated up and steam is generated. Finally the steam via a steam-turbine generates electricity.

A scheme of the energy transfer is the following:




In the project, waste heat from WECM is recovered using the Waste Heat Recovery Equipment to generate steam, and in the same equipment set, the steam is used to generate electricity WITHOUT **any Intermediate Energy Recovery Equipment** (as mentioned in Case 2 of Method 3). The same has been confirmed against thermodynamic system details and equipment list as provided in the Equipment Purchase contract between Lucky Cement Limited and Sinoma Energy Conservation Limited (IRL 14).

Based on the above analysis, the DOE confirms that the proposed project activity fits under Case 1. Following equation (eq. 40 of ACM0012 version 4) has been used to determine $f_{cap}$:

$$f_{cap} = \frac{Q_{OE,BL}}{Q_{OE,y}}$$

Where

| | |
|---|---|
| $Q_{OE,BL}$ | Output/intermediate energy that can be produced (TJ), to be determined on the basis of maximum energy that could be recovered from the WECM (MER), which would have been released (or WECM would have been flared or energy content of WECM would have been wasted) in the absence of CDM project activity. |
| $Q_{OE,y}$ | Quantity of actual output/intermediate energy during year *y* (TJ) |

The gross capacity of Steam Turbine is equal to 15 MW, as per the design value which is provided by the equipment supplier and which represents the maximum waste heat recovery potential of the waste heat recovery equipment (Equipment Purchase contract between Lucky Cement Limited and Sinoma Energy Conservation Limited, IRL 14).

Based on 80% load factor and 330 days/year of clinker production/kiln operation (Feasibility Study Report, IRL 46), the Gross electricity generation is equal to 15 MW*0.8*330d/y*24h/d = 95,040 MWh/year.

Thus, as per case 1 of Method 3, the maximum energy that could be theoretically recovered by waste heat recovery equipment is,
$Q_{OE,BL}$ = 95,040 MWh/yr * 3.6 * $10^{-3}$ = 342.144 TJ electrical The actual output electricity $Q_{OE,y}$ will be determined ex-post by actual measurement and "for ex-ante calculation, the value of QOE, y has

been assumed to be the same as $Q_{OE, BL}$. Therefore, the value of fcap is determined as 1. As the project activity does not envisage increased level of activity of the cement plant, this is a reasonable assumption"
The method selected for the calculation of fcap was thoroughly discussed during onsite validation and parameters used for its determination were verified against historical plant operational days and project plant capacity (IRL 14). Historical operational days of plant can be calculated from historical clinker production reports (IRL 20). Kilns E, F and G at Lucky Cement Karachi plant have the *same clinker production capacity of 3300 tons per day (TPD)*. The method selected for calculation of fcap (Case 1 of Method 3), which is based on ***Final Output Energy (electrical MWh)*** of the project plant, does not require calculation of fcap for each kiln.

As for our experience with clinker production plants 330 days per year operation of the project plant estimated by the project proponent is quite realistic and reasonable. Furthermore, the value is deemed as conservative since MER or $Q_{OE, BL}$ has been determined based on 80% load factor of the plant, which is conservative.This can be verified against number of operational days considered by similar Cement Sector CDM projects of Pakistan in section 3.6.3 below of this validation report.

There are several projects already registered which use similar approach like UNFCC No, 4208, 3564, 3674.

Based on its local and sectoral expertise, TÜV SÜD confirms that the calculation of fcap is in line with corresponding section of ACM0012 version 4 and paragraph 89-92 of VVM Version 1.2.

### 3.5.6. Project emissions

For the project emissions, the paragraph 13 & 14 of AMS-III.Q / Version 04 has been considered.

There is no auxiliary fuel combusted in the project activity to supplement waste gas and the waste heat recovery system consumes its own electricity for auxiliary needs.

Similarly, the project activity does not incinerate any waste gas to generate energy. Therefore, there are no project emissions due to the Project activity. (PE = 0)

### 3.5.7. Leakage

The equipment used in the project activity is not transferred from outside the boundary and the installed equipment is brand new (IRL 14). Therefore; there is no leakage due to the Project activity. (LE = 0).

### 3.5.8. Emission Reductions

In summary, the calculation of the baseline emissions, project emissions, leakage, and the emission reductions is correct. All the calculations regarding baseline emissions, project emissions, leakages and the emission reduction are explained in detail in the emissions reduction calculation spreadsheet (IRL 13).

## 3.6 Additionality

The additionality of this project, being it a small-scale one, has been demonstrated following *the Attachment A to Appendix B of the simplified modalities and procedure for small scale CDM project activity categories* which describe that “Project Participants shall provide an explanation to show that the project activity would not have occurred anyway due at least to one of the following barriers:” investment barrier, technological barrier, prevailing practice barrier or other barriers”.

The Project participants used the investment barrier to demonstrate the additionality.

The approach used in the PDD has been assessed initially through the document review, during which the following documents were reviewed:

- Feasibility Study Report (FSR) of Lucky Cement Limited Karachi Waste heat Recovery Plant (FSR) (IRL 46),
- IRR calculation spreadsheet (IRL 13)
- Email confirmation from DNA Pakistan that Waste Heat Recovery Based Power Generation is not a Common Practice in cement Industry of Pakistan (IRL 50).

On site, the additionality was discussed principally with Mr Qazi Sabir, Senior Project Manager at Carbon Services (Private) Limited and Mr Intisar Haqqi, Director Power Generation at Lucky Cement Limited. Further documents have been reviewed on-site (for details see Information Reference List in Annex 2).

Finally, the data, rationales, assumptions, justifications, and documentation provided have been verified using local knowledge as well as sectoral and financial expertise. The same has been cross checked against:

- The Board meeting on October 22$^{th}$, 2007 of high officials of Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant to make decision to proceed with the approval procedure under CDM revenue's support (IRL 40).
- CDM consulting Contract on August 2$^{nd}$, 2007 of Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant between Lucky Cement Limited and First Climate (Switzerland) AG (formerly Factor Consulting +Management AG) (IRL 39)
- Email confirmation from DNA Pakistan on October 13$^{th}$, 2009 that Waste Heat Recovery Based Power Generation is not a Common Practice in cement Industry of Pakistan (IRL 50).

Based on the aforementioned approach, TÜV SÜD confirms that the documentation provided is appropriate for this project.

### 3.6.3 Prior consideration of the clean development mechanism

The starting date of the project activity is May 7$^{th}$ 2008 which is determined by signing of purchasing contract for major equipment of the project activity (IRL 14) when the first real action was taken according to **Glossary of CDM terms**. In order to confirm the same, the assessment team has reviewed the following documents.

- Equipment purchase contract on May 7$^{th}$, 2008 of Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant (IRL 14)

In addition, the assessment team crosschecked this information with Mr. Qazi Sabir, Senior Project Manager at Carbon Services (Private) Limited and Mr. Intisar Haqqi, Director Power Generation at Lucky Cement Limited during various discussion on site.

The starting date of the project activity is determined to be 7$^{th}$ May, 2008 which is before 02 August 2008, as well as prior to the GSP (July 25$^{th}$, 2009) and repeated GSP (May 20$^{th}$, 2011). The PPs presented the following information to the assessment team:

- E-mail introduction of Carbon Services (Private) Limited on February 3$^{rd}$ 2007 about Income Potential from Carbon credits (IRL 7)

- The Board meeting on October 22th, 2007 of Lucky WHR project Karachi plant (IRL 40) indicates that the project participant was aware of the CDM prior to the starting date, and that the benefits of the CDM were a decisive factor in the decision to proceed with this project. This fulfill the requirement of EB 62 Annex 13 page 1 § 6 a.

The original of the documentation presented have been reviewed and crosschecked based on interviews with Mr. Qazi Sabir, Senior Project Manager Carbon Services (Private) Limited and Mr. Intisar Haqqi, Director Power Generation in Lucky Cement Limited. Hence the documents are considered credible to confirm the prior consideration of CDM. Additionally, in order to confirm that the PP has taken real actions to continue the activity as CDM and the following timeline has been reviewed against the respective documents presented in the table below.

**Timeline of Project Activity**

| Date | Activity | Document | Auditor conclusion |
|---|---|---|---|
| 3 February 2007 | CDM awareness | Copy of E-mail introduction of Carbon Services (Private) Limited to Lucky Cement Limited about Income Potential from Carbon credits (IRL 7) | TÜV SÜD has checked the authenticity of CDM awareness email. TÜV SÜD confirms that this is in line with EB 62, Annex 13 paragraph 6 (b). |
| 02 August 2007 | CDM Service Agreement between Lucky Cement Limited and Factor Consulting + Management AG (now First Climate AG) | Copy of Agreement (IRL 38) | Document meets the requirements for evidence of "continued action" according to EB62, Annex 13 paragraph 6 (b). |
| 22 October 2007 | Investment Decision | Extract of Minutes of the Board Directors meeting of Lucky Cement Limited (IRL 40 ) | Project approval at the highest management level, well before the starting date. TÜV SÜD has checked the authenticity of investment decision. TÜV SÜD confirms that this is in line with EB 62, Annex 13 paragraph 6 (b). |
| 07 May 2008 | Starting date of the project activity | Equipment purchase contract between Lucky Cement Limited and Sinoma Energy Conservation Ltd (IRL 14) | Document is plausible and complete and in accordance with the definition of a project starting date in the "CDM Glossary of Terms". TÜV SÜD has checked the authenticity of equipment purchase contract. TÜV SÜD confirms that this is in line with EB 62, Annex 13 paragraph 6 (b). |
| February 3, 2009 | Start of Civil Works | Copy of Inter office Memo of Lucky Cement Limited (IRL 53) | Document meets the requirements for evidence of "continued action" according to EB62, Annex 13 paragraph 6 (b). |

| Date | Activity | Document | Auditor conclusion |
|---|---|---|---|
| 10 July 2009 | Validation contract with TÜV SÜD | Validation Contract (IRL 41) | Document meets the requirements for evidence of "continued action" according to EB62, Annex 13 paragraph 6 (b). |
| 25 July 2009 | Start of the Global Stakeholder Process on UNFCCC website | UNFCCC website | - |
| 14 October 2009 | LoA Pakistan for Lucky Cement Limited | Copy of Letter of approval (IRL 42) | Document meets the requirements for evidence of "continued action" according to EB62, Annex 13 paragraph 6(b). TÜV SÜD has checked the authenticity of LoA. TÜV SÜD confirms that this is in line with EB 62, Annex 13 paragraph 6 (b) |
| 25 November 2010 | Swiss LoA for First Climate (Switzerland) AG | Copy of Letter of approval (IRL 43) | Document meets the requirements for evidence of "continued action" according to EB62, Annex 13 paragraph 6(b). TÜV SÜD has checked the authenticity of LoA. TÜV SÜD confirms that this is in line with EB 62, Annex 13 paragraph 6 (b) |
| 20 May 2011 | Start of the repeated Global Stakeholder Process with new applied methodology AMS.III.Q version 4 on UNFCCC website | UNFCCC website | - |

Hence the project complies with the requirements to demonstrate the prior consideration of the CDM.

### 3.6.2 Investment Analysis

The PP uses the investment barrier to demonstrate the additionality.

The financial returns of the proposed project without CDM revenues are insufficient to justify the investment.

The parameters used in the financial calculations have been validated based on review of the sources presented in the PDD, inter alia: FSR (IRL 46), investment costs, O&M costs, overhaul costs, electricity generation (load factor), fuel costs and have been crosschecked on site.

The FSR has been the basis of the decision to proceed with the investment in the project, the period of time between the finalization of the FSR (October 1st, 2007) (IRL 46) and the investment decision (October 22nd, 2007) (IRL 40) is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed.

The IRR presented in the GSP-PDD and repeated GSP-PDD is 7.39% while the IRR in FSR is 8.81%. The difference in IRR values was due to different input values applied in FSR and PDD. The O& M costs used in the investment analysis were slightly different from the one used in the FSR which resulted in different IRR value in the GSP-PDD as compared to FSR based IRR value of 8.81%. The depreciation costs, O&M costs and major overhaul costs have been corrected in PDD and IRR spreadsheet. The IRR indicated in the final PDD and IRR spreadsheet is 8.81% which is fully consistent with the IRR values in FSR.

TÜV SÜD confirms that the input values used in the PDD and associated annexes are fully consistent with the FSR, The input values applied for the investment analysis were further cross checked with following documents in order to evaluate their plausibility and appropriateness.

- IRR calculation spreadsheet (IRL 13)
- Equipment purchase contract between Lucky Cement Limited & Sinoma Energy Conservation Limited on May 7th, 2008 (IRL 14)
- Quarterly Report of the State Bank of Pakistan (Financial Year 2004) that shows that KIBOR was introduced as a reference rate for corporate lending in February 2004 (IRL 9)

  http://sbp.org.pk/reports/quarterly/fy04/thirdQtr/Money%20Market.pdf

  http://sbp.org.pk/ecodata/kibor/2007/
- Financial information was requested by PP by Citi Bank Pakistan about the benchmark, Karachi Inter Bank offer rates (KIBOR) and basis point (IRL 10)

*During the completeness check of this project, the EB raised the following question (Incomplete Reason No. 1): 1: The PP/DOE are requested to list all relevant assumptions, data, input values and references used in the investment analysis and the results of the investment analysis as per EB 48 Annex 60 paragraph 10 (a).*
*1. Further information is required on how the DOE validated the (a) Total Project Investment and b) O&M cost. In doing so the DOE is requested to provide details on each component of the total cost and how the DOE verified the same in accordance with paragraph 111 (b) (c) of the VVM.*
*2. The DOE is requested to provide further details on how it validated the basis of the 10% annual escalation of the O&M costs.*
*3. The DOE is requested to clarify how it validated the fuel costs (NG, HFO) as no information is provided in the VR.*
*4. The values in the PDD/VR are inconsistent with the values in the IRR spreadsheet. The DOE is requested to submit the correct worksheet for the IRR calculation.*
*5. Page 31 of the VR states that the FSR of the project was done internally by the PP. The DOE is requested to clarify how it verified all input values to be credible in accordance with paragraph 111 (a) and 113 of VVM (ver 1.2).*

***Question1. Further information is required on how the DOE validated the (a) Total Project Investment and b) O&M cost. In doing so the DOE is requested to provide details on each component of the total cost and how the DOE verified the same in accordance with paragraph 111 (b) (c) of the VVM***

TÜV SÜD would like to clarify this issue as follows:

**Project Investment Cost**

The estimated investment costs mentioned in Feasibility Study Report of the project are 1,260,000,000 PKR (Pakistani Rupees) which includes cost of power plant, transportation and logistics, civil and fabrication, taxes, duties and freight charges as well as other local costs. The following table provides a breakdown of total project investment as provided in the Feasibility Study Report (IRL 46) and the sources used by TÜV SÜD to validate its each component:

**Project Investment Cost Breakdown**

| Item | Value (USD) | Sources | Cross check & conclusion |
|---|---|---|---|
| Breakdown of estimated investment costs | | | |
| Cost of power plant | 17,000,000 | FSR (IRL 46) | TÜV SÜD checked the estimated costs of power plant against the preliminary quotation from equipment supplier (IRL 77). |
| Transportation and logistics | 800,000 | FSR (IRL 46) | TÜV SÜD checked the estimated costs of transportation and logistics against Transportation and logistics Quote (IRL 78). |
| Civil & fabrication | 2,500,000 | FSR (IRL 46) | TÜV SÜD checked the estimated costs Civil & fabrication against the Cost estimate for proposed WHR local scope (IRL 76). |
| Taxes and duties | 300,000 | FSR (IRL 46) | Taxes, duties and other local costs are based on assumption and constitute approximately 3.33 % of the total project investment. These were thoroughly discussed on-site (IRL 3a). |
| Others | 400,000 | FSR (IRL 46) | |
| Exchange rate US $ --> PKR | 60.00 PKR | FSR (IRL 46) | International Currency converter , Exchange rate US $ --> PKR http://www.iccfx.com/history.php (IRL 33) |
| Total estimated costs | 21,000,000 USD<br>equivalent to<br>1260,000,000 PKR | FSR (IRL 46) | Based on its local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that total estimated costs of the proposed project in the FSR were realistic. |
| Actual total investment costs | 1434 million PKR | Actual contracts (IRL 61) | The actual investment costs have been cross-checked against the actual equipment purchase contract costs invoices (Imported plant & Machinery Sinoma China) amounting to PKR 1403 million and Freight, Duties, Taxes & Others costs amounting to PKR 30 million (IRL 61) thus total up to 1434 million PKR. Costs like civil work, mechanical works & material cost, electrical and instrumentation, pre-production overheads are still not included in the actual project investment of 1434 million. So it is clear that the project investment cost estimated values in FSR are lower and therefore conservative compared to the real |

<table>
<tr><td></td><td></td><td></td><td colspan="2">investment costs).</td></tr>
<tr><td colspan="5">Operational and maintenance costs and Overhaul costs</td></tr>
<tr><td>O&M Cost assumed</td><td>63 million PKR<br>(5% of investment costs)<br>With 10% annual escalation</td><td colspan="2">FSR (IRL 46)</td><td>TÜV SÜD has cross checked O&M Cost against the Operational and maintenance cost information provided by PITCO (Third party Consultancy firm) IRL 21. Based on TÜV SÜD's local expertise and knowledge in this sector, it can be confirmed that the applied values are realistic and within the typical ranges described in Table 1 below.</td></tr>
<tr><td>Actual O&M Cost</td><td>62 million PKR<br><br>Breakdown of Actual O&M Cost<br><br><table><tr><td>Item</td><td>Value</td></tr><tr><td>Salaries, Wages and benefits</td><td>26,310,000</td></tr><tr><td>Stores and Spares Consumed</td><td>20,500,000</td></tr><tr><td>Insurance</td><td>2,520,000</td></tr><tr><td>Repair and Maintenance</td><td>13,510,000</td></tr></table></td><td colspan="2">Actual Operational & Maintenance costs of Lucky WHR Karachi plant (IRL 63)</td><td>It is discussed and confirmed by PP during onsite visit that the operational and maintenace costs cover the individual sub-items: Salaries, wages and benefits, Insurance, Store and spares consumed and Repair and Maintenance (IRL 63); according to evidence submitted by Lucky Cement Limited (IRL 63), the total operational and mainatenance costs for one year after operation of the project activity from July 2010 till June 2011 were 62.84 Million PKR as compared to estimated operational and maintenance costs (63 million PKR) in FSR (IRL 46). This shows that O&M costs assumed in FSR are reasonable.<br><br>As the project actvity is under operation, the actual operational and mainatenance cost have been cross checked against Lucky Cement Limited annual report 2011 (IRL 62).<br><br>Furthermore, the O&M cost used in the project were further cross-checked against the data reported for other similar WHR CDM projects in Pakistan in table below and found that the O&M costs are in reasonable range.</td></tr>
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<tr>
<td>Major overhaul costs</td>
<td>37,800,000<br>(3% of investment cost every five years with 10% annual escalation)</td>
<td>FSR (IRL 46)</td>
<td>TÜV SÜD has cross checked overhaul cost against the letter provided by PITCO (Third party Consultancy firm) IRL 21. Based on TÜV SÜD's local expertise and knowledge in this sector, it can be confirmed that the applied values are plausible.<br><br>Furthermore, it is important to mention that with consideration of zero Major overhaul costs, the IRR of the project still remains below the benchmark.</td>
</tr>
<tr>
<td>Operational Hours, Electricity production & Auxiliary Consumption</td>
<td>Operational Characteristics of Steam Turbo-Generator
<table>
<tr><td>Operational days per annum</td><td>330</td></tr>
<tr><td>Operational hours per day</td><td>24</td></tr>
<tr><td>Average load factor</td><td>80%</td></tr>
<tr><td>Gross electricity generation (MWh/year)</td><td>15*330*24*80 % = 95,040</td></tr>
<tr><td>Auxiliary consumption (MWh/year)</td><td>95,040 * 8% = 7,603</td></tr>
<tr><td>Net electricity generation (MWh/year)</td><td>95,040 – 7,603 = 87,437</td></tr>
</table>
</td>
<td>FSR (IRL 46)</td>
<td>During the onsite visit, the operational hours, Electricity production & Auxiliary Consumption were discussed in detail. According to historical data of the Lucky Cement Karachi Plant, number of operational days depends upon market demand of cement in the local and international market which is variable in year. According to FSR (IRL 46), in the project situation, Lucky Cement Limited plans to run the cement manufacturing plant for 330 days which is quite realistic and achievable production plan. 330 days operational of lucky cement plant means the plant load factor of 80% which is based on its historical operational of the plant (IRL 20). According to DOE experience with similar projects in host country, this is a plausible figure.<br><br>Furthermore, TÜV SÜD confirms that with consideration of zero auxiliary consumption in the project activity, the IRR of the project still remains below the benchmark.<br><br>Based on it local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that the estimated load factor, Gross electricity generation and auxiliary consumption of electricity are realistic and plausible.</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| Project Loan period | 5 years | Loan offer from Bank (IRL 8) | Based on its local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that the applied project load period is appropriate and applicable to the project activity. |
| Technical life time of equipment | 20 years | FSR (IRL 46) | The technical life time of equipment of the project activity has been cross checked against the a letter from EAST-WEST Commercial Enterprise on behalf of Sinoma Energy Conservation Limited, which was issued for a similar project in Pakistan (IRL 89). Based on its local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that technical life time of plant is appropriate. |
| Depreciation period | 20 years | FSR (IRL 46) | The depreciation period of 20 years has been used in project and the fair value of the project investments will be zero at the end of the analysis period. Depreciation and financial expenses are only used for tax calculation and added back to net profits for the calculation of the project IRR. |
| Tax rate | 35% | Income Tax Ordinance issued by Government of Pakistan (IRL 51) | Based on its local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that the applied tax rate is appropriate and applicable to the project activity. |

**Operational & Maintenance Cost and Major Overhaul costs**

The operational & maintenance cost and major overhaul cost estimated in FSR (IRL 46) are based on information provided by PITCO (Third party Consultancy firm) (IRL 21). PITCO has been providing services in Energy, engineering & Environmental Consulting services since 1938 and PITCO has been a leader in Pakistan's energy sector. PITCO provide a range of products and services to different clients, which include Government Utilities, Independent Power Producers, Private Industrial Companies, Government and Semi-Government Organizations. http://www.pitcopk.com/index.htm (IRL 60).

According to the consultancy firm the operational and maintenance cost in WHR projects in Cement Industry are 5 to 7 % of CAPEX (Investment) while overhaul cost are 3-5% of CAPEX while the frequency of Overhaul cost is every 4-5 years. Based on information from “Consultancy firm” the project participants selected the operational and maintenance cost of 5 instead of 7 % which is con-

servative value while the overhaul cost are considered 3% instead of 5% which is conservative value.

The Operation and Maintenance Costs 63 million PKR considered for the project activity are 5% of the total investment costs with an annual increase of 10% (IRL 13). This increase is due to rapidly increasing labour wages and costs associated with technical services. According to technology supplier (Sinoma Energy Conservation Limited) (IRL 14), after every 5 years, an overhaul of the installed equipment is necessary which will cost 37 million PKR which are 3% of the investment costs indexed by the annual increase of 10% of the Operation and Maintenance Costs (IRL 13). According to DOE experience with similar projects in the host country (Pakistan), 5% of O & M costs compared to the total investment costs is a rather conservative figure and hence, deemed to be reasonable. The operational & maintenance cost 5 % and major overhaul costs of 3% every five years have also been cross checked against the letter provided by PITCO.

Table 1: Cement WHR projects (with the available data) comparison in Pakistan

| **Project Name** | **MW** | **Investment Cost** | **O&M costs**<br>**O&M-I [%]** | **Plant Load Factor** |
|---|---|---|---|---|
| DGKCC Waste Heat Recovery and Utilization for 10.4 MW Power Generation at Dera Ghazi Khan Plant<br>http://cdm.unfccc.int/Projects/Validation/DB/XDNBLIDFFBLQR11A0SD86KIXIF5KUM/view.html<br>(UNFCCC Registration no. 4591) | 10.4MW | 1,563,000,000 | 78,150,000.00<br>(5% of total investment cost) | 85% |
| Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited Pezu Plant<br>http://cdm.unfccc.int/Projects/Validation/DB/5THY9Y15CINFMYJXYV51WVXMFRHX83/view.html | 10MW | 960,000,000 | 48,000,000<br>(5% of total investment cost) | 80% |
| Waste Heat Recovery and Utilization for Power Generation at Cherat Cement Company Limited, Nowshera, Pakistan<br>http://cdm.unfccc.int/Projects/Validation/DB/XN4SGWEQVUD7QMVZCW9KRWCI6D97D4/view.html | 7MW | 966,090,433 | 48,304,521.64<br>(5% of total investment cost) | 70% |
| Waste Heat Recovery based 15 MW Power Generation Project at Bestway Cement Limited, Chakwal, Pakistan (UNFCCC Registration no. 3555)<br>http://cdm.unfccc.int/Projects/Validation/DB/DLZHSFAMK6BA3FCS3SCCTDCIGSIIKN/view.html<br>*Additionality of this project has been claimed by first of its kind.* | 15MW | - | - | 82% |
| Waste Heat Recovery and Utilization for Power Generation at Maple Leaf Cement Factory Limited, Iskanderabad, Pakistan<br>http://cdm.unfccc.int/Projects/Validation/DB/P740TN7NRBRKEWN9AM3RM0L6BN0CXU/view.html | 13.9MW | 2,016,210,843 | 104,400,000<br>(5.1% of total investment cost) | 90% |
| Waste Heat Recovery Power Plant at Fecto Cement Limited<br>http://cdm.unfccc.int/Projects/Validation/DB/BRBHLN7AWUFXK6Q16JXXFNNOEE9Y14/view.html | 6MW | 7183200 USD=<br>Equivalent to 610,572000 PKR | Information not available- | - |

| | | | | |
|---|---|---|---|---|
| **Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant**<br><br>http://cdm.unfccc.int/Projects/Validation/DB/JZDZOGOA8Z0GM9JZYUINTLHLIRU2IN/view.html | **15MW** | **1,301,778,622** | **65,088,931**<br><br>(5% of total investment cost) | **80%** |

After thorough review of the abovementioned documents and sources, and based on its local and sectoral expertise TÜV SÜD confirms that the total project investment and O&M costs assumed at the time of investment decision are conservative.

***2. The DOE is requested to provide further details on how it validated the basis of the 10% annual escalation of the O&M costs.***

TÜV SÜD would like to clarify this issue as follows:

— The escalation rate of annual O&M costs and major overhaul cost (10%) in FSR (IRL 46) were based on following.

- Historical trend of increase in operation and maintenance costs from financial year 2003 to 2007 of lucky cement Limited Karachi Plant (IRL 68)
- Analysis of Consumer Price Index in Pakistan (IRL 69)
- Lucky Cement Limited's maintenance contract with the equipment supplier (Wartsila) (IRL 71)

— During the validation of the project, Lucky Cement Limited provided the yearly historical trend of increase in operation and maintenance costs from financial year 2003 to 2007 to DOE (IRL 72). The O&M costs include salaries and wages, stores and spares, insurance and repair and maintenance. All the values to determine O&M costs were taken from annual reports of Lucky Cement Limited, which are audited by third party auditors (Statutory Auditors for the period 2003-2007: Ford Rhodes Sidat Hyder, Chartered Accountants, now known as "Ernst & Young Ford Rhodes Sidat Hyder", a member firm of Ernst & Young Global Limited) and are also available at Lucky Cement's website (http://www.lucky-cement.com/financialreports.htm) (IRL 72). The IRL 68 shows that the minimum increase in O&M costs (15.07%) occurred during the financial year 2004-2005 (much higher increase occurred in 2003-2004: 24.74%, 2005-2006: 99.15% and 2006-2007: 43.47%). PP selected the 10% increase in O&M costs and major overhaul cost. Thus consideration of 10% increase in O&M costs and major overhaul cost as used in the investment analysis of the project activity is rather conservative.

— In order to determine annual increase in O&M cost and major overhaul cost, PP also presented a trend analysis of Consumer Price Index (IRL 69), to forecast average CPI in the host country (Pakistan) for the next twenty years from project decision (IRL 40). It was based on annual average Consumer Price Index (CPIs) from financial year 2002-2003 to 2006-2007 and all the raw data were taken from Annual Report of State Bank of Pakistan (SBP) for financial year 2006-2007 (IRL 70) available at SBP website (http://www.sbp.org.pk/reports/annual/arfy07/). All CPI related data as presented in the SBP annual reports are from Federal/Central Bureau of Statistics and Economic Survey of Pakistan. CPI forecast calculation shows an average CPI of 13% from July 2007 to June 2030 (IRL 69). This is the result of a logarithmic extrapolation curve, which results to be the most conservative one among other possible functions (linear, exponential, polynomial, etc.). The table below shows the comparison of the possible estimates of the CPI, according to differ-

ent extrapolations (polynomial has been excluded because it provides negative results, which are in contrast with the direct observations):

| Type of extrapolation | Average CPI for period 2007-2025 |
|---|---|
| Linear | 13% |
| Polynomial (Power 2) | -101% |
| Exponential | 270% |
| Power | 20% |

Based on these results, the selection of the logarithmic curve to predict the CPI is deemed conservative, and the selection of O&M and overhaul cost increase at 10% (lower than 13%) is appropriate.

Furthermore, a third party letter Tahir Jawad Imran Fecto – Chartered Accountants (IRL 88) states that O&M cost escalation based on CPI approach and historical cost is reasonable, and also that based on their work, the O&M cost escalation at the time of investment decision was over 13%. So, TÜV SÜD confirms that using CPI as proxy for the O&M escalation cost is reasonable, and the value of 10% is realistic and plausible.

— Lucky Cement Limited's maintenance contract with the equipment supplier (Wartsila) (IRL 71) for their power generation equipment clearly mentions that a price adjustment (in the maintenance contract price) based on Consumer Price Index announced by Central Bureau of Statistics, Government of Pakistan, shall take place annually. This clearly demonstrates the fact that PP's approach to employ CPI Forecast to predict annual increase of 10% in O&M Cost and Major Overhaul Cost is appropriate and conservative as well.

***3. The DOE is requested to clarify how it validated the fuel costs (NG, HFO) as no information is provided in the VR.***

TÜV SÜD would like to clarify this issue as follows:

The DOE has validated the escalation rates of baseline fuels based on the following documents

- Petroleum Exploration and Production Policy 2007 (IRL 73) (Please note that Petroleum Production Policies are available from 2003 to 2007, however guidance related to determine fuel prices is same across all these policies. The PP just referred the most recent policy available at the time of investment decision)
- Annual Energy Outlook 2006 (IRL 34)
- Pakistan Energy Yearbook 2006 (IRL 74)
- Energy Prices Future Evolution Calculation (IRL 75)

It should be noted that the fuel prices in Pakistan are decided by independent national bodies who, as per petroleum policy, index these to crude oil prices in the international market (IRL 73); any future change in fuel prices is thus intrinsically linked to fluctuations in crude oil prices in the interna-

tional market. Consequently, forecasting any increase in the fuel prices solely on the basis of national historical fuel prices would yield unrealistic results as it would not take into account the effect of variation in international crude oil prices.

Based on its local and sectoral expertise, TÜV SÜD confirms that the approach used by the PP to determine escalation in fuel prices (Energy Prices Future Evolution Calculation, IRL 75) is appropriate as it takes into account both international as well as national trends in fuel price variation.

Energy Prices Future Evolution Calculation (IRL 75), submitted by PP, forecasts the increase in fuel prices from 2007 to 2030. The calculation is based on the following data

- Five years historical data (2002 to 2006) for fuel prices in the national market as provided in Pakistan Energy Year Book 2006 (IRL 74)
- Five years historical data (2002 to 2006) for fuel prices in the international market as provided in Annual Energy Outlook 2006 (IRL 34)
- Fuel prices projections (2007 to 2030) in the international market as provided in Annual Energy Outlook 2006 (IRL 34)

All the input values provided in the Energy Prices Future Evolution Calculation (IRL 75) were cross-checked against IRL 34 and 74 and found to be correct.

An additional confirmation of the suitability of the fuel evolution estimate has been provided by an independent third party, the chartered accounting company Tahir Jawad Imran Fecto – Chartered Accountants, which confirms that “assumptions of 0.41%, 2.00% and 1.27% in the fuel price of Natural Gas, HFO and diesel respectively are reasonable” (IRL 88).

***During the course of request of registration of the project, the following question (Request for Review) was raised by EB:***

***1) The DOE shall further substantiate the suitability of input values used in the investment analysis, in particular:***

***a) Cost of baseline fuel (NG, HFO, diesel) used in the IRR calculation as there is no information provided in the VR. The DOE is requested to provide the details on the how it validated the same based on objective evidence.***

***b) (i) the appropriateness of the methods in determining the escalation rates given that the escalation rate of the O&M costs and overhaul cost is based on historical data (page 36 of the validation report) whereas the escalation rates of the baseline fuel prices are based on future anticipation (page 38 of the validation report); (ii) the source of the yearly inflation rates in the website of inflationdata.com (row 15 of table "Basic Info_AEO06" in spreadsheet "5521_Enclosure.xls") used in calculating the escalation rates of baseline fuel prices is not specified.***

***c) The DOE is also requested to clarify whether these yearly inflation rates are applicable to the baseline fuels in Pakistan; . Please refer to paragraph 111 (a) and (b) of VVM version 1.2.***

TÜV SÜD would like to clarify this issue as follows:

a) The baseline fuel cost, sources and cross-check information is provided in the table below:

| Information | Value in PKR | Source of data | Cross check & Audit team conclusion |
|---|---|---|---|
| HFO Cost (PKR/ton) | 20,751.86 | Feasibility Study for Lucky Cement WHR Karachi Project (IRL 46) | Historical data of Karachi Captive Power Plant from October 2006 till April 2008 (Power generation, fuel consumption and fuel cost data) (IRL11) |
| NG Cost (PKR/$Nm^3$) | 7.84 | | |
| Diesel Cost (PKR/Ltr) | 31.42 | | |

The figures applied in the Investment Analysis for the baseline fuels (20,751.86 PKR/ton for HFO, 7.84 PKR/$Nm^3$ for NG and 31.42 PKR/ltr for diesel) are correctly derived from the Feasibility Study for Lucky Cement WHR Karachi Project (IRL 46). TÜV SÜD further checked that these values are correctly calculated based on the fuel data costs included in the document Historical data of Karachi Captive Power Plant from October 2006 till April 2008 (Power generation, fuel consumption and fuel cost data) (IRL11), and can confirm that source data, calculation method and final values are correct.

The historical data used by the PP for IRR calculations refers to the period October 2006 - September 2007 in order to be consistent with the Feasibility Study Report (FSR), which refers to the same period. However, as per the requirements of the methodology (AMS III Q, V.4), maximum available historical data (October 2006 to April 2008) has been considered for the calculation of baseline emissions. Therefore, due to different data periods being considered, there are slight differences in the fuel consumption, fuel ratio, specific fuel consumption values, etc. as reported by the IRR calculation and Emission Reduction calculation sheets. Nevertheless, these differences do not affect the conservativeness of the approach used to calculate baseline emissions: for the IRR calculation, PP used the period October 2006 - September 2007 and estimates 43,138 CERs per year, while for the ER calculation, the PP used the period October 2006 to April 2008 and estimates 42,992 CERs. Between these two values, PP selected the lower one (42,992) to claim the emission reduction of the project, which is a conservative approach. For the additionality of the project (IRR without project), PP estimates a saving of 208,853,793 PKR in the first year (and then decreasing due to escalation of O&M being higher than fuel prices), which comes from the following savings: 6,262 ton of HFO saved, 17,859,060 $m^3$ of NG saved and 59,549 liters of diesel saved. If PP adopts the values in the ER calculation sheet, these would be 6,205 ton of HFO, 18,516,616 $m^3$ of NG, and 46,458 liters of diesel, for a total saving of 212,407,592 PKR, which would cause a higher IRR (without CDM revenues). However, the resulting value (IRR = 9.26%) is still largely under the benchmark (11.73%), so it is appropriate to use the data according to the FSR for consistency in the project.

The input parameters used for calculation of baseline emissions and the corresponding emission reductions as given in ER calculation sheet are same as provided in the PDD (IRL 91, 92). Likewise, input parameters (e.g. project investment, fuel costs, O&M costs, etc.) used for IRR calculation are consistent with those reported in the FSR and PDD.

**Second part of question 1 of Request for Review:**

**b) (i) the appropriateness of the methods in determining the escalation rates given that the escalation rate of the O&M costs and overhaul cost is based on historical data whereas the escalation rates of the baseline fuel prices are based on future anticipation;**

TÜV SÜD would like to clarify this issue as follows:

TÜV SÜD confirms that the methods applied to determine the escalation rates of O&M costs and baseline fuel prices are similar as both the methods are based on historical as well as future anticipation data. The reasons for similarities and appropriateness of these methods are explained and substantiated below:

**Escalation in O&M Cost**

As already mentioned earlier in section 3.6.2, the PP has conducted Consumer Price Index (CPI) analysis to determine the escalation in O&M Costs. This is done as per Lucky Cement's Maintenance Contract with Wartsila (IRL 71) which states that *an annual price adjustment shall take place based on the CPI index announced by the Government of Pakistan*. Correspondingly, the CPI analysis has been conducted using **historical CPI data** from the Annual Report of the State Bank of Pakistan (SBP) (FY 2003 to 2007) to identify a growth trend (the logarithmic growth is identified as the best and most conservative fit) and to calculate the **expected inflation (Future Anticipation) over 20 years (2007 to 2026)**. Then the average value is taken (13%).

TÜV SÜD confirms that PP's approach to use the CPI Forecast to predict the annual increase in O&M Cost and finally use a value of 10 is appropriate and in line with their maintenance contract with Wartsila and conservative value as well.

The appropriateness of escalation rate of O&M cost has been further cross-checked against the following evidences:

- Analysis of Consumer Price Index in Pakistan (IRL 69)
- Lucky Cement Limited's maintenance contract with the equipment supplier (Wartsila) (IRL 71)
- Third party letter by Tahir Jawad Imran Fecto which states that O&M cost escalation based on CPI approach is reasonable, considering that based on their work, the O&M cost escalation at the time of investment decision was over 13% in 2007 (IRL 88).

**Escalation of Baseline Fuel Prices**

It should be noted that the increase in baseline fuel prices is not solely based on predicted data **(Future Anticipation)** but also takes into account national and international historical fuel pric-

es. In fact, the fuel price escalation has been calculated as per the guidance provided in the *Petroleum Exploration and Production Policy of Pakistan* according to which international fuel prices form an integral part of the fuel price determination in Pakistan. The fuel prices in Pakistan are decided by independent national bodies who, as per Petroleum Policy, index these to crude oil prices in the international market; any future change in fuel prices in Pakistan is thus intrinsically linked to fluctuations in crude oil prices in the international market.

Thus, as per the Petroleum Policy, the increase in fuel prices has been determined using both the **historical and projected international fuel prices (Future Anticipation) provided by AEO** and the historical national fuel prices from Pakistan Energy Year Book (PEYB). The precise calculation steps are explained in part (ii) of this question.

Furthermore, the appropriateness of this approach has been further verified by a national 3rd party charted accountancy firm, Tahir Jawad Imran Fecto (IRL 88).

***(ii) The source of the yearly inflation rates in the website of inflationdata.com (row 15 of table "Basic Info_AEO06" in spreadsheet "5521_Enclosure.xls") used in calculating the escalation rates of baseline fuel prices is not specified.***

Yearly inflation rates given at row 15 of table "Basic Info_AEO06" in spreadsheet " Energy Prices Evolution.xls" are precisely taken from the web page

http://www.inflationdata.com/Inflation/Inflation_Rate/HistoricalInflation.aspx which aggregates them from the tables of Consumer Price Index (CPI-U) compiled by the American Bureau of Labor Statistics (http://www.bls.gov/cpi/cpi_dr.htm).

**Third part of question 1 of Request for Review:**

**c) The DOE is also requested to clarify whether these yearly inflation rates are applicable to the baseline fuels in Pakistan; . Please refer to paragraph 111 (a) and (b) of VVM version 1.2.**

TÜV SÜD would like to clarify this issue as follows:

The precise reasons as to why the yearly inflation rates are applicable to baseline fuels in Pakistan are provided below:

As already explained above, according to the guidance provided in the *Petroleum Exploration and Production Policy of Pakistan*, international fuel prices form an integral part of the fuel price determination in Pakistan. The fuel prices in Pakistan are decided by independent national bodies who, as per Petroleum Policy, index these to crude oil prices in the international market; any future change in fuel prices in Pakistan is thus intrinsically linked to **fluctuations** in crude oil prices in the international market. **Therefore, if the increase in fuel prices is solely determined on the basis on national historical data, it would not only be contradiction to the Petroleum Policy, but would make the whole calculation inappropriate.**

Thus, as per the Petroleum Policy, the increase in fuel prices has been determined using both

the historical and projected international fuel prices provided by AEO and the historical national fuel prices from Pakistan Energy Year Book (PEYB). The precise calculation steps are further explained below:

1. Historical International fuel prices along with their projections, as provided at http://www.eia.gov/oiaf/servicerpt/bmy/index.html, are given in sheet "AE02006" of the Energy Price Evolution worksheet.
2. An inflationary trend is added to the international fuel price projections (sheet "Basic In- fo_AEO06" of the Energy Price Evolution worksheet) based on the consumer price index values provided by the American Bureau of Labor Statistics. The inflation data is available at http://www.inflationdata.com/Inflation/Inflation_Rate/HistoricalInflation.aspx
3. Determination of correlation between the International Historical Fuel Prices (AEO) and National Historical Fuel Prices (PEYB) and using these correlation factors to forecast the base- line fuel prices in USD.
4. The forecasted baseline fuel prices are converted from USD to PKR using the expected exchange rates. Please refer to sheet "Fut.Price.Evol_HFO", "Fut.Price Evol_NG" and "Fut.Price.Evol_DIESEL" of the Energy Prices Evolution calculations.

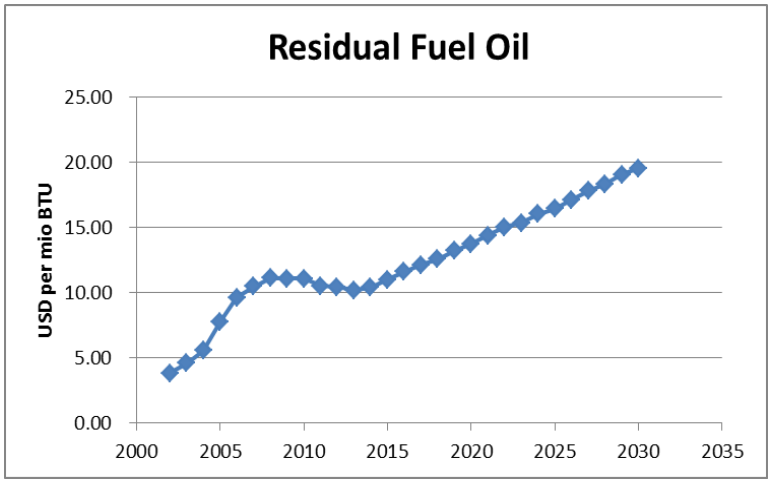
TÜV SÜD confirms that these inflation rates are applicable to the baseline fuels in Pakistan, in the context of the elaboration carried out in the "Energy Prices Evolution.xls", because, as explained above, it is a requirement of the Petroleum Exploration and Production Policy 2007 to refer to international fuel prices for fuel price forecasts. American consumer price index is a suitable proxy for international fuel prices and therefore applicable to Pakistan, as well, once the exchange rate is taken into account.

Furthermore, this approach has also been verified by the national third party chartered accountancy firm Tahir Jawad Imran Fecto (IRL 88).

The above mentioned steps are fully in line with guidance provided in the Petroleum Policy (IRL 73). Furthermore, **the consistency and appropriateness of this approach has been further verified by a 3rd party charted accountancy firm, Tahir Jawad Imran Fecto (IRL 88)**.

With regard to the difference in the escalation rate for O&M cost and fuel costs, and the large difference between historical fuel inflation in Pakistan and expected one (20% Vs 2%), it has to be considered that the historical prices reflect contingent events (such as political instability, lack of oil supply, etc.) which cannot be predicted in a sound way for the future, and therefore the historical data cannot be the reference for the fuel prices, whilst it can be for O&M cost which mostly depends on in-house economic factors.

It has to be further noticed that the price evolution on the international market, as predicted by the AEO 2006, itself presents a sharp fuel price increase for the years 2003-2006, which peaks in 2008 and then reduces until 2013, to eventually rise again starting from 2014. This trend is depicted in the



graph here aside which is built on the data from row 21 of the “Basic Info_AEO06” tab. In this sense, the international HFO price is consistent with the actual historical price detected in Pakistan, where for the period 2003-2006 a 21% average increase per year is predicted by the model, as it can be calculated from row 32 in the Fut.Price.Evol_HFO table.

In conclusion, TÜV SÜD confirms that the method applied to calculate the fuel escalation is appropriate, not just because it follows the prescription of the Pakistani Petroleum Policy, but also because, if applied retroactively to the past years (2003-2006), it in fact predicted the remarkable fuel increase of those years. Therefore, the use of this model to predict the future price evolution is correct and fulfills the requirements of paragraph 111(a) and (b) of VVM version 1.2 and hence it is appropriate.

TÜV SÜD confirms that the approach in calculating the future fuel price escalation, based on the AEO data, would be the same, even if PP refer to their historical prices, because not only there was an increase in fuel prices in 2003-2007 in the Pakistani market, but also in the international market.

***4. The values in the PDD/VR are inconsistent with the values in the IRR spreadsheet. The DOE is requested to submit the correct worksheet for the IRR calculation.***

TÜV SÜD would like to clarify this issue as follows:

The inconsistencies have been eliminated and the correct file will be uploaded to UNFCCC. ***5.***

***5. Page 31 of the VR states that the FSR of the project was done internally by the PP. The DOE is requested to clarify how it verified all input values to be credible in accordance with paragraph 111 (a) and 113 of VVM (ver 1.2).***

TÜV SÜD would like to clarify this issue as follows:

Input parameters applied in FSR (IRL 46) have been cross checked against the quotation received from suppliers, bank loan offer letter, equipment purchase contract, invoices, Government tax rates, historical trends of cement plant etc. All details have been provided in above section.

Furthermore, it shall be clarified that there is no requirement in the Pakistan law for external approval of FSR for a project such as current project activity. The FSR is an internal document and it is sufficient for seeking approval from the Lucky's Management.

Governmental approval of FSR is required for public sector projects only (e.g. FSR or PC1 documents for Hydro Power Projects are approved by ECNEC, Executive Committee of the National Economic Council (Pakistan).

Third party approval may also be required by sponsors, who provide funding for the project and have major stakes involved as well. As Lucky Cement is the sole owner of this project, neither of the situations applies. Based on its local and sectoral expertise and knowledge in this sector, TÜV SÜD confirms that financial calculations are in line with VVM version 1.2 § 111, a, b & c.

**Income Tax**

The tax rate considered in the proposed project for calculation of investment analysis is 35% which is in line with the Government of Pakistan Income Tax Regulation (IRL 51).

**Benchmark**

The applied benchmark in the PDD and IRR Spread sheet of proposed project is 11.73 %. The applied benchmark represents the local commercial lending rate and has two distinct components;

- Karachi Inter-bank Offer Rate (KIBOR)
- Credit spread over the KIBOR charged by the local bank.

KIBOR was officially introduced by State Bank of Pakistan as a third party as a reference rate for all corporate (both for lender as well as borrower) in Pakistan in February 2004 . KIBOR is always determined by State Bank of Pakistan. The credit spread calculation is performed by local banks in Pakistan which determine it based on various project specific risks or characteristics of a project type.

- KIBOR rate of 2007 are available at the website of State Bank of Pakistan (IRL 54): http://sbp.org.pk/ecodata/kibor/2007/
- Press release by State Bank of Pakistan: http://www.sbp.org.pk/press/2004/jan-21-04.pdf (IRL 56)

- Third Quarterly report of State Bank of Pakistan FY04 (IRL 55): http://sbp.org.pk/reports/quarterly/fy04/thirdQtr/Money%20Market.pdf

The commercial lending rate is determined by taking the average of three month KIBOR for September 2007 which is 9.73% and adding to it a credit spread of 200 basis points which is based on offer by Bank Alfalah Limited, a local bank in Pakistan (IRL 54). The benchmark thus evaluated was (9.73% + 2.0%) 11.73%.

The applied benchmark is in compliance with the requirements of EB 62, Annex 5. It is discussed in detail during onsite visit of lucky cement Karachi plant that the project activity could be implemented by another entity instead of Lucky Cement Limited like any Energy Service Company (ESCO) that would bear all the project related costs and recover its investment by claiming a portion of savings generated by the project activity. As the KIBOR and average spread are determined by the third party (State Bank of Pakistan & Local Bank), it is clear that the approach used for the calculation of benchmark (KIBOR + basis point) is appropriate.

**Benchmark determined by relevant National Authority**

It has been discussed by TÜV SÜD that there is no benchmark established by the Government of Pakistan for WHR based power projects. There are some benchmarks established by Government of Pakistan but only for hydropower and thermal power projects which are irrelevant in the context of the current project activity. Based on its local and sectoral expertise, TÜV SÜD confirms that there is no benchmark available in Pakistan for WHR based power projects.

**Comparison of the Chosen Benchmark with Other Benchmarks**

According to “Pakistan Cement Sector Review 2007” prepared by IGI Securities (IRL 49) which is a well known private company in Pakistan, the calculated Weighted Average Costs of Capital (WACC) for financial year 2007 for Lucky Cement is 13.10%. As per guidance provided in *Annex 05 of EB62*, WACC and benchmark determined by relevant national authority are also appropriate benchmarks for a project IRR which could be used to conduct the investment analysis for the project activity.

*The benchmark mentioned in EB 62 annex 5 as default value of the expected return on equity is 15.5%. So the applied benchmark in the project activity is 11.73% which is conservative as compared to 15.5%.*

Based on discussion above, TÜV SÜD considers that the applied benchmark 11.73% in the proposed project is conservative as compared to WACC rate of 13.10% and the default expected return on equity rate of 15.5%.

**Sensitivity analysis**

The sensitivity analysis was analyzed in detail and TÜV SÜD confirms that the underlying assumptions, parameters and chosen values are appropriate and that the calculations have been performed correctly. Sensitivity analysis was performed on the project investment cost; O&M cost, HFO price, NG price and Load factor of steam Turbine.

In the sensitivity analysis test, variation of ±10% has been considered as per the latest guidance from EB as indicated in the guidance on the investment analysis from EB62 (Annex 05). TÜV SÜD considers that all the variables chosen for conducting the sensitivity analysis as well as their variation range (±10%) are reasonable as these are in compliance with the latest guidance on investment analysis.

The main results of investment analysis show that IRR for Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant has been calculated with and without CDM revenues.

The project IRR without CDM revenues is 8.81% which means that the proposed project is economically unattractive and fulfils the requirement of additionality.

TÜV SÜD was able to verify that the IRR will touch the benchmark only the above mentioned parameters change by values as mentioned below:

| Key Indicators | Variation of the parameter indicator needed to reach benchmark |
|---|---|
| Project Investment costs | -12.40% |
| HFO Price | 18.15% |
| NG price | 18.75% |
| O&M Cost | -20.30% |
| Load factor of steam turbine | 9.16% |

The IRR of the proposed project with CERs revenues increases to 13.29% which is higher than the benchmark IRR of 11.73%. So the proposed project is economically attractive with CDM revenues. If the total investment cost decrease by 12.40% and there is an increase of more than 18.15 % in HFO price, an increase of more than 18.75 % in NG price or a decrease of 20.30% in O&M costs would turn IRR of the proposed project above the benchmark. Based on its local and sectoral expertise, TÜV SÜD confirms that such a high variable in the input parameters (project investment, fuel prices and O&M cost) is unlikely to happen. A variation of +10% in the load factor of steam turbine results into project IRR value higher than the benchmark. An increase of 9.16% in the load factor (87.25% load factor of the steam turbine) shall make the project IRR equal to the benchmark. However, this variation is not practically possible because the operational capacity of the WHRP (Waste Hear Recovery Plant) is dependent on the waste heat liberated from the kilns. The WHRP shall operate on 80% load factor only when all the three kilns E, F, G are simultaneously operating at their maximum capacity. All the three kilns do not run 330 days continuously on maximum capacity therefore achieving a plant load factor of greater than 80% (especially 87.25%) is not possible due to technical and commercial limitations. The plant operation depends upon demand of cement in the market which is always variable. The technical limitations include scheduled and unscheduled maintenance of kilns and the WHRP itself. Furthermore, as per technical design, turbines are always operated between 75 - 85% load to cater the surges in the electricity demand, and to safely operate within the electrical protection limits." The reasoning provided by the PP regarding the impact of variation in load factor is deemed to be reasonable.

The approach taken is fully in line with the given requirements and the minimum required range of +/- 10% is fully covered. The results indicate that it is highly unlikely that the project IRR would overcome the benchmark IRR. The assessment team was able to verify the results of the sensitivity analysis and confirms that the necessary increase and decrease in these parameters in order to overcome the benchmark is impossible.

The financial calculations have been verified and no mistakes have been found.

### 3.6.3 Barrier analysis

This step is not required as it is small scale project activity.

### 3.6.4 Common practice analysis

Common practice analysis is not required for small scale project.

## 3.7 Monitoring plan

The monitoring plan presented in the PDD complies with the requirements of the applicable methodology AMS.III.Q version 4. The assessment team has verified all parameters in the monitoring plan against the requirements of the methodology; no relevant deviations have been found.

The procedures have been reviewed by the assessment team through document review and interviews with the relevant personnel. This information, together with a physical site inspection, allows the assessment team to confirm that the proposed monitoring plan is feasible, and in line with the project design. The major parameters to be monitored have been discussed with the PPs, in particular with regard to the location of meters, data management, and the quality assurance and quality control procedures to be implemented in the context of the project.

According to the monitoring plan in the PDD, the net quantity of electricity supplied by the project activity to the recipient plant as for para 17a, $EG_{i,j,y}$ [MWh], will be measured continuously by an energy meter. Para 18 of AMS-III.Q is not applicable here since generated power is not exported to other facilities or to the grid. The QA/QC procedure planned is to cross check the results of the direct measurements with annual energy balances. The assessment team checked that QOE, y is a monitoring parameter in the MP as for para 19 of AMS-III.Q. Para 20 of AMS-III.Q is not applicable here. Furthermore, the applicable requirements specified in “General Guidelines to SSC CDM methodologies” as of para 21 of AMS-III.Q are deemed to be fulfilled by the MP.

Therefore, the PPs will be able to implement the monitoring plan and the achieved emission reductions can be reported ex-post and verified.

## 3.8 Sustainable development

The project will lead to sustainable development through employment generation, generation of clean energy, and introduction of energy efficient technologies to the host country. The project has received the host country approval letter which also indicates that the project will contribute to the sustainable development in Pakistan (IRL 42).

## 3.9 Local stakeholder consultation

The relevant local stakeholders meeting have been invited trough advertising in newspaper (Daily Times, Thursday, April 2nd, 2009). The evidence for the invitation is IRL 15, 16 and IRL 17 for the meeting. The assessment team has reviewed the documentation in order to validate the inclusion of relevant stakeholders. Using local expertise it can be confirmed that the communication method used to invite the stakeholders is appropriate. The summary of comments presented in the PDD has been cross checked with the documentation of the stakeholder consultation and it is found to be complete.

The relevant comments presented by the local stakeholders have been taken into due account by the PP; the same has been cross checked with the information obtained during the interviews.

As a result, TÜV SÜD considers the applied process for the local stakeholder consultation as adequate and appropriate.

## 3.10 Environmental impacts

The project participants undertook an analysis of environmental impacts of the project. An EIA as for item 161 of the VVM was not required for this project in accordance with the host country require-

ments. No significant negative impacts are caused by the project activity. The assessment team reviewed the documentation of the presented information. IRL 18 confirms the correctness of the approach used by the PP (IRL 18, Environmental Approval, issued by Environment Protection Department, Government of the Sindh, Karachi). TÜV SÜD concludes that the PP followed the requirements of the host country in regard to environmental impacts.

# 4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

TÜV SÜD published the project documents on the UNFCCC website and invited comments by affected Parties, stakeholders, and non-governmental organisations during a 30 day period.

All key information gathered is presented in the table bellow

**GSP Comments**

| | |
|---|---|
| **website:**<br>http://www.netinform.de/KE/Wegweiser/Guide2_1.aspx?ID=6219&Ebene1_ID=26&Ebene2_ID=2024&mode=1<br>https://cdm.unfccc.int/Projects/Validation/DB/4KAY98DK2HVFNSMYSYTR1OBBPIOQ53/view.html | |
| **Starting date of the global stakeholder consultation process:**<br>2009-07-25 | |
| **Comment submitted by:**<br>None | **Issues raised:**<br>- |
| **Response by TÜV SÜD:**<br>- | |

**Re-GSP Comments**

| | | |
|---|---|---|
| **website:**<br>http://www.netinform.de/KE/Wegweiser/Guide2_3.aspx?ID=7222&Ebene1_ID=26&Ebene2_ID=2410&mode=0<br>https://cdm.unfccc.int/Projects/Validation/DB/JZDZOGOA8Z0GM9JZYUINTLHLIRU2IN/view.html | | |
| **Starting date of the global stakeholder consultation process:**<br>2011-05-20 | | |
| **Comments** | **PP Response** | **TÜV SÜD Response** |
| **Re-GSP comment of Stakeholder:**<br>TÜV SÜD received the comments during the re-GSP of the project stated below.<br>Please clarify the below comments.<br>"It is evident from the PDD that the values are consistent and it is definitely forged and cooked up values to show a non CDM project as a CDM project. What is this? DoE to check the Detailed Project Report and Feasibility Report which is submitted to the other agencies and Banks by Project owner and ensure that the values match with the DPR/FR submitted to | The stakeholder himself admits that the values provided in the PDD are consistent. At the same time, he claims that these are "forged and cooked up". So the starting statement provided by the stakeholder is self-contradictory. Nevertheless, it is reiterated here by the PP that all the input parameters used in the feasibility study as well as in the investment analysis of the project activity are consistent and have been thor- | The Feasibility Study Report incorporates the IRR input figures that were base for the investment decision in October 1st, 2007 is credible for the DOE (see chapter 3.6 of the validation report). TÜV SÜD has discussed and checked that there is no detail project report avail- |

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| DoE also. After careful study of PDD it is found that DPR/FR is in different versions made and submitted with different purposes to different agencies which is totally unacceptable, illegal and unethical. PP/Consultant may show some undertaking letter from bank manager to DoE stating that both DPR's are same. These kinds of letters should not be accepted and entertained by DoE. While collecting the DPR/FR from banks and other agencies, all DPR/FR pages should be counter signed by Banks and other agencies so that the real DPR/FR given to other parties by the PP/Consultant is same as the one submitted to DOE. In this particular project there is clear cut evidence that DPR/FR values are changed/ fabricated mischievously and intentionally. This must be probed fully. DOE must take a written undertaking from the PP/Consultant about the list of parties to whom this DPR/FR is submitted and for what purposes. Then DOE should cross check with all the parties and confirm that the same DPR/FR is submitted to all the parties correctly without any changes. DOE must not accept any reports and undertakings from PP/Consultant. DOE must make independent evaluation and use totally different parties without informing the PP or Consultant to cross check the facts. DOE to write to the party who prepared the DPR/FR which is submitted to the banks and other agencies and the same is verified against the one submitted to the DOE by PP/Consultant. This project is a fabricated and fake CDM project and must be rejected by the DOE right away. DOE should not support this kind of projects otherwise CDM EB should suspend this DOE for at least one year". submitted by:<br><br>zhong zhou li<br><br>zhongzhouli8@gmail.com | oughly cross-checked by the DOE during the course of validation. The PP has provided the DOE with all the requisite evidences in this regard.<br><br>Please note that no Detailed Project Report of the proposed CDM project activity was prepared at the time of investment decision. The fact was also highlighted to DOE by the representatives from Finance Department of Lucky Cement during the onsite audit; furthermore, the financial decision making of the project activity was based on the feasibility study already shared with DOE. It should be noted that the feasibility study for the project activity is not publicly available. It is a confidential document and has not been shared with any other agency except the DOE and CDM project developers.<br><br>As already mentioned above that all the evidences related to the input parameters used in the feasibility have been provided to the DOE in a transparent manner for validation/verification purposes.<br><br>Since, the feasibility study was not included in the GSP package and there is no DPR of the project activity available, then how could the stakeholder, without any proper evidence, conclude that the feasibility study is made in different versions!<br><br>In view of the above it is stated that the stakeholder has put forward his comment regarding the project activity without any sound justifications and evidences.<br><br>It might be interesting to know (see attached file *GSP Comment Zhong Zhou Li.xlsx*) that the stakeholder has copy pasted the same comment on at least 33 projects (the number could be even higher as this is what the PP found through Google!) which have GSP starting dates between 27/04/2011 and 26/05/2011.<br><br>Although these 33 projects are from 8 different sectors, 7 different countries, under 9 different DOEs, yet the same | able. The FSR of project never presented to bank.<br><br>It is discussed and checked by DOE onsite that FSR was prepared by Lucky Cement Limited internally. It is also explained by PP that the FSR was never publically available and it is confidential documents that never shared with any other agency.<br><br>TÜV SÜD cross checked the applied input values and these are consistent with IRR spreadsheet and PDD.<br><br>It is explained in section 3.6 of the validation report that all input parameters are consistent with FSR. The stakeholder comments are deemed to be not applicable for this project activity.<br><br>The stakeholder comments are deemed to be not applicable for this project activity. |

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| | comment has been posted on against all these projects.<br><br>According to the PP, it is not humanly possible to do a "careful study" of 33 PDDs in less than a month and come up with a same comment in each case.<br><br>It is quite possible that this could be a computer generated spam.<br><br>The PP therefore concludes that the comment is not properly evidenced and lacks the seriousness of purpose which characterizes a responsible stakeholder. | |

# 5 VALIDATION OPINION

TÜV SÜD has performed a validation of the following proposed CDM project activity:

Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant

Standard auditing techniques have been used for the validation of the project. A methodology-specific protocol for the project has been prepared to conduct the validation process in a transparent and comprehensive manner.

The review of the project design documentation, subsequent follow-up interviews and further verification of references have provided TÜV SÜD with sufficient evidence to determine the fulfilment of stated criteria in the protocol. In the opinion of TÜV SÜD, the project meets all relevant UNFCCC requirements for the CDM if the underlying assumptions do not change. TÜV SÜD recommends the project for registration by the CDM Executive Board.

An analysis, as provided by the applied methodology, demonstrates that the proposed project activity is not a likely baseline scenario. Emission reductions attributable to the project are additional to any that would occur in the absence of the project activity. Considering that the project is implemented as designed, the project is likely to achieve the estimated amount of annual emission reductions of 42,992 tCO2e and a total estimated of 429,920 ER tCO2e as specified within the final PDD version.

The validation has been performed following the requirements of the CDM VVM and on the basis of the contractual agreement. The single purpose of this report is its use during the registration process as part of the CDM project cycle. Based on the work described in this report, nothing has come to our attention that causes us to believe that any project component or issue has not been covered by the validation process.

Pune, 19/02/2013

Certification Body “Environment and Energy”
TÜV SÜD South Asia Pvt Ltd

# Annex 1: Validation Protocol

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| ***A. General description of project activity*** | | | | |
| **A.1. Title of the project activity** | | | | |
| A.1.1. Does the used project title clearly enable to identify the unique CDM activity? | 1 | Yes,<br>The used project title "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant" clearly identifies the CDM activity. | ☑ | ☑ |
| A.1.2. Are there any indication concerning the revision number and the date of the revision? | 1 | Yes,<br>They are. The PDD in GSP is version 01 submitted in July 2009 with applied methodology AM0024. During the validation of the project the client changed the applied methodology and submitted the PDD for re-GSP with AMS.III.Q version 4. The change of methodology was due to Reply to AM_REV_0141 (methodology to be merged with ACM0012, but issues regarding the multiple fuel usage in baseline not addressed). | ☑ | ☑ |
| A.1.3. Is this consistent with the time line of the project's history? | 1 | Yes,<br>The date of the version of PDD is consistent with the time line of the project's history. | ☑ | ☑ |
| **A.2. Description of the project activity** | | | | |
| A.2.1. Is the description delivering a transparent overview of the project activities? | 1<br><br>IRL 27 | The project is being implemented at Karachi plant of Lucky Cement which has three kilns; Kiln E, Kiln F and Kiln G. Each kiln has a clinker production capacity of 3300 Tons per Day (TPD). Kiln E and F have been in operation since October 2006 while Kiln G started operation in January 2009.<br>According to the contract between Yunus Brothers Pakistan & HCRDI, the design capacity of each Kiln is 3300 Ttons of clinker | **CAR1** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | IRL 37 | per day.<br>The cement plant has a captive power plant with a capacity of 80 MW in sum (according to documents at lucky Karachi plant) which has twelve captive engines.<br>Two of these engines are HFO based while remaining engines are natural gas based. There is no grid connection for electricity imports/exports.<br>The project activity involves installation of six (two on each kiln) Heat Recovery Steam Generators (HRSGs) of total capacity 63.54 TPH (According to the purchase order of SINOMA) and to recover the waste heat from the kilns to generate electricity by a 15 MW (rated output) steam turbo generator.<br>The project activity will generate net 87,437 MWh (see Excel file for emission reduction calculation considering the project load factor of 80%, a plant load factor of 90,4% (330 clinker production operation days out of 365 maximum yearly days) and project own consumption of 8%) per year electricity and will result in 4,992 t $CO_2$ equivalent emission reductions per annum.<br>In the absence of project activity, Lucky Cement Limited will continue to get all of its power demand from the dual fuel based captive power plant because this comes out to be the most plausible baseline scenario.<br><br>**Corrective Action Request No.1.**<br>As per requirement of EB34, annex 9, PP shall explain the abbreviations used in PDD. | | |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| A.2.2. What proofs are available demonstrating that the project description is in compliance with the actual situation or planning? | 1,2 | According the PDD, following documents was presented to DOE.<br>- **February 2007** Letter from the (later on contracted) CDM consultant Carbon Services) to the to the Technical Director of Lucky Cement Limited (awareness of CDM)<br>- **August 2007** CDM consulting contract was signed between First Climate ( Earlier Factor Consulting + Management AG) and Lucky Cement Limited<br>• **October 2007** Extracts from the minutes of the board meeting of Lucky Cement Limited. In Karachi regarding the WHR project, Board of Director discussed the financial matters (feasibility Study Report based on the preliminary quotations provided by technology supplier) of WHR project at Lucky Karachi plant and decided that without CDM benefits, the project is not feasible to proceed. Board of directors of Lucky Cement Limited decided to proceeds the WHR project as CDM project so that extra CDM revenues will help the project overcome the financial barriers.<br>• **May 2008 Contract** Equipment purchase contract was signed for WHR power plant between Lucky Cement Limited and Sinoma International Engineering Co. Ltd. (supplier for WHR equipment)<br>• **November 2008** Start of civil works of WHR project | **CR1** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | • **November 2009**, Project pre-commissioning<br>• **December 2009**, full commissioning of project is expected.<br>It was discussed during the onsite that the pre-commissioning of the project will be completed in the end of the November 2009.<br>**Clarification Request No. 1.**<br>– It is mentioned in section B.5 of the PDD that the commissioning date of the project is expected February 2010 while it is 2011 now. Please clarify that either commissioning of Lucky Karachi Waste Heat Recovery Project has been done or not. | | |
| A.2.3. Is the information provided by these proofs consistent with the information provided by the PDD? | 1,2 | Yes. | ☑ | ☑ |
| A.2.4. Is all information presented consistent with details provided by further chapters of the PDD? | 1,2 | See CR 1, and CAR 1 | See CR 1, and CAR 1 | ☑ |
| **A.3. Project participants** | | | | |
| A.3.1. Is the form required for the indication of project participants correctly applied? | 1 | Yes,<br>The form for the indication of PPs is correctly applied. | ☑ | ☑ |
| A.3.2. Is the participation of the listed entities or Parties confirmed by each one of them? | 1 | **Clarification Request No. 2.**<br>– The LoA of the parties involved have to be provided to the DOE. | **CR2** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | – Please provide the Modalities of Communication (MoC). | | |
| A.3.3. Is all information on participants / Parties provided in consistency with details provided by further chapters of the PDD (in particular annex 1)? | 1 | See Annex 1 | ☑ | ☑ |
| **A.4. Technical description of the project activity** | | | | |
| *A.4.1. Location of the project activity* | | | | |
| A.4.1.1. Does the information provided on the location of the project activity allow for a clear identification of the site(s)? | 1,5 | Yes,<br>The geographical coordinates of the project has been provided in chapter A.4 of the PDD. | ☑ | ☑ |
| A.4.1.2. How is it ensured and/or demonstrated, that the project proponents can implement the project at this site (ownership, licenses, contracts etc.)? | 1,5 | **Clarification Request No. 3.**<br>Proofs of operation license of cement plant and construction license of the project activity have to be provided to the DOE, if possible, prior to the on-site Audit. | **CR3** | ☑ |
| *A.4.2. Category(ies) of project activity* | | | | |
| A.4.2.1. To which category(ies) does the project activity belonging to? Is the category correctly identified and indicated? | 1,2 | The project activity belongs to sectoral scopes<br>• Sectoral Scope 4 – Manufacturing industries<br>Both are correctly indicated in the PDD. | ☑ | ☑ |
| *A.4.3. Technology to be employed by the project activity* | | | | |
| A.4.3.1. Does the technical design of the project activity reflect current good practices? | 1,2,5 | **Clarification Request No. 4.**<br>a) The contracts with the supplier of HRSGs and steam tur- | **CR4** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | bine including technical data or at least the offer have to be provided to the DOE.<br>b) The PDD figure for electricity supply of the existing captive power plant needs to be evidenced. | | |
| A.4.3.2. Does the description of the technology to be applied provide sufficient and transparent input/ information to evaluate its impact on the greenhouse gas balance? | 1,2,5 | Yes,<br>The description of the technology to be applied provides sufficient and transparent information to evaluate its impact on the greenhouse gas balance. | ☑ | ☑ |
| A.4.3.3. Does the implementation of the project activity require any technology transfer from annex-I-countries to the host country(ies)? | 1,2,5 | Yes,<br>The technology is transferred from China to the Pakistan. | ☑ | ☑ |
| A.4.3.4. Is the technology implemented by the project activity environmentally safe? | 1,2,5 | Yes,<br>Technology implemented by the project activity is environmentally safe. | ☑ | ☑ |
| A.4.3.5. Is the information provided in compliance with actual situation or planning? | 1,2,5 | Yes. | ☑ | ☑ |
| A.4.3.6. Does the project use state of the art technology and / or does the technology result in a significantly better performance than any commonly used technologies in the host country? | 1,2,5 | Yes,<br>It is clear from the equipment purchase that the project use state of the art technology because project activity involves installation of new equipment which is not common in Pakistan as well (IRL 5). | ☑ | ☑ |
| A.4.3.7. Is the project technology likely to be | 1,2,5 | The project activity uses the start of art technology and it is clear | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| substituted by other or more efficient technologies within the project period? | | that project technology will not likely to be substituted by other or more efficient technologies within the project period. | | |
| A.4.3.8. Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period? | 1,2,5 | **Clarification Request No. 5.**<br>Information about initial training and maintenance for the implementation and operation of the project activity has to be provided to the DOE. | **CR5** | ☑ |
| A.4.3.9. Is information available on the demand and requirements for training and maintenance? | 1,2,5 | See CR 6 | See CR 6 | ☑ |
| A.4.3.10. Is a schedule available for the implementation of the project and are there any risks for delays? | 1,2,5 | Yes,<br>The project timeline is indicated in a table in chapter B.5 of the PDD, risks for delays of implementation: | ☑ | ☑ |
| *A.4.4. Estimated amount of emission reductions over the chosen crediting period* | | | | |
| A.4.4.1. Is the form required for the indication of projected emission reductions correctly applied? | 1,37 | Yes,<br>The form for the indication of projected emission reductions is correctly applied. | ☑ | ☑ |
| A.4.4.2. Are the figures provided consistent with other data presented in the PDD? | 1,37 | **Corrective Action Request No.2.**<br>a) For all default figures provided in the ER excel file calculation sheet appropriate sources have to be indicated in order to trace these figures. | **CAR2** | ☑ |
| *A.4.5. Public funding of the project activity* | | | | |
| A.4.5.1. Is the information provided on public funding provided in compliance with the actual situation or planning as available by the pro- | 1,6 | **Clarification Request No. 6.**<br>A written statement that public funding is excluded for this project | **CR 6** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| ject participants? | | needs to be submitted to the DOE. | | |
| A.4.5.2. Is all information provided consistent with the details given in remaining chapters of the PDD (in particular annex 2)? | 1,6 | See CR6 | See CR6 | ☑ |
| *A.4.6. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity* | | | | |
| A.4.6.1. Is there a registered small-scale CDM project activity or an application to register another small-scale CDM project activity: with the following characteristics: | | Debundling checklist / Yes / No<br>The same project participants? / No<br>In the same project category and technology/measure? / No<br>Registered within previous two years? Or in registration process? / No<br>Whose boundary is within 1 km of the project boundary of the small scale project activity under consideration? / No | ☑ | ☑ |
| A.4.6.2. If the answer to all the above question is '**Yes**' then: Does the total size of the small scale project activity combined with previously registered small scale CDM project activity exceeds the limits of small scale CDM project activities? | | N/A, The proposed project is not a debundled component of a larger project activity. | ☑ | ☑ |
| ***B. Application of a baseline and monitoring methodology*** | | | | |
| **B.1. Title and reference of the approved baseline and monitoring methodology** | | | | |
| B.1.1.1. Are reference number, version number, and title of the baseline and monitoring methodology clearly indicated? | 1,2 | Yes, the applicable Small Scale baseline methodology AMS-III.Q, Waste Energy Recovery (gas/heat/pressure) Projects (version 04) | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.1.1.2. Is the applied version the most recent one and / or is this version still applicable? | 1,2 | Yes. At the time of second GSP uploading, AMS-III.Q (version 4) has been the most recent one. | ☑ | ☑ |
| **B.2. Justification of the choice of the methodology and why it is applicable to the project activity** | | | | |
| B.2.1.1. Is the applied methodology considered the most appropriate one? | 1,2 | Yes,<br>The applied methodology AMS.III.Q version 4 is the most appropriate and recent one. | ☑ | ☑ |
| Integrate the required amount of sub-checklists on the applicability criteria as given by the applied methodology and comment on at least every line answered with "No"; | | | | |
| B.2.1. Criterion 1:<br>The applicability is limited to project activities that use waste heat generated in clinker making process to produce electricity. The category is for project activities that utilize waste gas and/or waste heat at existing facilities as an energy source for:<br>a) Cogeneration; or<br>b) Generation of electricity; or<br>c) Direct use as process heat; or<br>d) Generation of heat in elemental process (e.g. steam, hot water, hot oil, hot air); or<br>e) Generation of mechanical energy | 1,2 | Applicability checklist / Yes / No<br>Criterion discussed in the PDD? / Yes<br>Compliance provable? / Yes<br>Compliance verified? / Yes<br>The audit team confirms by Document Review (IRL 3- ) and on-site visit (IRL-3a)) that project activity utilizes waste heat from existing kilns as energy source of generation of electricity which is case b according to methodology applicability criteria 1. | ☑ | ☑ |

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>B.2.2. Criterion 2:<br>The category is also applicable to project activities that use waste pressure to generate electricity at existing facilities.</td><td>1,2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>NA</td></tr><tr><td>Compliance provable?</td><td>NA</td></tr><tr><td>Compliance verified?</td><td>NA</td></tr></table><br>The project involves use of waste heat only.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.3. Criterion 3:<br>The recovery of waste gas/heat/pressure should be a new initiative (no waste gas/heat/pressure was recovered from the project activity source prior to the implementation of the project activity).</td><td>1,2<br>IRL 3a</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table><br>Apart from the small share of waste heat that is used to pre-heat the raw meal, the waste heat from clinker kilns is as well released into the atmosphere prior to the project implementation. This has been confirmed by on-site visit (IRL 3a). Although, para 3 of AMS-III.Q, version 04 requires that “no waste heat was recovered from the project activity source prior to the implementation of the project activity”, it has been clarified by Annex 20 of EB61 report that project activities that recover waste heat in the baseline are eligible to AMS-III.Q anyway subject that “the current practice of recovering small amounts of waste energy continues during the crediting period”. Hence, the project activity on hand is eligible for</td><td>**CR 7**</td><td>☑</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td>AMS-III.Q, version 04.<br>In the PDD it is said: Appropriate evidences such as Energy Bills and Financial Statements audited by competent authorities will be provided to DOE during the validation.<br><u>Clarification Request No. 7.</u><br>Please provide the Energy Bills and Financial Statements audited by competent authorities.</td><td></td><td></td></tr>
<tr><td>B.2.4. Criterion 4:<br>Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually;</td><td>1,2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table><br>It is estimated that the project activity results in emission reductions 42.992 kt CO2 equivalent annually which is less than 60 kt $CO_2$</td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.5. Criterion 5:<br>a) The energy produced with the recovered waste gas/heat/or waste pressure should be measurable;</td><td>1,2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table><br>The energy that is produced from waste heat is electricity and it is measurable (Monitoring Parameter).</td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.2.6. Criterion 5:<br>b) Energy generated in the project activity may be used within the industrial facility or exported to other industrial facilities (included in the project boundary); | 1,2 | It is obvious that the power generated by the project substitutes the power generated by the existing captive power plant. It has been confirmed during onsite that the industrial facility has no grid connection. Furthermore, no other potential consumers outside the boundary have been identified during on-site visit. Hence, it is obvious that the power generated by the project activity will be used within the project boundary by consumers of the cement manufacturing plant.<br>Applicability checklist \| Yes / No<br>Criterion discussed in the PDD? \| Yes<br>Compliance provable? \| Yes<br>Compliance verified? \| Yes | ☑ | ☑ |

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.2.7. Criterion 5:<br>c) Electricity generated in the project activity may be exported to the grid or used for captive purposes; However, the methodology is not applicable to projects where the waste gas/heat/pressure recovery project is implemented in a single-cycle power plant (e.g. gas turbine or diesel generator) where heat (energy) generated on site is not utilizable for any other purposes on-site except to generate power. Such project activities shall consider AMS-III.AL “Conversion from single cycle to combined cycle power generation”. The projects recovering waste energy from such power plants for the purpose of generation of heat only can apply this methodology;</td><td>1,2</td><td><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>NA</td></tr><tr><td>Compliance provable?</td><td>NA</td></tr><tr><td>Compliance verified?</td><td>NA</td></tr></table>The WHR project is not implemented in a single cycle power plant but utilizes the waste heat of the kilns of the cement plant.<br><br>It has been discussed and confirmed during onsite that the industrial facility has no grid connection and the electricity generated in the project activity is used for captive purposes.</td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.2.8. Criterion 5:<br>d) For a project activity which recovers waste gas/heat/pressure for power generation from multiple sources (e.g. kiln and single-cycle power plant), this methodology can be used in combination with AMS-III.AL provided that:<br>(i) Within the project activity it is possible to distinguish two distinct waste energy sources such that:<br>• Waste energy source-I (e.g. kiln) belongs to such waste heat sources which are eligible under AMS-III.Q;<br>• Waste energy source-II (e.g. single-cycle power unit) belongs to such waste heat sources which are eligible under AMS-III.AL;<br>(i) It is possible, for each waste energy source, to determine the baseline according to the specific methodology referred to;<br>(ii) It is possible to objectively allocate the electricity produced in the project activity to each waste energy source, by means of one of the following methods:<br>• Through separate measurements of the electricity produced by utilizing waste energy from each waste energy source; or<br>• Through separate measurements of the energy content of the waste energy carrying medium (WECM) streams used for electricity production; or<br>• Through separate measurements of the energy content of the waste energy streams that are associated with each waste energy source and used for electricity production or for the WECM generation in a common waste heat recovery system (e.g. if steam is generated by waste heat from a kiln and waste heat from an internal combustion engine in a common waste heat recovery boiler); | 1,2 | See comments to Criterion 5c).<br><br>Applicability checklist / Yes / No<br>Criterion discussed in the PDD? / NA<br>Compliance provable? / NA<br>Compliance verified? / NA | ☑ | |

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.2.9. Criterion 5:<br>e) The emission reductions are claimed by the generator of energy using waste energy;</td><td>1,2</td><td>The generator of the power is the project participant of the host country.<br><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.2.10. Criterion 5:<br>f). in cases where the energy is exported to other facilities (included in the project boundary), the following are required:<br>(i) All historical information from the recipient plants;<br>(ii) An official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by the recipient plant(s) for using a zero-emission energy source;</td><td>1,2<br>IRL 3a</td><td>As information has been gathered during physical onsite visit,<br>Apart from the facilities allocated to the cement manufacturing process, there are no other facilities within the project boundary.<br><table><tr><th>Applicability checklist</th><th>Yes / No</th></tr><tr><td>Criterion discussed in the PDD?</td><td>NA</td></tr><tr><td>Compliance provable?</td><td>NA</td></tr><tr><td>Compliance verified?</td><td>NA</td></tr></table>DOE concluded that it is obvious that the electricity that is generated from the WHR plant is not exported to other facilities but is used within the cement plant. Hence, this criterion is not applicable for the project activity.</td><td>☑</td><td>☑</td></tr>
</table>

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<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.2.11. Criterion 5:<br>(g) For those facilities and recipients included in the project boundary, that prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods:<br>I. The remaining lifetime of equipments currently being used; and<br>II. Crediting period;</td><td>1,2<br>IRL 3a,<br>IRL 59,<br>IRL 25</td><td><table><tr><td>Applicability checklist</td><td>Yes / No</td></tr><tr><td>Criterion discussed in the PDD?</td><td>Yes</td></tr><tr><td>Compliance provable?</td><td>Yes</td></tr><tr><td>Compliance verified?</td><td>Yes</td></tr></table>The only facility that generates energy within the project boundary produced and in the baseline is the existing Captive power plant). The remaining lifetime as stated in the available evidences, is deemed to be reasonable. Hence, DOE concludes that criterion 5g is fully applicable for the project activity.</td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.2.12. Criterion 5:<br>(h) The waste gas/heat/pressure utilized in the project activity would have been flared or released into the atmosphere in the absence of the project activity. This shall be proven by one of the following options:<br>(i) By **direct measurements** of energy content and amount of the waste gas/heat/pressure for at least three years prior to the start of the project activity;<br>(ii) **Energy balance** of relevant sections of the plant to prove that the waste gas/heat/pressure was not a source of energy before the implementation of the project activity. For the energy balance the representative process parameters are required. The energy balance shall demonstrate that the waste gas/heat/pressure was not used and also provide conservative estimations of the energy content and amount of waste gas/heat/pressure released;<br>(iii) **Energy bills** (electricity, fossil fuel) to demonstrate that all the energy required for the process (e.g. based on specific energy consumption specified by the manufacturer) has been procured commercially. Project participants are required to demonstrate through the financial documents (e.g. balance sheets, profit and loss statement) that no energy was generated by waste gas/heat/pressure and sold to other facilities and/or the grid. The bills and financial statements should be audited by competent authorities;<br>(iv) **Process plant** manufacturers' original specification/information, schemes and diagrams from the construction of the facility could be used as an estimate of quantity and energy content of waste gas/heat/pressure produced for rated plant capacity per unit of product produced.<br>Table 1 is applicable to AMS.III.Q, version 04 | 1,2<br>IRL 58 | Applicability checklist: Yes / No<br>Criterion discussed in the PDD? Yes<br>Compliance provable? Yes<br>Compliance verified? Yes<br><br>The fact that waste heat was released to the atmosphere unused prior to the project is proved by **energy bills**. These evidences (IRL 58) have been prepared by third party auditors ""Ernst & Young Ford Rhodes Sidat Hyder".In addition to this, cost accounts are audited by the cost auditors under the provisions of the Companies (Audit of Cost Accounts) Rules, 1998. The name of present cost auditing company is "KPMG Taseer Hadi & Company". All the audits are done under the provisions of International Accounting Standards issued by the International Accounting Standard Board. All evidences (IRL 58) have been checked by the audit team and, hence, are deemed to be credible. | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.2.13. Criterion 6:<br>For the purpose of this category waste energy is defined as: a by-product gas/heat/pressure from machines and industrial processes having potential to provide usable energy, for which it can be demonstrated that it was wasted. For example gas flared or released into the atmosphere, the heat or pressure not recovered (therefore wasted). Gases that have intrinsic value in a spot market as energy carrier or chemical (e.g., natural gas, hydrogen, liquefied petroleum gas, or their substitutes) are not eligible under this category. | 1,2 | Applicability checklist: Yes / No<br>Criterion discussed in the PDD? Yes<br>Compliance provable? Yes<br>Compliance verified? Yes<br><br>The project activity utilizes waste energy (heat) from the clinker manufacturing kilns (industrial process). | ☑ | ☑ |
| **B.3. Description of the project boundary** | | | | |
| B.3.1. Does the project boundary include physical, geographical site where the project activity takes place?<br>In detail, does the project boundary include:<br>- The facility where the waste energy (heat/gas/steam) occurs?<br>- The facility where the waste energy is transformed to useful energy?<br>- The facility where the produced energy from the WHR plant is being used? | 1,2 | The project boundary of the Project activity includes Lucky cement plant where the waste heat is produced as well as electricity is produced using the recovered waste heat. | ☑ | ☑ |
| B.3.2. Do the spatial and technological boundaries as verified on-site comply with the | 1,2 | Yes. It has been checked onsite by audit team that spatial and technological boundaries of the project comply with the discussion | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| discussion provided by / indication included to the PDD? | | provided in the PDD. | | |
| B.3.3. Is a flow diagram of the project boundary, physically delineating the project activity, based on the description provided in section "A.4.3 to be employed by the project activity" presented? | 1,2 | Yes. The flow diagram of the project physical boundary cover kilns E, F & G where the waste heat is generated, the entire cement plant where the electricity is consumed and the waste heat recovery system are to be included in the project boundary. | ☑ | ☑ |
| **B.4. Description of how the baseline and its development** | | | | |
| | | | | |
| B.4.1. Have all technically feasible baseline scenario alternatives to the project activity been identified and discussed in the PDD? Why can this list be considered as being complete? | 1,2<br>IRL 3a | The PDD states that:<br>– The current use of waste heat from the kiln is to use a small part for the preheating of raw material and fuel and then venting the remaining waste heat into the atmosphere.<br>– There is no other demand of waste heat as part of the baseline.<br>– The residential area is approximately 10 km away from the project facility and climatic conditions are not favorable to supply waste heat for district heating.<br>– The use of waste heat for the preheating of raw material and fuel is part of the clinker making process and, thus, within the boundary.<br>The information has been gathered during physical onsite visit by audit team and confirms that above mentioned points are correct (IRL 3a). | ☑ | ☑ |
| B.4.2. Does the project identifies correctly and | 1,2 | See chapter D for more information. | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| excludes those options not in line with regulatory or legal requirements? | IRL 35 | There are no legal and other requirements to implement the project activity (IRL 35). | | |
| B.4.3. Have applicable regulatory or legal requirements been identified? | 1,2 | See chapter D for more information. | ☑ | ☑ |
| B.4.4. Does the PDD identify the most likely baseline scenario in absence of the project activity? | 1,2 | Yes,<br>The baseline scenario is identified as release of waste heat to the atmosphere. | ☑ | ☑ |
| B.4.5. Is this identification supported by official and/or verifiable documents (e.g. studies, web pages, certificates, etc? | 1,2 | See section B.2.10 | ☑ | ☑ |
| B.4.6. Is the identified baseline scenario in line with regulatory or legal requirements? | 1,2 | See chapter D for more information. | ☑ | ☑ |
| B.4.7. Is the identified baseline scenario in accordance with the selected baseline methodology? | 1,2 | See section B.2.10 | ☑ | ☑ |
| **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 CDM project activity (assessment and demonstration of additionality):** | | | | |
| B.5.1. In case of applying step 2 / investment analysis of the additionality tool: Is the analysis method identified appropriately (step 2a)? | 1,2 | The additionality of the project activity is demonstrated according to Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activity categories, “project participants shall provide an explanation to show that the project activity.<br><br>n/a. The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.2. In case of Option I (simple cost analy- | 1,2 | Not applicable | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| sis): Is it demonstrated that the activity produces no economic benefits other than CDM income? | | | | |
| B.5.3. In case of Option II (investment comparison analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.4. In case of Option III (benchmark analysis): Is the most suitable financial indicator clearly identified (IRR, NPV, cost benefit ratio, or (levelized) unit cost)? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.5. In case of Option II or Option III: Is the calculation of financial figures for this indicator correctly done for all alternatives and the project activity? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.6. In case of Option II or Option III: Is the analysis presented in a transparent manner including publicly available proofs for the utilized data? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.7. In case of applying step 3 (barrier analysis) of the additionality tool: Is a complete list of barriers developed that prevent the different alternatives to occur? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.8. In case of applying step 3 (barrier analysis): Is transparent and documented evidence provided on the existence and significance of these barriers? | 1,2 | n/a<br>The project does not apply the additionality tool. | ☑ | ☑ |
| B.5.9. In case of applying step 3 (barrier anal- | 1,2,5 | Yes. It is clear that the execution of at least one of the alternatives | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| ysis): Is it transparently shown that the execution of at least one of the alternatives is not prevented by the identified barriers? | ,9,12 ,13 | is not prevented by the identified barriers (investment barrier applied in project activity). | | |
| B.5.10. Have other activities in the host country / region similar to the project activity been identified and are these activities appropriately analyzed by the PDD (step 4a)? | 1,2,5 ,9,12 ,13 | Not applicable | ☑ | ☑ |
| B.5.11. If similar activities are occurring: Is it demonstrated that in spite of these similarities the project activity would not be implemented without the CDM component (step 4b)? | 1,2,5 ,9,12 ,13 | Not applicable | ☑ | ☑ |
| B.5.12. Is it appropriately explained how the approval of the project activity will help to overcome the economic and financial hurdles or other identified barriers (step 5)? | 1,2,5 ,9,12 ,13 | Not applicable | ☑ | ☑ |
| If the additionality tool has not been used please answer B.5.13 to B.5.18 | | | | |
| B.5.13. If the starting date of the project activity is before the date of validation, is evidence available to prove that incentive from the CDM was seriously considered in the decision to proceed with the project activity? | 1,5,9 ,12, 13 40 | – The starting date of the project is May 7th, 2008 which is the date of equipment purchase contract between Lucky Cement Limited and Sinoma Energy Conservation Ltd. This is before the start of validation. The equipment purchase contract has been submitted to DOE.<br>– The evidence of early CDM consideration has been submitted to DOE (E-mail introduction of Carbon Services (Private) Limited to Lucky Cement Limited about the CDM Project benefits) (IRL 7).<br>– Extract of Minutes of the Board Directors meeting of Lucky Cement Limited (IRL 40).<br>So it is evident that the PP were aware of CDM revenues before | ☑ | ☑ |

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<tr><td></td><td></td><td>the start date of the project and it is also clear from Board Decision that CDM revenues were the decisive factor to proceed with the project act CDM project.</td><td></td><td></td></tr>
<tr><td>B.5.14. Is a complete list of barriers developed that prevents the project activity to occur?</td><td>1,5,9,12,13</td><td>Investment analysis is chosen to demonstrate the additionality.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.5.15. Does this list include at least one of the following barriers?</td><td>1,5,9,12,13</td><td><table><tr><th>Barrier</th><th>Discussed?</th><th>Verified?</th></tr><tr><td>Investment</td><td>Yes</td><td>Yes</td></tr><tr><td>Technology</td><td>NA</td><td>NA</td></tr><tr><td>Due to prevailing practice</td><td>NA</td><td>NA</td></tr><tr><td>others</td><td>NA</td><td>NA</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.5.16. Does the discussion sufficiently take into account relevant national and/or sectoral policies?</td><td>1,5,9,12,13</td><td>Yes.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.5.17. Is transparent and documented evidence provided on the existence and significance of these barriers?</td><td>1,5,9,12,13</td><td>The investment analysis is done in line with the Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activity categories and chosen the investment barrier to demonstrate the additionality of the project. The investment analysis is conducted in line with the “Guidance on the Investment Analysis” by EB 62 Report annex 5. The investment analysis is based on the calculation of project IRR.</td><td>CR 8<br>CR 9<br>CR 10</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | **Benchmark.**<br>According to EB 62 annex 5, Project IRR is calculated to demonstrate additionality and has been compared against local commercial lending rate in Pakistan.<br>The local lending and borrowing rates in Pakistan are based on Karachi Inter-bank Offered Rate (KIBOR) plus the credit spread over the KIBOR charged by the local bank. The credit spread calculation is left to local banks as it depends on number of factors which vary widely for different corporate borrowers. For instance, the spread can range between 200 to 350 basis points depending on various criteria that determine the Credit Risk Rating (CRR) of the loan recipient; these include its inherent risk, annual profitability, cash flow position, debt ratio, gearing ratio (ratio of interest bearing liability to net worth), industry cycle, etc. For this project activity, LCL considered a three month tenor average KIBOR of 9.73 % for September 2007 and adopted 200 basis points as reasonable credit spread. The benchmark thus evaluated was (9.73 % + 2.0%) = 11.73%.<br>**Clarification Request No. 8.**<br>Please clarify the following questions.<br>- Who decides the KIBOR<br>- Please clarify who decides the basis points.<br>- Why 200 basis points are considered<br>- At what time project participants considered 200 basis points and what is base of consideration of 200 basis points.<br>- Please provide the unprotected and correctly formulae applied IRR calculation spreadsheet to DOE. | | |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | **Clarification Request No. 9.**<br>– The project IRR value presented in FSR is 8.81% while IRR in GSP PDD is 7.39% and same value is in the re-peated GSP. Please clarify why the project IRR presented in PDD is different from IRR value presented in FSR.<br>**Clarification Request No. 10.**<br>Please provide all the relevant evidence related to benchmark, Investment Cost, operational & Maintenance cost, | | |
| B.5.18. Is it appropriately explained how the approval of the project activity will help to overcome the identified barriers? | 1,5,12,13 | Yes. Project IRR with CER is calculated and it exceeds the benchmark. | ☑ | ☑ |
| **B.6. Emissions reductions** | | | | |
| *B.6.1. Explanation of methodological choices* | | | | |
| B.6.1.1. Is it explained how the procedures provided in the methodology are applied by the proposed project activity? | 1,2, 37 | Yes, the procedure follows the approved methodology. | ☑ | ☑ |
| B.6.1.2. Is every selection of options offered by the methodology correctly justified and is this justification in line with the situation verified on-site? | 1,2, 37 | Yes, the procedure follows the approved methodology and justified in PDD. | ☑ | ☑ |
| B.6.1.3. Determination of project emissions (Comment on any line answered “No”) | | | | |
| B.6.1.4. Component 1: emissions from use of fossil fuel | | | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Project emission checklist: Yes / No<br>Component discussed in the PDD? Yes<br>Formulae correctly applied? Yes<br>The project emissions are zero. | | |
| B.6.1.5. Are the formulae required for the determination of baseline emissions correctly presented, enabling a complete identification of parameters to be used and / or monitored? | | Yes, the formulae required for the determination of baseline emissions is correctly applied. | | |
| B.6.1.6. Are the formulae required for the determination of leakage emissions correctly presented, enabling a complete identification of parameter to be used and / or monitored? | 1,2, 37 | The project activity involves the brand new technology and that is why the leakages are considered as zero. | ☑ | ☑ |
| B.6.1.7. Are the formulae required for the determination of emission reductions correctly presented? | 1,2, 37 | Yes,<br>The formulae required for the determination of emission reductions is correctly applied. | ☑ | ☑ |
| *B.6.2. Data and parameters that are available at validation* | | | | |
| B.6.2.1. Is the list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology? | 1,2, 37 | Yes,<br>The list of parameters presented in chapter B.6.2 considered to be complete with regard to the requirements of the applied methodology. | ☑ | ☑ |
| B.6.2.2. Integrate the required amount of sub-checklists for monitoring parameter and comment on any line answered with “No” | | | | |
| B.6.2.3. Parameter Title:<br>Annual electricity supplied to the grid prior to retrofit | 1,2, 37 | Data Checklist: Yes / No | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| (applicable only for retrofit and modification activities) | | Title in line with methodology? NA<br>Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided? NA<br>Has this value been verified? NA<br>Choice of data correctly justified? NA<br>Measurement method correctly described? NA | | |
| B.6.2.4. Parameter Title:<br><br>Emission factor of the grid (CM)<br>Note: CM should be calculated as per the procedures described in the "Tool to calculate the emission factor for an electricity system" | 1,2, 37 | Data Checklist / Yes / No<br>Title in line with methodology? NA<br>Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided? NA<br>Has this value been verified? NA<br>Choice of data correctly justified? NA<br>Measurement method correctly described? NA | ☑ | ☑ |
| B.6.2.5. Parameter Title:<br>Operating margin (OM) emission factor of the grid<br>Note: OM should be calculated as per the procedures described in the "Tool to calculate the emission factor for an electricity system" | 1,2, 37 | Data Checklist / Yes / No<br>Title in line with methodology? NA<br>Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided? NA<br>Has this value been verified? NA<br>Choice of data correctly justified? NA | ☑ | ☑ |

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<tr><td></td><td></td><td><table><tr><td>Measurement method correctly described?</td><td>NA</td></tr></table></td><td></td><td></td></tr>
<tr><td>B.6.2.6. Parameter Title:<br>fuel consumption of each power source</td><td>1,2, 37</td><td><table><tr><th>Data Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>NA</td></tr><tr><td>Data unit correctly expressed?</td><td>NA</td></tr><tr><td>Appropriate description of parameter?</td><td>NA</td></tr><tr><td>Source clearly referenced?</td><td>NA</td></tr><tr><td>Correct value provided?</td><td>NA</td></tr><tr><td>Has this value been verified?</td><td>NA</td></tr><tr><td>Choice of data correctly justified?</td><td>NA</td></tr><tr><td>Measurement method correctly described?</td><td>NA</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.7. <u>Parameter Title:</u><br>emission coefficient of each fuel</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>NA</td></tr><tr><td>Data unit correctly expressed?</td><td>NA</td></tr><tr><td>Appropriate description of parameter?</td><td>NA</td></tr><tr><td>Source clearly referenced?</td><td>NA</td></tr><tr><td>Correct value provided?</td><td>NA</td></tr><tr><td>Has this value been verified?</td><td>NA</td></tr><tr><td>Choice of data correctly justified?</td><td>NA</td></tr><tr><td>Measurement method correctly described?</td><td>NA</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.8. <u>Parameter Title:</u><br>electricity generation of each power source</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>NA</td></tr></table></td><td>☑</td><td>☑</td></tr>
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| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided? NA<br>Has this value been verified? NA<br>Choice of data correctly justified? NA<br>Measurement method correctly described? NA | | |
| B.6.2.9. Parameter Title:<br>fraction of time with low costs /must run plant at the margin<br>(for simple adjusted OM only) | | Data Checklist: Yes / No / NA<br>Title in line with methodology? N/A<br>Data unit correctly expressed? N/A<br>Appropriate description of parameter? N/A<br>Source clearly referenced? N/A<br>Correct value provided? N/A<br>Has this value been verified? N/A<br>Choice of data correctly justified? N/A<br>Measurement method correctly described? N/A | ☑ | ☑ |
| B.6.2.10. Parameter Title:<br>Electricity imports | | Data Checklist: Yes / No / NA<br>Title in line with methodology? N/A<br>Data unit correctly expressed? N/A<br>Appropriate description of parameter? N/A<br>Source clearly referenced? N/A<br>Correct value provided? N/A<br>Has this value been verified? N/A<br>Choice of data correctly justified? N/A | ☑ | ☑ |

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<tr><td></td><td></td><td><table><tr><td>Measurement method correctly described?</td><td>N/A</td></tr></table></td><td></td><td></td></tr>
<tr><td>B.6.2.11. <u>Parameter Title:</u><br>$CO_2$ emission coefficient of fuels used in connected grids</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No / NA</th></tr><tr><td>Title in line with methodology?</td><td>N/A</td></tr><tr><td>Data unit correctly expressed?</td><td>N/A</td></tr><tr><td>Appropriate description of parameter?</td><td>N/A</td></tr><tr><td>Source clearly referenced?</td><td>N/A</td></tr><tr><td>Correct value provided?</td><td>N/A</td></tr><tr><td>Has this value been verified?</td><td>N/A</td></tr><tr><td>Choice of data correctly justified?</td><td>N/A</td></tr><tr><td>Measurement method correctly described?</td><td>N/A</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.12. $EG_{i,j,y}$ The <u>quantity of electricity</u> supplied to the recipient j by generator, that in the absence of the project activity would have been sourced from $i^{th}$ source (i can be either grid or identified source) during the year y in MWh,</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No / NA</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td colspan="5">If the baseline generation source is an identified existing plant.</td></tr>
</table>

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.6.2.13. $NCV_{HFO}$: Net Calorific value of Heavy Fuel Oil (HFO).</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No / NA</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.14. $NCV_{NG}$: Net Calorific value of Natural Gas (NG).</td><td></td><td><table><tr><th>Data Checklist</th><th>Yes / No / NA</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Choice of data correctly justified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.15. NCVdiesel: Net Calorific value of diesel (DI).</td><td></td><td></td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Data Checklist / Yes / No / NA<br>Title in line with methodology? Yes<br>Data unit correctly expressed? Yes<br>Appropriate description of parameter? Yes<br>Source clearly referenced? Yes<br>Correct value provided? Yes<br>Has this value been verified? Yes<br>Choice of data correctly justified? Yes<br>Measurement method correctly described? Yes | | |
| B.6.2.16. **E $_{HFO, historical}$**: Electricity generated on HFO at captive power plant in historical year | | Data Checklist / Yes / No / NA<br>Title in line with methodology? Yes<br>Data unit correctly expressed? Yes<br>Appropriate description of parameter? Yes<br>Source clearly referenced? Yes<br>Correct value provided? Yes<br>Has this value been verified? Yes<br>Choice of data correctly justified? Yes<br>Measurement method correctly described? Yes | ☑ | ☑ |
| B.6.2.17. **FC $_{HFO, historical}$** : HFO consumption for electricity generation at captive power plant in historical year | | Data Checklist / Yes / No / NA<br>Title in line with methodology? Yes | ☑ | ☑ |

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td><table>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>B.6.2.18. $E_{NG, historical}$: Electricity generated on Natural gas at captive power plant in historical year</td><td></td><td><table>
<tr><th>Data Checklist</th><th>Yes / No / NA</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table></td><td>☑</td><td>☑</td></tr>
</table>


<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.6.2.19. FC <sub>NG, historical:</sub> Natural gas consumption for electricity generation at captive power plant in historical year</td><td></td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No / NA</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.20. FC <sub>diesel, historical:</sub> Diesel consumption at captive power plant in historical year</td><td></td><td>
<table>
<tr><th>Data Checklist</th><th>Yes / No / NA</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
</table>


<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td>B.6.2.21. $COEF_{HFO}$: Emission Coefficient of HFO</td><td></td><td><table>
<tr><th>Data Checklist</th><th>Yes / No / NA</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>Yes</td></tr>
</table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.6.2.22. $COEF_{diesel}$: Emission Coefficient of diesel</td><td></td><td><table>
<tr><th>Data Checklist</th><th>Yes / No / NA</th></tr>
<tr><td>Title in line with methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes</td></tr>
<tr><td>Appropriate description of parameter?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced?</td><td>Yes</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Has this value been verified?</td><td>Yes</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
</table></td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Measurement method correctly described? — Yes | | |
| B.6.2.23. **COEF** $_{NG}$: Emission Coefficient of natural gas | | Data Checklist — Yes / No / NA<br>Title in line with methodology? — Yes<br>Data unit correctly expressed? — Yes<br>Appropriate description of parameter? — Yes<br>Source clearly referenced? — Yes<br>Correct value provided? — Yes<br>Has this value been verified? — Yes<br>Choice of data correctly justified? — Yes<br>Measurement method correctly described? — Yes | ☑ | ☑ |
| Baseline emissions from electricity (BEelec, y) to provide mechanical energy generated by waste energy. | | | | |
| B.6.2.1. In case, in the baseline situation, more than one type of fossil fuel is used in the captive plant, the relative contribution to the total output of each fossil fuel shall be considered and the formulas for baseline emissions shall be adjusted accordingly. | | The Lucky Cement used more than one type of fossil fuel in the captive plant in the baseline scenario. To consider the relative contribution to the total output of each fossil fuel shall be considered and the formulas for baseline emissions shall be adjusted accordingly.<br><br>**Clarification Request No. 11.** | **CAR11** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| Efficiency of the power plant ($\eta_{Plant,j}$) shall be one of the following:<br>(i) Assume a constant efficiency of the captive plant and determine the efficiency, as a conservative approach, for optimal operation conditions i.e. design fuel, optimal load, optimal oxygen content in flue gases, adequate fuel conditioning (temperature, viscosity, moisture, size/mesh etc.), representative or favourable ambient conditions (ambient temperature and humidity); or<br>(ii) Highest of the efficiency values provided by two or more manufacturers for power plants with specifications similar to that which would have been required to supply the recipient with the electricity that it receives from the project activity; or<br>(iii) Assume a captive power generation efficiency of 60% based on the net calorific values as a conservative approach. | | Please clarify in detail how the efficiency of the power plant ($\eta_{Plant,j}$) has been calculated. | | |
| B.6.2.2. HGj,y, Net quantity of heat supplied to the recipient plant j | | Not Applicable | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.6.2.3. What parameters are given to calculated $f_{WCM}$? | | See section B.6.2.1 | ☑ | ☑ |
| B.6.2.4. How has $f_{WCM}$ been calculated? | | The parameter is set to 1 because, according to the methodology, the electricity generation is purely from use of waste energy. | ☑ | ☑ |
| B.6.2.5. What parameters are given to calculated $f_{CAP}$? | | See section B.6.2.1 | ☑ | ☑ |
| B.6.2.6. How has $f_{CAP}$ been calculated? Is that in line with ACM0012? | | **Clarification Request No. 12.**<br>- The calculation of the project load factor of 80% has to be justified and evidenced<br>- Please clarify why Fcap has not been calculated for each clinker production line.<br>- Please clarify the use of the waste heat to meet the internal energy demand of the clinker production lines<br>- Please clarify the total energy demand of the industrial facility<br>- Please clarify the specific energy consumption of the clinker production. | **CAR12** | ☑ |
| *B.6.3. Ex-ante estimation of emission reductions* | | | | |
| B.6.3.1. Is the projection based on the same procedures as used for future monitoring? | | Yes,<br>The same procedures are used for future monitoring which only considers the baseline emissions, no project emissions and no leakage. | ☑ | ☑ |
| B.6.3.2. Are the GHG calculations documented in a complete and transparent manner? | | Yes. | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.6.3.3. If there is more than one component of the project activity, then, are emission reduction calculations provided separately for each component? | | Not Applicable | ☑ | ☑ |
| B.6.3.4. Is the data provided in this section consistent with data as presented in other chapters of the PDD? | | Yes,<br>The data provided is consistent with data presented in other chapters of the PDD. | ☑ | ☑ |
| *B.6.4. Summary of the ex-ante estimation of emission reductions* | | | | |
| B.6.4.1. Will the project result in fewer GHG emissions than the baseline scenario? | | The project definitely will result in fewer GHG emissions than the baseline scenario. | ☑ | ☑ |
| B.6.4.2. Is the form/table required for the indication of projected emission reductions correctly applied? | | Yes,<br>The form is correctly applied according to the PDD template. | ☑ | ☑ |
| B.6.4.3. If the project activity involves more than one component, is separate table included for each of the component. | | Not Applicable | ☑ | ☑ |
| B.6.4.4. Do these values comply with small-scale criteria for every year? | | Yes, since the estimated emission reductions are less than 60,000 $tCO_2$. | | |
| B.6.4.5. Is the projection in line with the envisioned time schedule for the project's implementation and the indicated crediting period? | | Yes. | ☑ | ☑ |
| B.6.4.6. Is the data provided in this section in consistency with data as presented in other chapters of the PDD? | | Yes,<br>The data provided is consistent with data presented in other chapters of the PDD. | ☑ | ☑ |


<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td colspan="5">B.7. Application of the monitoring methodology and description of the monitoring plan</td></tr>
<tr><td colspan="5">B.7.1. Data and parameters monitored</td></tr>
<tr><td>B.7.1.1. Is the list of parameters presented in chapter B.7.1 considered to be complete with regard to the requirements of the applied methodology?</td><td>1,2</td><td>Yes.<br>The list presented is complete.</td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.2. Comment on any line answered with “No”</td><td></td><td></td><td></td><td></td></tr>
<tr><td>B.7.1.3. <u>Parameter Title</u>: Thermal and/or electrical energy produced $Q_{OE,y}$</td><td>1,2</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr><tr><td>Title in line with methodology?</td><td>Yes</td></tr><tr><td>Data unit correctly expressed?</td><td>Yes</td></tr><tr><td>Appropriate description of parameter?</td><td>Yes</td></tr><tr><td>Source clearly referenced?</td><td>Yes</td></tr><tr><td>Correct value provided for estimation?</td><td>Yes</td></tr><tr><td>Has this value been verified?</td><td>Yes</td></tr><tr><td>Measurement method correctly described?</td><td>Yes</td></tr><tr><td>Correct reference to standards?</td><td>Yes</td></tr><tr><td>Indication of accuracy provided?</td><td>Yes</td></tr><tr><td>QA/QC procedures described?</td><td>Yes</td></tr><tr><td>QA/QC procedures appropriate?</td><td>Yes</td></tr></table></td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.4. <u>Parameter Title:</u> In case of thermal energy: the enthalpy of the thermal energy out-</td><td>1,2</td><td><table><tr><th>Monitoring Checklist</th><th>Yes / No</th></tr></table></td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| put stream like hot water/ steam should be monitored. | | Title in line with methodology? NA<br>Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided for estimation? NA<br>Has this value been verified? NA<br>Measurement method correctly described? NA<br>Correct reference to standards? NA<br>Indication of accuracy provided? NA<br>QA/QC procedures described? NA<br>QA/QC procedures appropriate? NA | | |
| B.7.1.5. Parameter Title: Amount of waste gas or the amount of energy contained in the waste heat or waste pressure | 1,2 IRL 22, 23, 24, | Monitoring Checklist / Yes / No<br>Title in line with methodology? NO<br>Data unit correctly expressed? NO<br>Appropriate description of parameter? NO<br>Source clearly referenced? NO<br>Correct value provided for estimation? NO<br>Has this value been verified? NO<br>Measurement method correctly described? NO | **CAR3** | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Correct reference to standards? NO<br>Indication of accuracy provided? NO<br>QA/QC procedures described? NO<br>QA/QC procedures appropriate? NO<br><br>**Corrective Action Request No.3.**<br>Please clarify the quantity and energy content of the waste energy produced for the rated plant capacity/per unit of product produced. | | |
| B.7.1.6. Parameter Title: Metering the amount of mechanical energy generated /supplied | 1,2 | Monitoring Checklist / Yes / No<br>Title in line with methodology? NA<br>Data unit correctly expressed? NA<br>Appropriate description of parameter? NA<br>Source clearly referenced? NA<br>Correct value provided for estimation? NA<br>Has this value been verified? NA<br>Measurement method correctly described? NA<br>Correct reference to standards? NA<br>Indication of accuracy provided? NA<br>QA/QC procedures described? NA<br>QA/QC procedures appropriate? NA | ☑ | ☑ |

<table>
<tr><th>CHECKLIST TOPIC / QUESTION</th><th>Ref.</th><th>COMMENTS</th><th>PPD in GSP</th><th>Final PDD</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>B.7.1.7. <u>Parameter Title:</u> Metering the temperature and pressure of WECM</td><td>1,2</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>NA</td></tr>
<tr><td>Data unit correctly expressed?</td><td>NA</td></tr>
<tr><td>Appropriate description of parameter?</td><td>NA</td></tr>
<tr><td>Source clearly referenced?</td><td>NA</td></tr>
<tr><td>Correct value provided for estimation?</td><td>NA</td></tr>
<tr><td>Has this value been verified?</td><td>NA</td></tr>
<tr><td>Measurement method correctly described?</td><td>NA</td></tr>
<tr><td>Correct reference to standards?</td><td>NA</td></tr>
<tr><td>Indication of accuracy provided?</td><td>NA</td></tr>
<tr><td>QA/QC procedures described?</td><td>NA</td></tr>
<tr><td>QA/QC procedures appropriate?</td><td>NA</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
<tr><td>B.7.1.8. <u>Parameter Title: $f_{cap}$</u></td><td>1,2</td><td>
<table>
<tr><th>Monitoring Checklist</th><th>Yes / No</th></tr>
<tr><td>Title in line with methodology?</td><td>no</td></tr>
<tr><td>Data unit correctly expressed?</td><td>No</td></tr>
<tr><td>Appropriate description of parameter?</td><td>No</td></tr>
<tr><td>Source clearly referenced?</td><td>No</td></tr>
</table>
</td><td>☑</td><td>☑</td></tr>
</table>

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| | | Correct value provided for estimation? — No<br>Has this value been verified? — No<br>Measurement method correctly described? — No<br>Correct reference to standards? — No<br>Indication of accuracy provided? — No<br>QA/QC procedures described? — No<br>QA/QC procedures appropriate? — No<br>See section B.7.1.1 Fcap calculated based on Method 3, Case 1 of ACM00012 version 3.1 is applied based on the pre-calculated $Q_{OE,BL}$ and the monitored $Q_{OE,y}$. | | |
| *B.7.2. Description of the monitoring plan* | | | | |
| B.7.2.1. Is the operational and management structure clearly described and in compliance with the envisioned situation? | 1,2 | Yes,<br>Operational and management structure clearly described and it is in compliance with the envisioned situation. | ☑ | ☑ |
| B.7.2.2. Are responsibilities and institutional arrangements for data collection and archiving clearly provided? | 1,2 | Yes,<br>Shift Operator and Shift at Lucky Cement Karachi Plant are responsible. | ☑ | ☑ |
| B.7.2.3. Does the monitoring plan provide current good monitoring practice? | 1,2 | **Corrective Action Request No.4.**<br>In table B.7.2.2 it has to be confirmed why the chosen frequency is not appropriate. | **CAR4** | ☑ |
| B.7.2.4. Have QA/QC procedures of the methodology been covered? | 1,2 | Yes,<br>QA/QC procedures of the methodology been covered | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| B.7.2.5. If applicable: Does annex 4 provide useful information enabling a better understanding of the envisioned monitoring provisions? | 1,2 | Not Applicable | ☑ | ☑ |
| **B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)** | | | | |
| B.8.1.1. Is there any indication of a date when the baseline was determined? | 1,2 | Yes,<br>The baseline was determined on 02/03/2009. | ☑ | ☑ |
| B.8.1.2. Is this consistent with the time line of the PDD history? | 1,2 | Yes | ☑ | ☑ |
| B.8.1.3. Is the information on the person(s) / entity(ies) responsible for the application of the baseline and monitoring methodology provided consistent with the actual situation? | 1,2 | Yes. | ☑ | ☑ |
| B.8.1.4. Is information provided whether this person / entity is also considered a project participant? | 1,2 | Yes,<br>First Climate (Switzerland) AG and Carbon Services (Private) Limited are project participants. | ☑ | ☑ |
| ***C. Duration of the project activity / crediting period*** | | | | |
| **C.1. Duration of the project activity** | | | | |
| C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable? | 1 | Yes,<br>Starting date of the project activity is May 7, 2008 which is the date of signing contract between Lucky Cement Limited and Sinoma Energy Conservation Ltd | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| **C.2. Choice of the crediting period and related information** | | | | |
| C.2.1. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max 7 years with potential for 2 renewals or fixed crediting period of max. 10 years)? | 1 | The project has the fixed crediting period of 10 years. | ☑ | ☑ |
| ***D. Environmental impacts*** | | | | |
| **D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts** | | | | |
| D.1.1. Has the analysis of the environmental impacts of the project activity been sufficiently described? | 1,18, 45, | According to host country regulations, the project activity required an Initial Environmental examination (IEE).<br>**Clarification Request No. 13.**<br>Please provide the evidences related to Initial Environmental examination (IEE) to the DOE. | **CR 13** | ☑ |
| D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, has an EIA been approved? | 1,18, 45, | See CR 13 | See CR 13 | ☑ |
| D.1.3. Will the project create any adverse environmental effects? | 1,18, 45, | See CR 13 | See CR 13 | ☑ |
| D.1.4. Were transboundary environmental impacts identified in the analysis? | 1,18, 45, | See CR 13 | See CR 13 | |
| **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** | | | | |
| D.2.1. Have the identified environmental impacts been addressed in the project design | 1,18, | See CR 13 | See | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| sufficiently? | 45, | | CR 13 | |
| D.2.2. Does the project comply with environmental legislation in the host country? | 1,18, 45, | See CR 13 | See CR 13 | ☑ |
| ***E. Stakeholders' comments*** | | | | |
| **E.1.Brief description how comments by local stakeholders have been invited and compiled** | | | | |
| E.1.1. Have relevant stakeholders been consulted? | 1,15, 16,17 | Yes, Local stakeholder consultation meeting was held on April 8th, 2009 at Lucky Cement Limited Karachi Plant. | ☑ | ☑ |
| E.1.2. Have appropriate media been used to invite comments by local stakeholders? | 1,15, 16,17 | It is mentioned in section E.1 of the PDD that stakeholders were informed through specific advertising published by the project owner in the local language. The National language of Pakistan is Urdu while the advertisement shown in the Annex 6 is in English.<br>**Clarification Request No. 14.**<br>It is not clear from the section E.1 of the PDD that which media was used for invitation of local stakeholders. Please mention the media and its access to local area people. | **CR14** | ☑ |
| E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws? | 1,15, 16,17 | **Clarification Request No. 15.**<br>It is not mentioned in section E.1 of PDD that stakeholder consultation is required by law in Pakistan. Please describe. | **CR15** | ☑ |
| E.1.4. Is the undertaken stakeholder process that was carried out described in a complete and transparent manner? | 1,15, 16,17 | See CR15 | See CR 15 | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| **E.2. Summary of the comments received** | | | | |
| E.2.1. Is a summary of the received stake-holder comments provided? | 1,15, 16,17 | Yes,<br>Summary of the received stakeholder comment have been provided in section E.2 of PDD and has been delivered to DOE. | ☑ | ☑ |
| **E.3. Report on how due account was taken of any comments received** | | | | |
| E.3.1. Has due account been taken of any stakeholder comments received? | 1,15, 16,17 | Summary of the received stakeholder comments shows that no negative comments received. | ☑ | ☑ |
| ***F. Annexes 1 - 4*** | | | | |
| **F.1. Annex 1: Contact Information** | | | | |
| F.1.1. Is the information provided consistent with the one given under section A.3? | 1 | Yes | ☑ | ☑ |
| F.1.2. Is the information on all private participants and directly involved Parties presented? | 1 | Yes | ☑ | ☑ |
| **F.2. Annex 2: Information regarding public funding** | | | | |
| F.2.1. Is the information provided on the inclusion of public funding (if any) in consistency with the actual situation presented by the project participants? | 1,6 | Yes | ☑ | ☑ |
| F.2.2. If necessary: Is an affirmation available that any such funding from Annex-I-countries does not result in a diversion of ODA? | 1,6 | Yes | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| **F.3. Annex 3: Baseline information** | | | | |
| F.3.1. If additional background information on baseline data is provided: Is this information consistent with data presented by other sections of the PDD? | 1,2 | **Corrective Action Request No.5.** The choice of the emission coefficients for HFO needs to clarify as for IPCC 2006 default values has been taken into account a conservative approach. Why not local or country-specific values of emission factors of fuels have been considered. | **CAR5** | ☑ |
| F.3.2. If additional background information on baseline data is provided: Is this information consistent with data presented by other sections of the PDD? | 1,2 | See CAR5 | See CAR5 | ☑ |
| F.3.3. Is the data provided verifiable? Has sufficient evidence been provided to the validation team? | 1,2 | See CAR5 | See CAR5 | ☑ |
| F.3.4. Does the additional information substantiate / support statements given in other sections of the PDD? | 1,2 | See CAR5 | See CAR5 | ☑ |
| **F.4. Annex 4: Monitoring information** | | | | |
| F.4.1. If additional background information on monitoring is provided: Is this information consistent with data presented in other sections of the PDD? | 1,2 | Monitoring information has been given in Section B.7.2 | ☑ | ☑ |
| F.4.2. Is the information provided verifiable? Has sufficient evidence been provided to the validation team? | 1,2 | Monitoring information has been given in Section B.7.2 | ☑ | ☑ |
| F.4.3. Do the additional information and / | 1,2 | Monitoring information has been given in Section B.7.2 | ☑ | ☑ |

| CHECKLIST TOPIC / QUESTION | Ref. | COMMENTS | PPD in GSP | Final PDD |
|---|---|---|---|---|
| or documented procedures substantiate / support statements given in other sections of the PDD? | | | | |

## Table 2 Resolution of Corrective Action and Clarification Requests

| Clarifications and corrective action requests by validation team | Ref. to table 1 | Summary of project owner response | Validation team conclusion |
|---|---|---|---|
| **Corrective Action Request No.1.**<br>As per requirement of EB34, annex 9, PP shall explain the abbreviations used in PDD. . | A.2.1. | All abbreviations now have been explained in the PDD. | All used abbreviation in the project has been explained in PDD.<br>The issue is settled.<br>☑ |
| **Corrective Action Request No.2.**<br>For all default figures provided in the ER excel file calculation sheet appropriate sources have to be indicated in order to trace these figures. | A.4.4.2. | For all default figures provided in the ER excel file calculation sheet appropriate sources have already been indicated in order to trace these figures. | The evidences of all default figures provided in PDD have been delivered to DOE.<br>The issue is settled.<br>☑ |
| Parameter Title: Amount of waste gas or the amount of energy contained in the waste heat or waste pressure:<br><br>**Corrective Action Request No.3.**<br>Please clarify the quantity and energy content of the waste energy produced for the rated plant capacity/per unit of product produced. | B.7.1.5. | The method selected for calculation of $f_{cap}$ (Case 1 of Method 3) is based on Final Output Energy (electrical MWh) of the project plant; therefore, the determination of intermediate energy (waste heat per unit of product) is not relevant to the selected approach for calculation of $f_{cap}$. No historical measurements or data is available for waste energy produced by the kilns. | The applied approach to calculate the Fcap is (Case 1 of Method 3) which does not require to determination the intermediate energy (waste heat per unit of product). The TÜV SÜD confirms that the applied approach used for calculation of Fcap is in line with ACM0012 version 4.<br>The issue is settled.<br>☑ |
| **Corrective Action Request No.4.**<br>In table B.7.2.2 it has to be confirmed why | B.7.2.3. | Since all the data of Lucky Cement Limited and other companies in Pakistan are compiled and audited at | The description provided in PDD is fine because all the data of |

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| the chosen frequency is not appropriate. | IRL 58 | the time of publishing annual progress report of the company so the chosen annual auditing frequency is appropriate. | Lucky Cement Limited in Pakistan is compiled and audited annually at the time of publishing annual progress report of the company. TÜV SÜD confirms that chosen annual auditing frequency is appropriate.<br>The issue is settled.<br>☑ |
| **Corrective Action Request No.5.**<br>The choice of the emission coefficients for HFO needs to clarify as for IPCC 2006 default values has been taken into account a conservative approach. Why not local or country-specific values of emission factors of fuels have been considered. | F.3.1. | The type of HFO has been specified in Annex 3 of the PDD. According to table 1.1 of Volume 2, Chapter 1 of IPCC 2006, types of HFO being used is Residual Fuel Oil. Local or country-specific values of emission factors of fuels are not available. Therefore, IPCC default values are used for all the fuels including HFO. According to applied methodology AMS-III.Q. / Version 04 it is permissible to use IPCC default values of emission factors for fuels. | According to applied methodology AMS-III.Q. / Version 04 it is permissible to use IPCC default values of emission factors for fuels. TÜV SÜD confirms that as per applied methodology in project activity; it is allowed to use IPCC default values of emission factors for fuels.<br>The issue is settled.<br>☑ |
| **Clarification Request No. 1.**<br>It is mentioned in section B.5 of the PDD that the commissioning date of the project is expected February 2010 while it is 2011 now. Please clarify that either commissioning of Lucky Karachi Waste Heat Recovery Project has been done or not. | A.2.2. | **PP Response:**<br>It has already been stated in §A.2 and Table B.5.1 of the PDD that the project was commissioned in February 2010.<br><br>**TÜV SÜD Response:**<br>It is mentioned in section B.5 of the PDD that commissioning of the project is expected in February | The PDD has been revised. The statement regarding commissioning date of project activity has been corrected.<br>The issue is settled.<br>☑ |

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| | | 2010. Please revise it<br><br>**PP Response:**<br>The statement has been corrected in PDD version 07. | |
| **Clarification Request No. 1.**<br>– The LoA of the parties involved have to be provided to the DOE.<br>– Please provide the Modalities of Communication (MoC). | A.3.2.<br>IRL 42<br>IRL 43<br>IRL65 | – Host Country Approval of the project activity for the Project Participants (Lucky Cement Ltd. and Carbon Services Private Ltd.) from the DNA (Designated National Authority) for CDM in Pakistan has been provided to DOE.<br>Swiss LoA of First Climate (Switzerland) AG is attached with this response to validation protocol.<br>– Modalities of Communication form is in process and shall be provided to DOE later. | – Both LoA have been provided to DOE<br>– Modalities of Communication (MoC) has also been provided to DOE (IRL 65).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 2.**<br>Proofs of operation license of cement plant and construction license of the project activity have to be provided to the DOE, if possible, prior to the on-site Audit. | A.4.1.2.<br>IRL 3a<br>IRL 18 | No operation license of cement plant is required by Government of Pakistan. The only construction license for the project activity is Environmental Approval from the Environmental Protection Agency of Provincial Government. The Environmental Approval has already been provided to DOE. | TÜV SÜD confirms based on its local and sectoral expertise that the project participant needs environmental approvals from<br>Environmental Protection Agency of Provincial Government (Punjab, Pakistan) which has been delivered to DOE (IRL 18).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 3.**<br>a) The contracts with the supplier of HRSGs and steam turbine including | A.4.3.1.<br>IRL 19 | a) The contract with the supplier (Sinoma Energy Conservation Ltd.) of HRSGs and steam turbine including technical data has been provided to | a) The evidence of contract for HRSGs and steam turbine including technical data be- |

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| technical data or at least the offer have to be provided to the DOE.<br>b) The PDD figure for electricity supply of the existing captive power plant needs to be evidenced. | IRL 20 | DOE.<br>b) The proofs for electricity supply from the existing captive power plant "Monthly Statement of Power Generation" have been provided to DOE. | tween Lucky Cement Limited and Sinoma Energy Conservation Ltd has been provided to DOE (IRL 05).<br>b) The evidence of monthly electricity supply from the existing captive power plant has been delivered to DOE (IRL 19, 20).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 4.**<br>Information about initial training and maintenance for the implementation and operation of the project activity has to be provided to the DOE. | A.4.3.8.<br>IRL 05 | Information about initial training and maintenance for the implementation and operation of the project is on page 148 of attached pdf file of contract between Lucky Cement Limited and Sinoma Energy Conservation Ltd. It is shown in the Annex 3; Project Time Schedule Gantt Chart that training before pre-commissioning of the project is responsibility of the supplier. Moreover, training records have been provided to DOE. | Information regarding initial training and maintenance for the implementation and operation of the project is part of equipment purchase contract which has been delivered to DOE (IRL 05).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 5.**<br>A written statement that public funding is excluded for this project needs to be submitted to the DOE. | A.4.5.1.<br>IRL 06 | A written statement from the Director Finance of Lucky Cement Limited that no public funding is involved in this project has been provided to DOE. | The Evidence regarding the no public funding involvement in the project activity has been delivered to DOE (IRL 06).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 6.**<br>Please provide the Energy Bills and Financial Statements audited by competent authorities. | B.2.3.<br>IRL 58 | Annual financial report for year 2006/07 of Lucky Cement Limited, audited by a competent third party, has been provided to DOE which demonstrates that all the energy required for the process has been pro- | TÜV SÜD confirms after cross-checking the annual financial report of Lucky Cement Limited that all required energy at Lucky Ce- |

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| | | cured commercially. | ment Karachi Plant is produced by Captive power plant and no waste heat recovery system was installed at the plant site (IRL 58).<br>The issue is settled.<br>☑ |
| **Clarification Request No. 7.**<br>Please clarify the following questions.<br>- Who decides the KIBOR<br>- Please clarify who decides the basis points.<br>- Why 200 basis points are considered<br>- At what time project participants considered 200 basis points and what is base of consideration of 200 basis points.<br>- Please provide the unprotected and correctly formulae applied IRR calculation spreadsheet to DOE. | B.5.17.<br>IRL 48<br>IRL 54<br>IRL 55 | – State Bank of Pakistan decides the daily KIBOR.<br>– The lending bank decides the spread to be added to the KIBOR. The average spread over the KIBOR or the risk component used in the calculation of benchmark is linked to specific risks or characteristics of the project activity (which a lending bank will always take into account while extending a loan offer to a borrower).<br>– The average spread (200 basis points) used in the benchmark calculation is based on the loan offer that the PP got from a local bank (a copy of the loan offer letter has already been provided to the DOE).<br>– 200 basis points were considered at the time of feasibility preparation for the project activity. The basis for consideration of 200 points is already explained in parts b & c.<br>– The unprotected IRR calculation file has been provided to the DOE. | The KIBOR (Karachi Interbank Offered Rate) is determined by the third party (State Bank of Pakistan) which is the lending bank which ultimately decides about the average spread to be charged above KIBOR. The average spread (200 basis points) used in the benchmark calculation is based on the loan offer that the PP got from a local bank As bank offer for basis point is also from the third party so it is clear that the approached used for the calculation of benchmark (KIBOR + basis point) is appropriate.<br>The unprotected IRR calculation IRR file has been provided.<br>See IRL 48, 54 and 55 of annex 2.<br>The issue is settled.<br>☑ |
| **Clarification Request No. 8.**<br>The project IRR value presented in FSR is 8.81% while IRR in GSP PDD is 7.39% and | B.5.17. | **PP Response:**<br>The difference in the IRR value was due to difference in the input values of investment analysis. The | The difference in the IRR of the proposed project has been explained and DOE has checked |

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| same value is in the repeated GSP. Please clarify why the project IRR presented in PDD is different from IRR value presented in FSR. | | project IRR value has in the PDD version 06 has been made consistent with the FSR. The IRR calculation excel sheet is attached with this response to validation protocol.<br>**TÜV SÜD response:**<br>Please explain in detail why the different input values was applied in previous IRR spreadsheet while according to EB 61 Annex 13 clearly say that "Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant"<br><br>**PP Response:**<br>The initial investment analysis as provided in the GSP PDD was based on the information provided in financial questionnaire which was sent to the PP by the CDM Project Developer. As FSR of the proposed CDM project activity was not shared with the PDD developer at the time of PDD development that is why a difference in values of input parameters occurred. This has now been rectified and input values used in all investment analyses are now consistent and are in compliance with the guidance provided in EB61 Annex13. | that all input parameters in FSR were valid and applicable at the time of investment decision.<br><br>The issue is settled.<br>☑ |
| **<u>Clarification Request No. 9.</u>**<br>Please provide all the relevant evidence related to benchmark, Investment Cost, operational & Maintenance cost. | B.5.17.<br>IRL 5<br>IRL 21<br>IRL 44<br>IRL 48<br>IRL49 | Evidences related to benchmark (source of KIBOR & bank loan offer letter), investment cost (contract with the equipment supplier and bank loan offer letter), and operation & maintenance cost (letter from consultants) have been provided to DOE. | Evidences related to benchmark, investment cost and bank loan offer letter and operation & maintenance cost has been provided to DOE (IRL 5, 21,44, 48, 49,51, 54, 55, 56)<br>The issue is settled. |

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| | IRL 51<br>IRL 54<br>IRL55<br>IRL56 | | ☑ |
| **Clarification Request No. 10.**<br>Please clarify in detail how the efficiency of the power plant ($\eta_{Plant, j)}$) has been calculated. | B.6.2.1. | **PP response:**<br>Calculation of efficiency of the power plant has been explained in Emission Reduction Calculation Excel Sheet and the relevant supporting documents have been provided to DOE.<br><br>**TÜV SÜD response:**<br>It is not clear that how the plant efficiency has been calculated in the excel file there is a need to amend the PDD and give more information how the calculation has been done according to applied methodology AMS.III. Q version 4 page 6.<br><br>**PP response:**<br>The efficiency of the captive plant has been determined according to option (i) mentioned at page 6 of AMS-III.Q. / Version 04. As a conservative approach, the highest optimal operation (designed) efficiency among the four types of gensets is selected as constant efficiency of the existing captive plant. The determination of efficiency has been explained in §B.6.1 of PDD version 07. | The captive power plant of the project has for four types of gensets.<br>1. CatMak 16CM32C DF Gensets<br>2. CatMak 16CM34 Gensets<br>3. Rolls-Royce Gensets<br>4. Wartsila 20V34SG Genset<br>The efficiency of the captive plant has been determined according to option (i) mentioned at page 6 of AMS-III.Q. / Version 04. The highest efficiency among all the gensets of the captive power plant is of Rolls-Royce gensets and by a conservative approach, a constant efficiency of 45.79% for the captive power plant is selected as per option (i) of AMS.III.Q for efficiency of power plant.<br>The issue is settled.<br>☑ |
| **Clarification Request No. 11.**<br>- Please clarify which method is used to calculate the Fcap of the plant | B.6.2.6. | – Case 1 of Method 3 is used to calculate $f_{cap}$ of the plant. It is mentioned in §B.6.1 of the PDD. | – For calculation of Fcap, the method 3 case 1 has been used. |

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| - Please clarify why Fcap has not been calculated for each clinker production line.<br>- Please clarify the use of the waste heat to meet the internal energy demand of the clinker production lines<br>- Please clarify the total energy demand of the industrial facility<br>- Please clarify the specific energy consumption of the clinker production. | | – All three clinker production lines have same capacity of 3300 TPD each. The method selected for calculation of $f_{cap}$ (Case 1 of Method 3) doesn't require calculation of $f_{cap}$ for each clinker production line.<br>– Lucky Cement Limited doesn't have any internal demand of waste heat. The waste heat generated at the cement plant in the clinker production process is vented to the atmosphere with only a small portion recycled to heat the incoming raw materials.<br>– Fuel consumption at kilns and electricity demand corresponding to clinker production are mentioned in Annex 3 of the PDD. Relevant proofs of the data have been provided to DOE.<br>– Historical specific fuel energy consumption for the clinker production is 3.698 GJ per ton of clinker. It has been mentioned in Annex 3 of the PDD version 06 and calculation is provided in updated Emission Reduction Calculation Excel Sheet. | – As all clinker production lines have same capacity of 3300 TPD, it is not required by methodology to calculate the Fcap for each clinker production lines.<br>– The information regarding the internal waste heat demand has been described in PDD.<br>– The information regarding Fuel consumption at kilns and electricity demand corresponding to clinker production has been provided in PDD and found correct.<br>– The provided figure of historical specific fuel energy consumption for the clinker production is 3.698 GJ per ton of clinker which is in a reasonable range.<br>The issue is settled.<br>☑ |
| **Clarification Request No. 12.**<br>Please provide the evidences related to Initial Environmental examination (IEE) to the DOE. | D.1.1.<br>IRL 45 | A copy of Initial Environmental Examination (IEE) Report has been provided to DOE. | The issue is settled.<br>☑ |

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| **Clarification Request No. 13.**<br>It is not clear from the section E.1 of the PDD that which media was used for invitation of local stakeholders. Please mention the media and its access to local area people. | E.1.2.<br>IRL 15 | The type of media used for the invitation of local stakeholders was newspaper, public notice boards within and surrounding the cement plant. It is already mentioned in §E.1. of the PDD. | The issue is settled.<br>☑ |
| **Clarification Request No. 14.**<br>It is not mentioned in section E.1 of PDD that stakeholder consultation is required by law in Pakistan. Please describe. | E.1.3.<br>IRL 42 | The local stakeholders' consultation meeting is a requirement by Designated National Authority (DNA) of CDM Pakistan, as well as it is required for the CDM PDD. The DNA issues Host Country Approval to the project participants after the stakeholders' consultation meeting is conducted and all the evidences are provided to it.<br>This information is already provided in §E.1 of the PDD. | Based on its local and sectoral expertise, TÜV SÜD confirms that local stakeholder consultation meeting is required by DNA Pakistan to issue Letter of Approval for project (IRL 42).<br>The issue is settled.<br>☑ |
| **Clarifications and corrective action requests by validation team after TR** | **Ref. to table 1** | **Summary of project owner response** | **Validation team conclusion** |
| **Correct Action request :1**<br>The title of the project mentioned in PDD is not consistent letter of approval from Pakistan. | | Updated Host Country Approval Letter (LoA) for the project activity, containing correct details for the project title, has been provided to DOE. | The updated LoA from Pakistan has been submitted to DOE and it is consistent with PDD.<br>The issue is settled.<br>☑ |

## Table 3 Unresolved Corrective Action and Clarification Requests (in case of denials)

| Clarifications and / or corrective action requests by validation team | Id. of CAR/CR | Explanation of Conclusion for Denial |
|---|---|---|
| - | - | - |

# Annex 2: Information Reference List

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| 1 | 29/07/2009<br>18/05/2011 | – PDD "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant", Version 01<br>– PDD "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant", Version 05 | First Climate Group<br>First Climate Group | PDD in GSP<br>PDD in Re--GSP |
| 2 | 15/04/2011 | Methodology for Waste energy recovery (gas/heat/pressure) projects – AMS.III. Q Version 4 | UNFCCC | - |
| 3 | 29/09/2009 | Participant list of on-site interviews | TÜV SÜD | - |
| 3a | | On-site interviews conducted on September 29, 2009 at the project site in Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant, Pakistan by auditing team of TÜV SÜD<br><br>**Validation team on-site:**<br><br>Khalid Mahmood — TÜV SÜD, GHG Assessment Team Leader & Host Country Expert<br>Paula Auer — TÜV SÜD, GHG Auditor<br>Robert Mitterwallner — TÜV SÜD, GHG Auditor<br>Georgios Agrafiotis — TÜV SÜD, GHG Auditor<br><br>**Interviewed persons at Lucky Cement Limited, Pakistan:**<br><br>Qazi Sabir — Sr. Project Manager (Carbon Services | TÜV SÜD | - |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| | | Pakistan)<br>Feroz Baig — Project Engineer (Carbon Services Pakistan)<br>Mohammad Qutubuddin Baig — Technical Director (Lucky Cement Limited)<br>Intisar Haqqi — Director Power Generation (Lucky Cement Limited)<br>Hassan Mazhar — Deputy General Manager, Power generation (Lucky Cement Limited)<br>Muhammad Shahid Patel — Deputy Manager , costing and budgeting (Lucky Cement Limited)<br>Muhammad Faisal Panawala — Senior Account officer (Lucky Cement Limited) | | |
| 4 | 29/09/2009 | Lucky Cement Limited homepage http://www.lucky-cement.com/ | | |
| 5 | 13/05/2008 | Letter of credit for purchasing the major equipment of the project activity from SINOMA ENERGY CONSERVATION LTD. | Lucky Cement Limited | |
| 6 | 29/09/2009 | Letter of No Public Funding Involvement issued by Lucky Cement Limited | Lucky Cement Limited | - |
| 7 | 03/02/2007 | E-mail introduction of Carbon Services (Private) Limited to Lucky Cement Limited about the CDM Project benefits | Lucky Cement Limited | CDM Awareness evidence |
| 8 | 05/07/2007 | Offer letter from Bank Alfalah Limited of Pakistan for up to PKR 1,300 Million Term Finance Facility to Lucky cement limited | Bank Alfalah Limited | Benchmark |
| 9 | 2005 | ***The State bank of Pakistan (Financial Year 2004) - Quarterly Report***<br>*Initially, introduced in September 2001, KIBOR was only used as a reference rate for interbank money market (for clean lending). However, to promote the culture of floating rate lending and make the mechanism transparent both for lender as well as borrower, KIBOR was also introduced* | State bank of Pakistan | Benchmark |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
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| | | *as a reference rate for corporate lending in February 2004.* | | |
| 10 | 04/11/2008 | Financial information was requested by Omar Malik (Carbon Services Private Limited) and information provided by Citi Bank Pakistan about the benchmark, Karachi Inter Bank offer rates (KIBOR). | Citi Bank, Pakistan | Benchmark |
| 11 | NA | Historical data of Karachi Captive power plant (fuel consumption) from October 2006 till April 2008(power generation, fuel consumption and fuel cost data). | Lucky Cement Limited | |
| 12 | NA | Technical specification of turbines from Sinoma (Technological supplier) | Lucky Cement Limited | |
| 13 | 29/07/2009<br>13/07/2010 | • Investment Analysis Sheet (IRR Calculation spreadsheet) version 1<br>• Investment Analysis Sheet (IRR Calculation spreadsheet) version 2 | First climate AG and Carbon services | - |
| 14 | 07/05/2008 | Contract between Lucky Cement Limited and Sinoma Energy Conservation Limited | Lucky Cement Limited / Sinoma Energy Conservation Limited | Start date of Project Activity |
| 15 | 02/04/2009 | Local Stakeholder meeting Consultation invitation in Daily Times Karachi Newspaper, Daily Express Karachi, | Lucky Cement Limited | - |
| 16 | 02/04/2009 | Local Stakeholder meeting Consultation invitation in Daily Jasarat, Daily Newspaper, Daily Jasarat Karachi, http://www. Jasarat.com | Lucky Cement Limited | - |
| 17 | 09/04/2009 | List of Participants of Public stakeholder process, issued and submitted by Lucky Cement Ltd | Lucky Cement Limited | - |
| 18 | 18/06/2009 | Environmental Approval decision on Initial Environment Examination (IEE), issued by Environment Protection Department, Government of the Sindh, Karachi | EPA Sindh, Pakistan | - |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| 19 | 29/09/2009 | Captive Power plant and fuel consumption baseline data of Lucky Karachi ( October 2006 till April 2008) | Lucky Cement Limited | |
| 20 | 29/09/2009 | Clinker Production and Fuel Consumption Data October 2006 - April 2008<br>Clinker Production and Fuel Consumption Data October 2006 April 2008 2009 | Lucky Cement Limited | |
| 21 | 02/05/2007 | Waste heat recovery system information & Operational and maintenance cost information provided by PITCO (Consultancy firm ) | PITCO | |
| 22 | 29/09/2009 | Quality coal analysis Report from Quality Control Department of Lucky Cement Limited | Lucky Cement Limited | |
| 23 | 25/06/2008 | Analytical report of the Natural Gas Test by PERAC Research & Development Foundation | Lucky Cement Limited | - |
| 24 | 25/07/2008 | Analytical report of Heavy Speed Diesel (HSD) Sample Test by PERAC Research & Development Foundation | Lucky Cement Limited | - |
| 25 | NA | Single line diagram of Lucky Cement Plant | Lucky Cement Limited | |
| 26 | NA | Technical specification of Boilers and Turbines | | |
| 27 | 23/05/2004 | Contract for setting up Cement Plant at Karachi having designed production capacity of 3300 tons of clinker per day | Yunus Brothers-Pakistan & HEFEI Cement Research and Design Institute (HCRDI)" | |
| 28 | 17/8/2009 | Detail of Engines at Karachi Plant with specifications and capacities | Lucky Cement Limited | |
| 29 | 29/09/2009 | Cement based power consumption KWHR/TON data from October 2006- | Lucky Cement Limited | |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| | | September- 2008 at Lucky cement Limited | | |
| 30 | 29/09/2009 | Daily Operation Log Book of Gas consumption, Captive power plant Voltage, Exhaust Gas Temperature | Lucky Cement Limited | |
| 31 | 29/09/2009 | Pakistan electric power company (private) limited (PEPCO) supply & demand position: http://www.ppib.gov.pk/SupplyDemand.htm | Private Power and Infrastructure Board (PPIB) | - |
| 32 | 29/09/2009 | Technical specification of Caterpillar and Rolls-Royce Engines, Gas Turbine specification, Thermodynamic System ad parameter determination | SINOMA | - |
| 33 | 29/09/2009 | International Currency converter , Exchange rate US $ --> PKR http://www.iccfx.com/history.php | International Currency converter | |
| 34 | 2007 | Annual Energy Outlook 2006 (AEO 2006) prepared by the Energy Information Administration http://www.eia.doe.gov/ | U.S Energy Information Administration | |
| 35 | 01/07/2009 | Pakistani Cement Industry (Operational Units Data) issued by All Pakistan Cement Manufactures Association (APCMA) | All Pakistan Cement Manufactures Association | |
| 36 | 29/09/2009 | UDI World Electric Power Plants Data Base (WEPP). Global inventory of electric power generating units. Platts, McGraw Hill Group.<br>• Design information for more than 145,000 units at more than 60,000 plant sites in 225+ countries;<br>• Coverage of installed and projected steam and gas turbines, combined-cycle plants, IC engines, hydro units, wind turbines, and renewable energy units;<br>• Details on plant operators, geographic location, capacity (MW), age, technology, fuels, and boiler, turbine, and generator manufacturers, emissions control equipment, and more. | Platts (www.platts.com) | |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| 37 | 20/01/2009 | Emission Reduction (ER) Calculation sheet | Lucky Cement Limited | - |
| 38 | 02/08/2007 | Draft proposal of the CDM Service Agreement between Lucky Cement Limited and Factor Consulting + Management AG (now First Climate, FC) | First Climate | Continued action evidence |
| 39 | 02/08/2007 | CDM Service Agreement Contract between Lucky Cement Limited & First Climate) | First Climate | Continued action evidence |
| 40 | 22/10/2007 | Extract of Minutes of the Board Directors meeting of Lucky Cement Limited<br>**The document includes the following statement:**<br>*"The board extensively discussed the feasibility studies which were based on the preliminary quotations provided by the technology supplier. The CEO further briefed the board that it is evident from the feasibility studies that without the inclusion of carbon credits, none of the aforementioned projects is a financially viable investment opportunity. The carbon credit income from both (Lucky Karachi & Lucky Pezu) would approximately be Rs.100-110 Million annually up till 2012, which is critical to their financial approval.*<br>*The projects (Lucky Karachi & Lucky Pezu) were approved by the Board of directors and resolution was passed.* | Lucky Cement Limited | |
| 41 | 10/07/2009 | Validation contract between Lucky Cement Limited and TÜV SÜD Carbon Management Service | Lucky Cement Limited / TÜV SÜD | Continued action evidence |
| 42 | 14/10/2009<br>26/08/2011 | LoA Pakistan for Lucky Cement Limited<br>Updated LoA Pakistan for Lucky Cement Limited | DNA Pakistan<br>National Energy Conservation Center , Government of Pakistan | - |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| | | | | |
| 43 | 25/11/2010 | LoA Switzerland | DNA Switzerland | - |
| 44 | 31/12/2007 | Actual loan document: Term finance facility for PKR 3000 Million offered by National Bank of Pakistan to Lucky Cement Limited | National Bank of Pakistan | |
| 45 | 01/05/2009 | Initial Environmental Examination Report | Environmental Consultancy & Services | |
| 46 | 01/10/2007 | Feasibility Study for Lucky Cement WHR Karachi Project | Lucky Cement Limited | |
| 47 | 07-02-2010<br>03-03-2010<br>13/02/23010<br>28/02/2010<br>03/03/2010<br>03/03/2010<br>03/03/2010 | Lucky WHR project Training certificate ( Boiler Operation and maintenance)<br>Lucky WHR project Training attendance sheet<br>Lucky WHR project Training certificate ( Chemical dosing of Boiler and water treatment plant)<br>Lucky WHR project Training certificate ( Turbine operation and maintenance)<br>Lucky WHR project Training certificate ( Electric, Instrument, automation for boiler, turbine, generator Pion and maintenance) part 1<br>Lucky WHR project Training certificate ( Electric, Instrument, automation for boiler, turbine, generator Operation and maintenance) part 2<br>Lucky WHR project Training schedule & list of participant | Sinoma Energy Conservation Limited | |
| 48 | 24-05-2007 | News articles about the KIBOR and Basis point in Pakistan | Dawn News | |
| 49 | 01/05/2007 | Extract from IGI Pakistan Cement Sector Review - May 2007 Page 41 | IGI Securities | WACC of Lucky Cement Limited in 2007 |
| 50 | 13/10/2009 | Email confirmation from DNA Pakistan that Waste Heat Recovery based | DNA Pakistan | Common Practice |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| | | power generation is not a common practice in cement Industry of Pakistan | | Analysis |
| 51 | 2007 | Tax rate document "Rates and Taxes for Companies" | Government of Pakistan | Tax Rate |
| 52 | 22/03/2010 | Natural Gas curtailment, gas shortage articles and press releases in Pakistan | | |
| | | 39a Energy Shortage forcing textile units to shift abroad | | |
| | | 39b Winter gas shortage hurts consumers, business | | |
| | | 39c Five work days/week for industrial units, CNG stations announced | | |
| | | 39d Curtailment of gas supply to the fertilizer plants, Chemical Plants in 2008 | | |
| 53 | 03/02/2009 | Start of Civil work | Lucky Cement Limited | |
| 54 | 2007 | KIBOR rate of State Bank of Pakistan: http://sbp.org.pk/ecodata/kibor/2007/ | State bank of Pakistan | benchmark |
| 55 | 2004 | Third Quarterly report of 2004 of State Bank of Pakistan | State Bank of Pakistan | |
| 56 | 21/01/2004 | SBP, PBA ask Banks To use KIBOR as The Benchmark Rate For Corporate Lending | State Bank of Pakistan | |
| 57 | 27/09/2010 | PDD of CDM project “Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant” Version 4 | Lucky Cement Limited | |
| 58 | | Financial Reports of Lucky Cement Limited<br>• Financial audit report 2007<br>• Financial audit report 2008<br>• Financial audit report 2009<br>• Financial audit report 2010 | Lucky Cement Limited | |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| 59 | 05/07/2011 | PDD of CDM project "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant" Version 7 | Lucky Cement Limited | |
| 60 | NA | Introduction of Consulting firm "PITCO"<br>http://www.pitcopk.com/index.htm | | |
| 61 | 08/10/2011 | Actual equipment purchase contract costs invoices (Imported plant & Machinery-Sinoma China). invoices values-F.O.B<br>Invoices of Freight, Duties, Taxes & Others | Lucky Cement Limited | |
| 62 | 2011 | Lucky Cement Limited annual report 2011 | KPMG Taseer Hadi & Company | |
| 63 | 08/10/2011 | Actual Operational & Maintenance costs of Lucky WHR Karachi plant | Lucky Cement Limited Pezu Plant | |
| 64 | 08/10/2011 | Total operational and maintenance costs of Cement Plants (Lucky Karachi & Lucky Pezu Plant) | Lucky Cement Limited | |
| 65 | 29/09/2011 | Modalities of Communication | First Climate (Switzerland) AG, Lucky Cement Limited | |
| 66 | 08/10/2011 | PDD of CDM project "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant" Version 8 | Lucky Cement Limited | |
| 67 | 02/12/2011 | PDD of CDM project "Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant" Version 9 | Lucky Cement Limited | |
| 68 | 07/10/2011 | Yearly operational and maintenance cost trend from 2003 to 2007 | Lucky Cement Limited | |
| 69 | NA | Analysis of Consumer Price Index | | |
| 70 | NA | Annual Report of State Bank of Pakistan 2006-2007 | State Bank of Pakistan | |
| 71 | 30/01/2006 | Lucky Cement Limited's maintenance contract with the equipment supplier (Wartsila) | | |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| 72 | | Annual reports of Lucky Cement Limited from 2003 till 2007<br><br>Annual reports of Lucky Cement Limited from 2007 till 2009 | Ford Rhodes Sidat Hyder, Chartered Accountants, now known as "Ernst & Young Ford Rhodes Sidat Hyder", a member firm of Ernst & Young Global Limited | |
| 73 | 2007 | Petroleum Exploration and Production Policy 2007 | Ministry of Petroleum & Natural Resources | |
| 74 | December, 2006 | Pakistan Energy Yearbook 2006 | Hydrocarbon Development Institute of Pakistan | |
| 75 | 2007 | Energy Prices Future Evolution Calculation | Lucky Cement Limited | |
| 76 | 18/09/2007 | Cost estimate for proposed WHR local scope | Lucky Cement Limited | |
| 77 | 24/08/2007 | Preliminary Quotation from WHR Equipment Supplier | East West Commercial Enterprise | |
| 78 | 19/09/2007 | Transport and Logistics Quote | CEI Logistics(Private) Limited | |
| 79 | 11/08/ 2007 | Kiln Line G Supply Contract | Lucky Cement Limited & HCRDI China | |
| 80 | 22/08/2007 | Kiln-Line G LC (letter of credit ) | | |
| 81 | 9/01/2008 | Kiln-Line G_Bill of Landing | | |
| 82 | 14/02/ 2008 | Kiln-Line G Delivery at site | | |
| 83 | NA | Technical Specification/ Test Data of Caterpillar Engines, Type 16CM32C | Caterpillar | |

| Ref. No. | Issuance and/or submission date (dd/mm/yyyy) | Title/Type of Document | Author/Editor/ Issuer | Additional Information (Relevance in CDM Context) |
|---|---|---|---|---|
| | | DF | | |
| 84 | NA | Technical Specification/ Test Data of Caterpillar Engines Type 16CM34 | Caterpillar | |
| 85 | NA | Technical Specification/ Test Data of Rolls-Royce Engine Type B35:40V-20AGS | Rolls-Royce | |
| 86 | NA | Technical Specification/ Test Data of Rolls-Royce Engines Type 40V-16AGS | Rolls-Royce | |
| 87 | NA | Technical Specification/ Test Data of Wartsila Engine Type 20V34SG | Wartsila | |
| 88 | 28/09/2012 | Third party confirmation of escalation of Operational and maintenance costs of Waste heat recovery project and baseline fuel cost | Tahir Jawad Imrab FECTO Chartered Accountants | Third party confirmation that the applied approach of escalation of O&M costs per year and price of fuel cost considered in baseline are realistic |
| 89 | 13/09/2007 | Waste heat recovery system information provided by EAST-WEST Commercial Enterprise about technical lifetime of equipment etc. | EAST-WEST Commercial Enterprise | |
| 90 | 25/10/2012 | PDD of CDM project “Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant” Version 10 | Lucky Cement Limited | |
| 91 | 11/02/2013 | Emission Reduction (ER) Calculation sheet | Lucky Cement Limited | |
| 92 | 19/02/2013 | Investment Analysis Sheet (IRR Calculation spreadsheet) version 3 | First climate AG and Carbon services | |
| 93 | 19/02/2013 | PDD of CDM project “Waste Heat Recovery and Utilization for Power Generation at Lucky Cement Limited, Karachi Plant” Version 11 | Lucky Cement Limited | |

# Annex 3: Appointment Certificates

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Mahmood, Khalid fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

| Qualification applicable to | | | | | |
|---|---|---|---|---|---|
| **Standard** | CDM | GS | VCS | VER | Other |
| **Date** | 23.03.12 | | | | |

| Qualification as | | | | | | |
|---|---|---|---|---|---|---|
| **Status** | Trainee | Validator | Verifier | Team Leader | Technical Reviewer | Technical Expert |
| **Date** | | 23.03.12 | 23.03.12 | 23.03.12 | | 1.2, 13.1, 13.2,15.2 |

| Other qualification | | | | | | |
|---|---|---|---|---|---|---|
| **Country Expertise** | | | | | | |
| **Region** | 1 | 2 | 3 | 4 | 5 | Other |
| **Date** | 23.03.12 | | | | | |
| **Further countries** | | | | | | |
| **Financial Expertise** | | | | | | |
| **Date** | | | | | | |

| Qualification in technical areas | |
|---|---|
| **Technical Area** | **Date** |
| 1.2_Energy generation from renewable energy source | 23.03.12 |
| 13.1_Waste handling and disposal | 23.03.12 |
| 13.2_15.2_Animal waste management | 23.03.12 |
| | |
| | |
| | |

This appointment is valid until 28.02.2013 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.
In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference no. CB-IND-CCP-0028/001.

| Date | Signature |
|---|---|
| 21.11.2012: Extension of Validity | |
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TÜV SÜD
South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Mitterwallner, Robert fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

| Qualification applicable to | | | | | |
|---|---|---|---|---|---|
| **Standard** | CDM | GS | VCS | VER | Other |
| **Date** | 23.03.12 | | | | |

| Qualification as | | | | | | |
|---|---|---|---|---|---|---|
| **Status** | Trainee | Validator | Verifier | Team Leader | Technical Reviewer | Technical Expert |
| **Date** | | 23.03.12 | 23.03.12 | 23.03.12 | 23.03.12 | 1.2, 4.1, 4.3, 13.1 |

| Other qualification | | | | | | |
|---|---|---|---|---|---|---|
| **Country Expertise** | | | | | | |
| **Region** | 1 | 2 | 3 | 4 | 5 | Other |
| **Date** | 23.03.12 | | 23.03.12 | | | |
| **Further countries** | | | | | | |
| **Financial Expertise** | | | | | | |
| **Date** | | | | | | |

| Qualification in technical areas | |
|---|---|
| **Technical Area** | **Date** |
| 1.2_Energy generation from renewable energy source | 23.03.12 |
| 4.1_Cement sector | 23.03.12 |
| 4.3_Iron and steel sector | 23.03.12 |
| 13.1_Waste handling and disposal | 23.03.12 |
| | |
| | |

This appointment is valid until 28.02.2013 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.
In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference no. CB-IND-CCP-0030/001.

| Date | Signature |
|---|---|
| 21.11.2012: Extension of Validity | |
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South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Agrafiotis, Georgios fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

| Qualification applicable to | | | | | |
|---|---|---|---|---|---|
| **Standard** | CDM | GS | VCS | VER | Other |
| **Date** | 22.03.12 | | | | |

| Qualification as | | | | | | |
|---|---|---|---|---|---|---|
| **Status** | Trainee | Validator | Verifier | Team Leader | Technical Reviewer | Technical Expert |
| **Date** | | 22.03.12 | 22.03.12 | | | 1.2, 13.1 |

| Other qualification | | | | | | |
|---|---|---|---|---|---|---|
| **Country Expertise** | | | | | | |
| **Region** | 1 | 2 | 3 | 4 | 5 | Other |
| **Date** | 22.03.12 | | 22.03.12 | | | |
| **Further countries** | | | | | | |
| **Financial Expertise** | | | | | | |
| **Date** | 22.03.12 | | | | | |

| Qualification in technical areas | |
|---|---|
| **Technical Area** | **Date** |
| 13.1_Waste handling and disposal | 22.03.12 |
| 1.2_Energy generation from renewable energy source | 22.03.12 |
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This appointment is valid until 28.02.2013 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.
In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference no. CB-IND-CCP-0002/001.

| Date | Signature |
|---|---|
| 21.11.2012: Extension of Validity | |
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South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Agarwal, Nikunj fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

| Qualification applicable to | | | | | |
|---|---|---|---|---|---|
| **Standard** | CDM | GS | VCS | VER | Other |
| **Date** | 22.03.12 | | | | |

| Qualification as | | | | | | |
|---|---|---|---|---|---|---|
| **Status** | Trainee | Validator | Verifier | Team Leader | Technical Reviewer | Technical Expert |
| **Date** | | 22.03.12 | 22.03.12 | 22.03.12 | 22.03.12 | 1.1,1.2, 3.1, 4.10, 13.1,13.2, 15.2 |

| Other qualification | | | | | | |
|---|---|---|---|---|---|---|
| **Country Expertise** | | | | | | |
| **Region** | 1 | 2 | 3 | 4 | 5 | Other |
| **Date** | 22.03.12 | | | | | |
| **Further countries** | | | | | | |
| **Financial Expertise** | | | | | | |
| **Date** | 22.03.2012 | | | | | |

| Qualification in technical areas | |
|---|---|
| **Technical Area** | **Date** |
| 1.2_Energy generation from renewable energy source | 22.03.12 |
| 13.1_Waste handling and disposal | 22.03.12 |
| 3.1_Energy demand | 22.03.12 |
| 13.2_15.2_Animal waste management | 22.03.12 |
| 1.1_4.10_Thermal energy generation.. | 23.11.12 |
| | |

This appointment is valid until 28.02.2013 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.
In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.
Your Certificate has the internal reference no. CB-IND-CCP-0001/001.

| Date | Signature |
|---|---|
| 23.11.2012 | |
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South Asia

# CERTIFICATE OF APPOINTMENT

Mr. Kleiser Thomas fulfills the requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd to participate in audits.

| Qualification applicable to | | | | | |
|---|---|---|---|---|---|
| **Standard** | CDM | GS | VCS | VER | Other |
| **Date** | 25.03.12 | | | | |

| Qualification as | | | | | | |
|---|---|---|---|---|---|---|
| **Status** | Trainee | Validator | Verifier | Team Leader | Technical Reviewer | Technical Expert |
| **Date** | | 25.03.12 | 25.03.12 | 25.03.12 | 25.03.12 | 1.1, 1.2, 4.1, 4.10 |

| Other qualification | | | | | | |
|---|---|---|---|---|---|---|
| **Country Expertise** | | | | | | |
| **Region** | 1 | 2 | 3 | 4 | 5 | Other |
| **Date** | 25.03.12 | | | | | |
| **Further countries** | | | | | | |
| **Financial Expertise** | | | | | | |
| **Date** | 25.03.12 | | | | | |

| Qualification in technical areas | |
|---|---|
| **Technical Area** | **Date** |
| 1.1_4.10_Thermal energy generation.... | 25.03.12 |
| 1.2_Energy generation from renewable energy source | 25.03.12 |
| 4.1_Cement sector | 25.03.12 |
| | |
| | |
| | |

This appointment is valid until 28.02.2013 and is bound by internal requirements of the Certification Body "Environment and Energy" of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0022/001.

| Date | Signature |
|---|---|
| 21.11.2012: Extension of Validity | |
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