



VALIDATION REPORT

DAK SRONG 2 HYDROPOWER PROJECT

REPORT No. GHGCC(A)09-005

REVISION No. 04.4

GHG Certification Office

KOREA ENERGY MANAGEMENT CORPORATION



VALIDATION REPORT

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Approved by: Lee Jae Hoon (Director)	Organisational unit: GHG Certification Office, Korea Energy Management Corporation
Client: KYOTOenergy Pte. Ltd.	Client ref.: Mr. D. L. Shaw
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First PDD (version and date)	Version 01.15, 11/02/2009
Final PDD (version and date)	Version 03.5, 10/11/2010
<p>Summary:</p> <p>The Korea Energy Management Corporation (KEMCO) Validation Team has conducted validation of the “Dak Srong 2 Hydropower Project” in Viet Nam to ensure that the proposed project is in conformity with all applicable CDM requirements including the CDM modalities and procedures, and relevant decisions by the COP/MOP and the CDM Executive Board.</p> <p>The validation consisted of following three phases:</p> <ol style="list-style-type: none"> 1) Desk review of the project design, baseline methodology and monitoring plan, and relevant data and information; 2) On-site assessment and follow-up interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation; and, 3) Resolution of outstanding issues and issuance of the final validation report and opinion. <p>During the validation, the Team assessed, using objective evidence, the completeness and accuracy of the claimed emission reductions and conservativeness of the assumptions made in the project design document (PDD). In addition, based on its sectoral and regional expertise, the Team assessed whether the project activity complies with the relevant requirements set out in the CDM modalities and procedures, the applicability conditions of the selected methodology and guidance issued by the CDM Executive Board.</p> <p>In summary, KEMCO is of the opinion that the project, as described in the project design document as of 22/01/2010/10/11/2010, meets all applicable UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology ACM0002 (version 11). Hence, KEMCO requests the registration of the “Dak Srong 2 Hydropower Project” as a CDM project activity.</p>	

Report No.: GHGCC(A)-09-005	Subject Group:	
Report title: Dak Srong 2 Hydropower Project		
Work carried out by: Han, Seung-Ho, Hwang, In-Chul		
Work verified by: Lee, Hoon-Goo		
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Indexing terms

UNFCCC/Kyoto Protocol/CDM

Validation / Verification

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Abbreviations

Explain any abbreviations that have been used in the report here.

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEMCO	Korea Energy Management Corporation
LOA	Letter of Approval
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change
(CDM) VVM	Clean Development Mechanism (CDM) Validation and Verification Manual

Conversion Factors and Definitions

Insert and describe any conversion factors used in the report here. In addition, define any specific terminology used in the report.



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1 INTRODUCTION

Bunge Emissions Holdings Sarl has commissioned Korea Energy Management Corporation (KEMCO) to perform a validation of the “Dak Srong 2 Hydropower Project” in Viet Nam (hereafter called “the project”). This report summarises the validation findings for the project, as well as means of validation to assess the correctness of the information provided by the project participants.

The validation team consisted of the following personnel:

Role	Name	Organization	Scope of work
Team Leader, Validator	Han, Seung-Ho	KEMCO GHG Certification Office	Baseline and Monitoring methodology, Estimation of GHG emission reductions
Lead GHG Validator	Hwang, In-Chul	KEMCO GHG Certification Office	Sustainable Development, Environmental impacts, Stakeholder comments

1.1 Objective

The purpose of validation is to ensure a thorough, independent assessment of proposed project activities submitted for registration as a proposed CDM project activity against all applicable CDM requirements. In particular, application of the baseline and monitoring methodology and demonstration of the project additionality is validated through document review, on-site observation, and interviews with relevant stakeholders and personnel.

1.2 Scope

The validation scope is defined as an independent and objective review of:

- Technical description of the project;
- GHG sources and types to be included within the project boundaries;
- Baseline scenario;
- Project additionality;
- Monitoring plan;
- Environmental impacts by the proposed project; and,
- Comments by local stakeholders

The validation scope can be extended depending on project-specific situations or required by relevant decisions by the COP/MOP and the CDM Executive Board.



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1.3 GHG Project Description

The Dak Srong 2 Hydropower Project is a grid-connected hydro power plant which will be located in Kong Chro District, Gia Lai Province, Viet Nam. The proposed project will generate electricity using water resources of the Ba River with the total installed capacity of 24 MW (8 MW \times 3units). The annual generation of electricity is estimated at 91,816 MWh and resulting emission reductions will arrive at 44,466 tCO₂e/year, by displacing electricity generation by fossil fuel-fired plants.

The project has the following positive impacts with respect to contribution to sustainable development in Viet Nam:

- environmentally offsetting fossil fuel use and lowering greenhouse gas emissions;
- socially providing jobs, development of a cultural house, ensuring reliable electricity supply, roads;
- technologically transfer of hydropower-related technology; and,
- economically satisfying growing energy demands to allow the country and region to develop and alleviate poverty.



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2 METHODOLOGY

The validation may consist of the following three phases:

- 1) Desk review of the project design, baseline methodology and monitoring plan, and relevant data and information;
- 2) On-site assessment and follow-up interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation; and,
- 3) Resolution of outstanding issues and issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customized for the project, according to the Validation and Verification Manual. The protocol shows in transparent manner, criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes.

- It organizes, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure1. The completed validation protocol is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective Action Requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The validation team may also use the term Clarification, which would be where:

- iv) additional information is needed to fully clarify an issue.



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Validation Protocol Table 1: Mandatory Requirements			
Requirement	Reference	Conclusion	Cross reference
The requirements the project must meet.	Gives reference to the legislation or agreement where the requirement is found.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Validation report.	Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.

Validation Protocol Table 2: Requirement checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	Gives reference to documents where the answer to the checklist question or item is found.	Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.	The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). Clarification is used when the validation team has identified a need for further clarification.

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	Ref. to checklist question in table 2	Summary of project owner response	Validation conclusion
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.	The responses given by the Client or other project participants during the communications with the validation team should be summarised in this section.	This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".

Figure 1 Validation protocol tables



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2.1 Review of Documents

The Project Design Document (PDD) version 1.15 dated 11/02/2009 submitted initially and final version 03.5 /1/ dated 10/11/2010 along with additional background document /2/ - /19/ related to the project design and baseline were assessed as a part of validation.

The desk review focused mainly on the following aspects:

- Participation Requirement
- Project Design Document
- Project Additionality
- Sustainable Development and Approval by Parties involved
- Baseline Methodology and Project Baseline
- Monitoring Methodology and Plan – Coverage of Emission Sources
- Monitoring Practices and GHG Data Management

2.2 Follow-up Interviews

On 31st March 2009, KEMCO performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The Director of Hoang Anh Giai Lai Hydropower Joint Stock Company and project consultants of KYOTOEnergy Pte. Ltd were interviewed. The main topics of the interviews are summarized in Table 1. In addition, KEMCO received the letters from the responsible persons of EVN (Electricity of Viet Nam) and MONER (Ministry of Natural Resource and Environment) confirming that “Masterplan 6 in Viet Nam” shows the latest data on hydropower plants respectively.

Furthermore KEMCO interviewed with the responsible person of Department of Meteorology, Hydrology and Climate Change, which is the Designated National Authority(DNA) on 17 November 2010 regarding the GEF published in March 2010 by DNA.



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Table 1 Interview topics

Interviewed organisation	Interview topics
Hoang Anh Giai Lai Hydropower Joint Stock Company	<ul style="list-style-type: none"> ➤ Project background information ➤ Project technology, operation, maintenance and monitoring capability ➤ Project additionality ➤ Project monitoring and management plan. ➤ Project approval status (incl. EIA approval, CDM project status) ➤ Stakeholder consultation process
KYOTOEnergy Pte. Ltd.	<ul style="list-style-type: none"> ➤ Application of selected baseline and monitoring methodology ➤ Baseline determination ➤ Emission reduction calculation ➤ Emission reduction monitoring plan
Department of Meteorology, Hydrology and Climate Change(which is the Designated National Authority)	<ul style="list-style-type: none"> ➤ Grid Emission Factor
Electricity of Viet Nam (EVN): receipt of the letter	<ul style="list-style-type: none"> ➤ Availability of the grid data
Ministry of Natural Resource and Environment (MONRE): receipt of the letter	<ul style="list-style-type: none"> ➤ Common practice in developing hydropower projects

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve the requests for corrective actions and clarification and any other outstanding issues which needed to be clarified for KEMCO's positive conclusion on the project design. The Corrective Action Requests and Clarification Requests raised by KEMCO, presented to the project participant in KEMCO's NC report as of 31/03/2009 were resolved during communications between the project participants and KEMCO. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

Since modification to the project design were necessary to resolve KEMCO's concerns, the client decided to revise the PDD and resubmitted the PDD as version 03.5. After reviewing and assessing the revised PDD, KEMCO issued this final validation report and opinion.

2.4 Internal Quality Control

The final validation report underwent technical review before requesting registration of the project activity. The technical review was performed by one Review Member qualified in accordance with KEMCO's Committee Operation Procedure mainly in terms of validation procedures and results, and approved by Director of KEMCO's GHG Certification Office.



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3 VALIDATION FINDINGS

In the following sections the findings of the validation are stated. The validation findings for each validation subject are presented as follows:

- 1) The findings from the desk review of the original project design documents, and the findings from physical site inspection and interviews during the follow-up visit are summarised. These findings are in detail described in the Validation Protocol in Appendix A.
- 2) Where the validation team had identified issues that needed clarification or that represented a risk to the fulfilment of the project objectives, a Clarification or Corrective Action Request, respectively, have been issued. The Clarification and Corrective Action Requests are stated, where applicable, in the following sections and are further documented in the Validation Protocol in Appendix A. The validation of the Project resulted in ten Corrective Action Requests and two Clarification Requests.
- 3) Where Clarification or Corrective Action Requests have been issued, the communications between the Client and KEMCO to resolve these Clarification or Corrective Action Requests are summarised.
- 4) In conclusion, the validation opinion of the validation team has been presented.

The final validation findings are based on the revised project design document (version 03.5, dated 10/11/2010) and re-submitted supporting documentation.

3.1 Approval

The project participant at the host Party's side is Hoang Anh Giai Lai Hydropower Joint Stock Company, Viet Nam. Vietnam had ratified the Kyoto Protocol on 25 September 2002 and Ministry of Natural Resources and Environment, Department of Meteorology, Hydrology and Climate Change of Viet Nam takes on the DNA function.

The DNA of Viet Nam has issued a Letter of Approval (LOA) dated 30/12/2009, precisely referring to the title of the project activity and confirming that participation is voluntary, and the project assists in achieving sustainable development.

The project participant at the investing Party's side is Bunge Emissions Holdings Sarl, Switzerland. Switzerland had ratified the Kyoto Protocol on 09 July 2003 and Federal Office for the Environment FOEN, Climate Unit takes on the DNA function.

The DNA of Switzerland has issued a Letter of Approval (LOA) dated 22/01/2010, precisely referring to the title of the project activity.

There are no provisions in the LoA stipulating special conditions with respect to the above-mentioned. KEMCO received the LoA from the project participant. It is confirmed by comparing to the other published LoAs that the LoA is authentic. There are no descriptions in the LoA with respect to version number of PDD and Validation Report.



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3.2 Participation

The DNA of Viet Nam has issued a Letter of Approval (LOA) dated 30/12/2009, authorizing Hoang Anh Giai Lai Hydropower Joint Stock Company as project participant.

The DNA of Switzerland has issued a Letter of Approval (LOA) dated 22/01/2010, authorizing Bunge Emissions Holdings Sarl.

The validation did not reveal any information indicating that the project can be seen as a diversion of official development assistance (ODA) funding towards Viet Nam.

3.3 Project Design Document

The PDD is prepared in accordance with the latest template (version 03) and guidance published by the CDM EB.

3.4 Project Description

The project is a grid-connected hydro power plant of which capacity is 24 MW. By supplying electricity to the grid with renewable resources, the project will reduce greenhouse gas emissions by avoiding CO₂ emissions from electricity generation by fossil fuel power plants in Viet Nam.

The main items of equipment such as turbines, generators, governors etc are imported from China. This will contribute to the transfer of technology to Vietnam. The electricity generated by the project will be delivered to the Vietnam national grid via a new single-circle 110 kV transmission line.

The project will involve construction of a spill-over dam and therefore be constructed and operated in a relatively environmentally safe manner, which does not involve significant land clearance, development or resettlement, as in the case of accumulation reservoir types of projects.

The expected lifetime of the project is about 30 years. A renewable crediting period of 7 years has been chosen for the project, starting from 30 April 2010. The emission reductions are estimated to be 44,466 tCO₂/year and 311,262 tCO₂ over the seven years of crediting period.

The PDD is in accordance with the applicable CDM requirements for completing PDDs such as forms and guidance.

3.5 Baseline and Monitoring Methodology

The proposed project appropriately applied ACM0002 “Consolidated baseline and monitoring methodologies for grid-connected electricity generation from renewable sources” (version 11) and Tool to calculate the emission factor for an electricity system (ver 01.1).

As per the methodology, for hydro power plants, emissions of CH₄ from the reservoir should be accounted for if the power density (PD) of power plant is greater than 4 W/m² and less than or equal to 10 W/m². In this regard, the surface area of the run-of-river reservoir, 5,037,000 m² was validated by cross-checking the Basic Design Report. It is thus confirmed that the power density



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of the proposed project is 4.76 W/m^2 and the project emissions from the reservoir are properly calculated with the formulae presented in the baseline methodology.

Project participant calculated emission reductions using the GEF of 'SUTDY, Definition of Vietnam Grid Emission Factor' published by DNA (March, 2010). KEMCO visited the DNA office in Hanoi of Vietnam and interviewed the responsible person regarding the GEF calculation. It was confirmed by cross-checking with evidences such as draft secondary National Communication of Vietnam and plant information submitted by each plant owner that country specific data for net calorific value (NCVi) of each plant and country specific carbon emission factor of each type of fossil fuel are also used in calculating baseline emission factors.

Specifically, in regards to selection of OM methods, Simple OM is selected as low cost/must run plants constitute less than 50% of total grid generation based on the most recent five-year power generation data. In addition, with regards to must-run resources, the Validation Team noted that there were no concepts about that in the interview with an expert from EVN and thus confirmed again that selection of Simple OM was justified since low cost/must run plants constitute less than 50% of total grid generation based on the most recent five-year power generation data. Three-year data from 2006 to 2008 are used for operating margin calculation. The OM is calculated to be $0.6465 \text{ tCO}_2/\text{MWh}$ as a generation-weighted average for the consecutive three years. The BM is calculated to be $0.5064 \text{ tCO}_2/\text{MWh}$.

Meanwhile, Build Margin emission factor is determined based on electricity generation data of the most recent set of power plants which generate 20% of the total system generation as the amount is larger than the annual generation of the five power plants built most recently. The BM is calculated to be $0.5064 \text{ tCO}_2/\text{MWh}$.

Given that the weighting factors, w_{OM} and w_{BM} are selected as 0.5 and 0.5, respectively, as stipulated by Tool to calculate the emission factor for an electricity system (ver 01.1). The combined margin of $0.5764 \text{ tCO}_2/\text{MWh}$ is fixed ex-ante for the crediting period.

The emission reduction ER_y by the project during the crediting period is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (Ly).

- 1) Baseline emissions: Baseline emissions (BE_y in tCO_2) are the product of the baseline emission factor (EF_y in tCO_2/MWh) times the electricity supplied by the project to the grid (EG_y in MWh).
- 2) Project emissions: Since the power density (PD) of the proposed project is 4.76 W/m^2 , greater than 4 W/m^2 and less than or equal to 10 W/m^2 , the project emissions from the reservoir are properly calculated with the formulae presented in the baseline methodology.
- 3) Leakage: There is no need to consider these emission sources as leakage in accordance with ACM0002 (version 11).
- 4) Emission reduction: $ER_y = BE_y - PE_y - Ly = (91,816 \times 0.5764) - 8,457 - 0 = 44,466 \text{ tCO}_2\text{e}$

With regards to emission reduction calculations and calculation of Simple OM, one CAR and one CL was raised and closed out as follows;



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- **CAR 2:** It was found the GEF (grid emission factor) in Viet Nam in the PDDs was not updated in line with the latest version of Tool to calculate the emission factor for an electricity system which requires the GEF to be calculated with the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. It is requested to take conservative values in accounting for GEF. It should be further confirmed that the most up-to-date data is used to account for the baseline emission factor. (see Table 2, Section E.11);
 - **Corrective Actions:** The project proponent has submitted to the Validation Team the letter from the responsible person from EVN (Electricity of Viet Nam) confirming that the data from power plants in the report “Report on the Operation of Vietnam National Electricity System in years 2005-7” is the latest data available.
 - **Conclusions:** It is properly evidenced that the project proponent uses the most up-to-date data in calculating the grid emission factors (GEF). In addition, the GEF was properly updated in line with the latest version of Tool to calculate the emission factor for an electricity system which requires the GEF to be calculated with the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. The NC therefore is closed.
 - **Further Corrective Action :** Based on the request for review, the project proponent voluntarily decided to use the GEF which the Vietnamese DNA has published through the report “STUDY, DEFINITION OF VIET NAM GRID EMISSION FACTOR”. This has been published in order to provide one standardized grid emission factor for the country. It is the official version and its use is now required by the DNA of Viet Nam. At the time the PDD for the proposed project went to validation (25/03/2009) and submission to EB (10/02/2010), the report had not yet been made available to DOEs. The PDD was amended to use the DNA GEF which is more conservative and also uses more recent (2006-8) data.
 - **Final Conclusions:** It is properly evidenced that the project proponent uses the most up-to-date data in calculating the grid emission factors (GEF). KEMCO interviewed with the responsible person of DNA in Vietnam and confirmed that the GEF was properly calculated in line with Tool to calculate the emission factor for an electricity system. The NC therefore is closed.
- CL 2:** According to PDD, Viet Nam is importing electricity from China. It should be therefore clarified in the PDD how to deal with the electricity imports in accounting for the baseline emission factor. (see Table 2. Section E.10);
- **Corrections :** Vietnam currently imports electricity from China to make up for the shortfall in supply from its own generation system. Whilst the emission factor of China’s grid is higher than that of Vietnam’s, as a conservative approach, this PDD has considered these imports as zero emissions whilst taking into account their contribution to the overall power generation of Vietnam.
 - **Conclusions:** It is confirmed that a conservative approach has been taken in considering electricity imported from China. Therefore, the NC is closed.



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- **Further Corrective Action** : Following request for review, the project proponent elected to change the GEF used in the PDD to that described in the report “STUDY, DEFINITION OF VIET NAM GRID EMISSION FACTOR”. It is seen that this report takes a conservative approach by considering the emissions due to electricity imported from China to be zero.
- **Final Conclusion**: It is confirmed that a conservative approach has been taken by the DNA in considering electricity imported from China. Therefore, the NC remains closed.

The baseline emission factor for the project is determined ex-ante as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM).

The formulae for the emission factors were correctly applied and consistently reflected in the monitoring plan. Finally it has been verified by interviewing and cross-checking evidences that the GHG calculations are complete, accurate and transparent. It is further confirmed that the national grid data used are most recently available at the point of the commencement of validation and ver 01.1 of the tool was the latest version of the tool available when the DNA completed the Study.

3.6 Additionality

In order to demonstrate additionality, the PDD employed benchmark analysis and barrier, then, showed that the project is not financially attractive under the baseline scenario by using the “Tool for the demonstration of additionality (ver 05.2)”.

It is first confirmed that in line with the “Glossary of CDM terms (ver05) the starting date of the proposed project activity is chosen as the date when the project proponent committed to expenditures related to the implementation of the project activity: Construction Contract (25 Jan. 2008) between Jian Huang International Company Limited and Hoang Anh Gia Lai Hydropower JSC Company.

The project is an existing project as per EB 41, Annex 46. As the starting date is before the date of the commencement of validation (Period for global stakeholder comments: 25 Mar 09 to 23 Apr 09), it has been assessed whether or not the incentive of the CDM was seriously considered in the decision to proceed with the project activity.

To validate the prior consideration of CDM benefits the Validation Team then checked the Board Resolution on Investment in the proposed project dated 30 Oct. 2007 stating that without CDM development with revenues from carbon credits the project is not feasible, and Carbon Asset Management Agreement between Hoang Anh Gia Lai Hydropower JSC and KYOTOenergy dated 12 Mar. 2008. It was therefore concluded that CDM benefits were sufficiently considered by decision-makers in the decision to proceed with the project activity before the project activity started. In addition, the project proponent presented in the PDD the chronology of events to reveal that parallel action had been taken to implement the project and to get the project registered as a CDM activity.



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In identifying alternatives to the proposed project, three options are identified including the proposed project activity undertaken without being registered as a CDM project activity the project proponent provided the explanation of how second option, i.e. construction of a fossil-fuel fired power plant or any other energy renewable power plants with equivalent amount of annual electricity generation, has been eliminated. The explanation is deemed reasonable in line with the Tool for the demonstration and assessment of additionality (ver 05.2).

With regards to benchmark analysis it is noted that the IRR for the project is 10.36% without CER revenue, far lower than the relevant benchmark value, 12.38% which is the Prime Lending Rate (PLR : base interest rate of the State Bank of Viet Nam) plus a conservative mark up in Viet Nam. It was validated that all parameters and assumptions of the proposed project are accurate and suitable in light of relevant accounting practices as follows:

- Investment cost: it is confirmed that total investment costs was based on the Basic Design Report on the proposed project activity. The appropriateness of total investment costs of the proposed project, i.e. around 22 million VND/kW, is reinforced by cross-checking the Vietnamese Master plan for Electricity production, “Development Plan for National Electricity, Period 2006-2015, Vision 2025 (June 2006)” which states that per kW investment costs for hydropower projects in Vietnam have a range of 15,000,000 VND/kW to 25,000,000 VND/kW.
- O&M costs: O&M costs for the proposed project were validated by reviewing the Tentative Decisions on Assessment of Economy and Finance for Electricity Generation Projects as announced by the Ministry of Industry (13 June 2007), which describes the typical O&M costs for less than 30MW hydropower projects as 1~2% of total investment costs. It is also noted that even if the inflation rate applied to the annual O&M costs is removed from the investment analysis, the proposed project would remain additional, keeping its project IRR below the selected benchmark value.
- Electricity tariff: the electricity tariff for the project activity was confirmed by checking the Basic Design Report. Based on the sectoral expertise, the amount of the electricity tariff, viz. 732.96 VND/kWh is deemed reasonable and conservative comparing to other registered CDM hydropower projects whose electricity tariffs offered by EVN (Electricity of Vietnam) are around 600 VND/kWh.
- Tax rate: as per Law No. 14/2008/QH12 of June 3, 2008 detailing the implementation of the Law on Enterprise Income Tax, Gia Lai Province where the proposed project is located, is classified as the geographical area with special socio-economic difficulties and thus entitled to tax exemption.
- Plant load factor (PLF): PLF is estimated properly by A Dong Construction and Investment Consulting Joint Stock Company, considering natural conditions including water flow and net head.
- Benchmark value: It is deemed reasonable to assume that local commercial lending rates in Viet Nam, which could be considered appropriate by the project proponent at the time of investment decision, viz. Oct. 2007, are highly likely to be in the range of 12.38% and 13.7%. Particularly, it was noted that 12.38%, the lowest value in the range above, was theoretically determined because the relevant civil code requires that commercial banks, when lending, charge up to 150% of the base rate (8.25%) as determined by the Bank of Vietnam while some banks were going beyond their permitted limits. On the other hand,



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it was also noted that the IMF Country Report stated that the Nominal Interest Rate for medium-term loans as 13.7% in 2007. It is therefore concluded that the selected benchmark value is deemed conservative taking into account country-specific circumstances.

- Validity of FSR: the Basic Design Report for the proposed project was prepared by an engineering company, A Dong Construction and Investment Consulting Joint Stock Company in Dec. 2007. Comparing to the start date of the project activity (Jan. 2008), the date of investment decision (Oct. 2007), and the publishing date of the Report, it is deemed reasonable to conclude that the investment decision was based on the Basic Design Report.

With regards to the sensitivity analysis, it was validated that the sensitivity analysis for the project activity was properly carried out considering both negative and positive variations in major variables such as total investment costs, O&M costs, power generation, and electricity tariff. Results of the sensitivity analysis were confirmed by assessing the appropriateness of the assumed variations in the cash flow and noting that the IRR remains below the benchmark value under the favorable conditions assumed.

The Validation Team assessed other barriers than investment barriers based on the documents submitted by the project participants as follows:

- Technological barriers: the Validation Team reviewed the Decree No. 164-2003 (22 Dec. 2003) and confirmed the project site was classified as a geographical area meeting with special socio-economic difficulties, which are entitled to investment preferences.
- Barriers due to government policy: the Validation Team confirmed that there was currently no preferential treatment for hydropower projects in terms of promotion of renewable energy in an interview with a local project developer.
- Barriers due to macro economic conditions: highly-increasing inflation rate has been evidenced by the IMF Country Report (Vietnam: Statistical Appendix)

It is further assessed the barriers above are unlikely to equally prevent implementation of the possible alternatives, e.g. projects invested by Electricity of Vietnam (EVN) which is a state-owned company that dominates power production, transmission, and sales in Vietnam because of the reasons outlined in paragraph 2 of page 17.

With regards to the common practice analysis, the Validation Team assessed the appropriateness of the geographical scope of the common practice analysis for the assessment of common practice related to hydro power projects. It is deemed reasonable that the common practice analysis for the proposed project was carried out across the national boundary. It is also noted that for the common practice analysis, all the existing and planned plants in Viet Nam between 2004 and 2008 are assessed with reference to National Master Plan 2006, EVN report, and EU background report. It is then demonstrated that the majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (121 or 85% of projects listed). In addition, of the plants remaining, there are few that are considered privately owned (22 or 15% of identified projects) and fewer still would cross the CDM large scale / small scale threshold of 15MW generation capacity as Dak Srong 2 does (only 7 or 5% of projects). It is hence concluded construction of hydro power plants of the size of Dak Srong 2 by private corporations is not a common practice



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in Vietnam. Further it is noted that for those plants for which no information could be publically found, it has been conservatively assumed that there is private ownership.

The Validation Team further noted that among 34 hydropower plants with a capacity of 15 to 100 MW, most of them were invested by the state-owned IPP or EVN (state-owned electricity company), and only one project was invested by a private company and three projects provided no specific information on investors. Considering projects invested by the government side can maintain stronger positions than ones invested by the private sector, it is concluded that similar activities to the project activity which are invested by the private IPP are not widely observed and commonly carried out in the region.

But, with regards to sensitivity analysis and common practice analysis, one CAR and one CL was raised and closed out as below:

- **CAR 1:** It was found that the sensitivity analysis excluded one favorable condition, the increased power tariff, which can significantly influence the IRR value for the proposed project. It is therefore requested to complete the sensitivity analysis. In addition, the calculation spreadsheets for the sensitivity analysis are slightly wrong. The error should be therefore corrected. (see Table 2. Section F.9);
 - **Corrective Actions:** The sensitivity analysis has been elaborated by calculating the IRR with a 10% increase of power tariff. In addition, minor calculation errors have been corrected.
 - **Conclusions:** It is confirmed that the sensitivity analysis is properly corrected. Therefore, the NC is closed.
- **CL 1:** the common practice analysis for the proposed project was carried out across the national boundary. But, the list of hydropower plants for the Common Practice Analysis is not clearly referenced. (see Table 2. Section F. 14);
 - **Corrective Actions:** For the common practice analysis, all the existing and planned plants in Viet Nam between 2004 and 2008 are assessed with reference to National Master Plan 2006, EVN report, and EU background report. It is then demonstrated that the majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (76% of projects listed). In addition, of the plants remaining, there are few that would cross the CDM large scale / small scale threshold of 15MW generation capacity as Dak Srong 2 does (only 21% of projects). It is hence concluded construction of hydro power plants of the size of Dak Srong 2 by private corporations is not a common practice in Vietnam. Further it is noted that for those plants for which no information could be publically found, it has been conservatively assumed that there is private ownership.
 - **Conclusions:** The Validation Team particularly noted that among 34 hydropower plants with a capacity of 15 to 100 MW, most of them were invested by the state-owned IPP or EVN (state-owned electricity company), and only one project was invested by a private company and three projects provided no specific information on investors. Considering projects invested by the government side can maintain stronger positions than ones invested by the private sector, it is concluded that



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similar activities to the project activity which are invested by the private IPP are not widely observed and commonly carried out in the region. Furthermore, the selected power plants for the common practice analysis are evidenced by the letter from the responsible person in the government confirming that there are no later or more accurate sources data on hydro power plants in comparison with Master Plan 2006 in Viet Nam. Therefore, the NC is closed.

3.7 Monitoring Plan

The monitoring plan for the project activity is established pursuant to the approved baseline and monitoring methodology, ACM0002 (version 11) and “Tool to calculate the emission factor for an electricity system (ver 01.1).”

The combined margin emission factor (CM) is determined ex-ante based on the most recently available information. Hence, electricity supplied to the grid only will be monitored.

The net electricity generated from the project will be recorded on a monthly basis. This data will be cross verified against the sales receipt from the grid.

The monitoring and QA/QC procedures including responsibilities and authorities for project management, calibration of metering equipment, double-check of key monitoring indicators are provided in the PDD. Detailed procedures will be implemented at the latest prior to the start of the crediting period to enable subsequent verification of emission reductions.

During the site visit, the Validation Team witnessed the transmission line available for the proposed project and confirmed that the proposed project was a grid-connected power generation project. It was also checked that the monitoring of power generation and parasitic consumption by the hydropower plant would be implemented properly.

One CAR regarding the monitoring plan was raised and closed out as follows;

- **CAR 3:** The monitoring plan states that the meters are to be calibrated by the relevant authority in accordance with Article 6.3 of the Power Purchase Agreement. But, it was found during the site visit that the Power Purchase Agreement had not been signed yet. This discrepancy should be addressed in the PDD. (see Table 2. Section G.1);
 - **Corrective Actions:** The relevant paragraphs mentioning PPA has been revised considering that the monitoring practice will follow the PPA after it is signed.
 - **Conclusions:** The monitoring plan is properly corrected. Therefore, the NC is closed.

3.8 Local Stakeholders Consultation

The stakeholder meeting was held near the project site on 28 July 2008. Personal invitations were sent to community leaders, local People's Committee representatives, media etc. and public notices of the planned consultations were placed in National Resources and Environmental Newspaper which is widely published and read in provinces. In the consultation meeting, presentations were made by the project owner and consultant who outlined the planned project activity in a non-technical manner (including environmental, social and technological



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considerations), climate change, the role of the Clean Development Mechanism and annual emission reductions potential.

The Validation Team checked the attendance list, questionnaire sheet, and announcement of the meeting in the Natural Resource and Environment Journal dated 6 March 2008 and concluded that the process of receipt of stakeholder's comments was appropriately implemented.

3.9 Environmental Impacts

As for its environmental impacts on the local area, the project proponents submitted a copy of the Environmental Impact Assessment (EIA) report, which include potential environmental impacts by the proposed project to the neighboring area and how to minimize the identified impacts. The Validation Team noted that this EIA report had been approved by the Gia Lai Provincial People's Committee on January 31st 2008 and no significant negative environmental impacts were raised by relevant authorities.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

In accordance with Paragraph 40(c) of the CDM Modalities and Procedures, the project design document of the "Dak Srong 2 Hydropower Project" had been posted on the UNFCCC CDM website for public comments and Parties, stakeholders and NGOs were through CDM website invited to provide comments during 30 days period from 25 Mar 09 to 23 Apr 09 (30days). No comments were received during the period.

5 VALIDATION OPINION

KEMCO has undertaken the validation of Dak Srong 2 Hydropower Project which claimed approximately 44,466 CO₂eq ton annually by generating electricity utilizing water resources. To ensure the transparency and integrity of the validation, the Validation Team first had established the validation protocol taking into account UNFCCC, Kyoto Protocol, Marrakesh Accords, Decision 3, 4/CMP.1 and relevant decisions of the CDM executive board. Based on the checklist the validation of the project activity was undertaken in three stages, i.e. desk review, on-site assessment and follow-up interviews, and review of corrective actions.

As a result of the desk review and on-site assessment, the validation team identified three Corrective Action Requests (CARs) and two Clarification Requests (CLs) and then requested the project proponents to take corrective actions against them. In response to the request, the project proponents submitted the revised project documentation to the Validation Team, of which the Validation Team made a full review. Then the team has fully agreed that all the significant CARs and CLs issued had been cleared.

In conclusion, KEMCO is of the opinion that Dak Srong 2 Hydropower Project is in full compliance with all applicable requirements for the CDM by leading to emission reductions additional to what would have otherwise occurred, providing for reliable and measurable emission reductions with the well-established monitoring plan and contributing to sustainable



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development in Viet Nam through improvement of environmental condition, resource exploration and conservation, and socio-economic benefits.



6 REFERENCES

Category 1: Documents and electronic files submitted by the Project Participants

- /1/ KYOTOenergy. Project Design Document (Version 03.5, 10/11/2010)
- /2/ KYOTOenergy. Baseline Emissions Excel File (submitted on 06/01/2010)
- /3/ KYOTOenergy. Investment Analysis Excel File (Version 02.4)
- /4/ Electricity of Vietnam (EVN), Report of Electricity Generation by Sources (2005-2007), Appendix 2 and 3, June 2008
- /5/ A Dong Construction and Investment Consulting Joint Stock Company, Basic Design Report, Dec. 2007
- /6/ Homepage of the State Bank of Vietnam, <http://www.sbv.gov.vn/en/CdeCSTT-TD/laisuat2.jsp>
- /7/ Civil law no. 33/2005/QH11, 14 June 2005
- /8/ 2007 International Monetary Fund, IMF Country Report No. 07/386, Vietnam: Statistical Appendix, December 2007
- /9/ Ministry of Industry, Tentative Decisions on Assessment of Economy and Finance for Electricity Generation Projects, Appendix I, 13 June 2007, page 8
- /10/ MOI, EVN, IOE, National Power Development Plan (2006-2015) and 2025 Outlook (Vol.1), Nov. 2006 page XIV 30-31
- /11/ European Union Background Report, Overview of Policy Instruments for the Promotion of Renewable Energy and Energy Efficiency in Vietnam, the publishing date is not available
- /12/ Hoang Anh Gia Lai Hydropower JSC and Binh Dinh CONTREXIM company, Construction Contract 25 Jan. 2008
- /13/ Jian Huang International Company Limited and Hoang Anh Gia Lai Hydropower JSC, Equipment Purchase Contract, 25 Aug. 2008
- /14/ Hoang Anh Gia Lai Hydropower JSC, Board Resolution on Investment in Dak Srong 2 Hydropower Plant, 30 Oct. 2007
- /15/ Hoang Anh Gia Lai Hydropower JSC and KYOTOenergy, Carbon Asset Management Agreement, 12 Mar. 2008
- /16/ Gia Lai Provincial People's Committee, Approval on Environmental Impact Assessment Report, 31 Jan. 2008
- /17/ Viet Nam DNA,s Letter of Approval for Dak Srong 2 Hydropower Project, Ministry of Natural Resource and Environment, 30/12/2009
- /18/ Letter of approval of a project under article 12 of the Kyoto Protocol (CDM) for Dak Srong 2 Hydropower Project, The Federal Office of the Environment, Switzerland,



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/19/ Vietnamese Government decision 2010QD-BCN, 13/06/2007

Category 2: Documents and websites referred to by KEMCO

- /20/ Clean Development Mechanism Validation and Verification Manual (ver 01.1)
- /21/ ACM0002 Consolidated Methodology for Grid Connected Electricity Generation from Renewable Sources (ver11)
- /22/ Tool to calculate the emission factor for an electricity system (ver 01.1)
- /23/ Study, Definition of Vietnam grid emission Factor, Department of Meteorology, Hydrology and Climate Change, 12/2009
- /24/ Confirmation letters by Department of Meteorology, Hydrology and Climate Change regarding the validity of Tool to calculate the emission factor for an electricity system and the criteria of NCVs and EFs, 18/11/2010
- /25/ Glossary of CDM terms (ver05),
- /26/ Tool for the demonstration and assessment of additionality (ver05.2)
- /27/ Guidance on the Assessment of Investment Analysis (ver03)
- /28/ <http://cdm.unfccc.int/DNA/index.html>
- /29/ IPCC, 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- /30/ Guidelines for the reporting and validation of Plant Load Factors(ver 01)

Persons interviewed:

List persons interviewed during the validation, or persons contributed with other information that are not included in the documents listed above.

Hoang Anh Giai Lai Hydropower Joint Stock Company

Mr. Nguyen Van Hung (Director)

KYOTOenergy Pte. Ltd.

Mr. D. L. Shaw

Mr. Pham Duc Uy

Mr. Bui Thanh Binh

Ms. Nguyen Thanh Huyen

Department of Meteorology, Hydrology and Climate Change

Mr. Quach Tat Quang(receipt of letter and interview)

EVN (receipt of letter)

Ms. Nguyen Thuong Huyen



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Appendix A

Validation Protocol

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Table 1. Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

REQUIREMENT	Reference	Conclusion	Comments
1. All Parties involved have approved the project activity.	Kyoto Protocol (KP) Article 12.5(a), CDM Modalities and Procedures (M&P) paragraph 28, 40(a), CDM Validation and Verification Manual (VVM) para. 44	Checked	The LoAs from Viet Nam and Switzerland have been received.
2. All project participants have been listed in a consistent manner in the project documentation, and their participation in the project activity has been approved by a Party to the Kyoto Protocol.	CDM VVM para. 51	Checked	The participation of all participants has been approved in the form of LoA.
3. Public funding for the project from Annex I Parties shall not result in a diversion of official development assistance	Decision 17/CP.7	Checked	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Viet Nam.
4. Comments on the validation requirements shall be received, within 30 days, from Parties, stakeholders and UNFCCC accredited NGOs, and thereafter made publicly available.	CDM M&P paragraph 40(c)	Checked	The PDD of the project had been posted on the UNFCCC CDM website for public comments and Parties, stakeholders and NGOs were through CDM website invited to provide comments from 25 Mar 09 to 23 Apr 09 (30days). No comments were received during the period.

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REQUIREMENT	Reference	Conclusion	Comments
5. The PDD used as a basis for validation shall be prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website	CDM M&P paragraph 40(b), CDM VVM para. 55	Checked	The PDD is in line with the latest UNFCCC CDM-PDD format. Table2, Section C.1
6. The PDD shall contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation.	CDM VVM para. 58	Checked	Table 2, Section D.1
7. The DOE shall ensure that the baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM Executive Board.	CDM M&P paragraph 37(e), CDM VVM para. 65	Checked	Table 2, Section E.1-2
8. The DOE shall validate that the selected baseline and monitoring methodology previously approved by the CDM Executive Board, is applicable to the project activity.	CDM VVM para. 68	Checked	Table 2, Section E.3
9. The PDD shall correctly describe the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.	CDM M&P paragraph 52, CDM VVM para. 77	Checked	Table 2, Section E.6
10. The PDD shall identify the baseline for the proposed CDM project activity, defined as the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity.	CDM M&P paragraph 45(b), (c), (e), CDM VVM para. 80	Checked	Table 2, Section E.6

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REQUIREMENT	Reference	Conclusion	Comments
11. The steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions shall comply with the requirements of the selected baseline and monitoring methodology.	CDM M&P paragraph 45(b), CDM VVM para. 88	Checked	Table 2, Section E.11
12. The PDD shall describe how a proposed CDM project activity is additional	KP Article 12.5(c), Decision 3/CMP.1 CDM M&P paragraph 37(d), 43, CDM VVM para. 93	Checked	Table 2, Section F.1-13
13. If the project activity start date is prior to the date of publication of the PDD for stakeholder comments it shall be demonstrated that the that the CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity.	CDM VVM para. 96	Checked	Table 2, Section F.3-7
14. The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required (e.g., methodology ACM0002).	CDM M&P paragraph 45(b), (c), (e), CDM VVM para. 103	Checked	Table 2, Section F.8
15. If investment analysis has been used to demonstrate the additionality of the proposed CDM project activity, the PDD shall provide evidence that the proposed CDM project activity would not be: (a) The most economically or financially attractive alternative; or (b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs). The DOE shall comply with the latest version of the “Guidance on the Assessment of Investment Analysis” as provided by the CDM Executive Board.	CDM VVM para. 106	Checked	Table 2, Section F.9-11

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REQUIREMENT	Reference	Conclusion	Comments
16. If barrier analysis has been used to demonstrate the additionality of the proposed CDM project activity, the PDD shall demonstrate that the proposed CDM project activity faces barriers that: (a) Prevent the implementation of this type of proposed CDM project activity; or (b) Do not prevent the implementation of at least one of the alternatives.	CDM VVM para. 113	Checked	Table 2, Section F.12-13
17. For large-scale CDM project activities, unless the proposed project type is first-of-its kind, common practice analysis shall be carried out as a credibility check of the other available evidence used by the project participants to demonstrate additionality. This is a test to complement the investment analysis (Step 2 of the additionality tool) or barrier analysis (Step 3 of the additionality tool) to confirm that the project activity is not widely observed and commonly carried out in the region.	CDM VVM para. 117	Checked	Table 2, Section F.14
18. The PDD shall include a monitoring plan. This monitoring plan shall be based on the approved monitoring methodology applied to the proposed CDM project activity.	CDM M&P paragraph 37(f), CDM VVM para. 120	Checked	Table 2, Section G.1
19. CDM project activities shall assist Parties not included in Annex I to the Convention in achieving sustainable development.	KP Article 12.2, CDM VVM para. 123	Checked	Table 2, Section A.1 The LoAs from Viet Nam and Switzerland have been received.
20. Local stakeholders shall be invited by the PPs to comment on the proposed CDM project activity prior to the publication of the PDD on the UNFCCC website.	CDM M&P paragraph 37(b), CDM VVM para. 126	Checked	Table 2, Section H.1

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REQUIREMENT	Reference	Conclusion	Comments
21. Project participants shall submit documentation to the DOE on the analysis of the environmental impacts of the project activity in accordance with paragraph 37(c) of the CDM modalities and procedures	CDM M&P paragraph 37(c), CDM VVM para. 129	Checked	Table 2, Section I.1

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Table 2. Requirements Checklist

 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A. Approval <i>In this section, it is assessed that all Parties involved have approved the project activity.</i>		Para 44 Para125					
	<p>A.1. Has the written letter(s) of approval been provided by the DNA of each Party indicated as being involved in the proposed CDM project activity in section A.3 of the PDD confirming the following:</p> <ul style="list-style-type: none"> (a) The party is a Party to the Kyoto Protocol (b) Participation is voluntary (c) In the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country (d) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration. 	Para.45 Para126 <i>(Para49)</i> <i>(Para127)</i>	/17/ /18/	Document Review	<p>1. Checked: The project participant at the host Party's side is Hoang Anh Giai Lai Hydropower Joint Stock Company, Viet Nam. Vietnam had ratified the Kyoto Protocol on 25 September 2002 and Ministry of Natural Resources and Environment of Viet Nam takes on the DNA function.</p> <p>2. The DNA of Viet Nam has issued a Letter of Approval (LOA) dated 30/12/2009, precisely referring to the title of the project activity, and confirming that the project assists in achieving sustainable development. KEMCO received this letter from the project participant.</p> <p>3. The project participant at the investing Party's side is Bunge Emissions Holdings Sarl, Switzerland. Switzerland had ratified the Kyoto Protocol on 09 July 2003 and Federal Office for the</p>	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					Environment FOEN, Climate Unit takes on the DNA function. 4. The DNA of Switzerland has issued a Letter of Approval (LOA) dated 22/01/2010, precisely referring to the title of the project activity.		
	A.2. Is the letter(s) of approval unconditional with respect to A.1 above?	Para.46	/17/ /18/	Document Review	1. Checked: there are no provisions in the LoAs stipulating special conditions with respect to A.1 above.	OK	
	A.3. Has the letter(s) of approval been issued by the respective Party's designated national authority (DNA)? and if in doubt, has it been verified with the DNA that the letter of approval is valid for the proposed CDM project activity under validation?	Para.47	/17/ /18/	Document Review	1. KEMCO received the LoAs from the project participants. It is confirmed by comparing to the other published LoAs that the LoAs are authentic.	OK	
	A.4. If the DOE doubts the authenticity of the letter of approval, has it been verified with the DNA that the letter of approval is authentic?	Para.48 (Para50)	/17/ /18/	Document Review	1. Checked: It is confirmed by comparing to the other published LoAs that the LoAs are authentic.	OK	
	B. Participation <i>In this section, it is assessed that all project participants have been listed in a consistent manner in the project documentation, and their participation in the project activity has been approved by a Party to the Kyoto Protocol.</i>	Para 51					
	B.1. Has it been confirmed that the project participants are listed in tabular form in section A.3 of the PDD and that this information is consistent with the	Para.52 (Para54)	/17/ /18/	Document Review	1. Checked: the information on the project participant is described consistently across the PDD.	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	<p>contact details provided in annex 1 of the PDD?</p> <p>Has it been determined whether the participation of each project participant has been approved by at least one Party involved, either in a letter of approval or in a separate letter specifically to approve participation? Has it been confirmed that no entities other than those approved as project participants are included in these sections of the PDD?</p>				<p>2. The participation of the project participants has been approved by the LoAs of Viet Nam and Switzerland which are authorizing Hoang Anh Gai Lai Hydropower Joint Stock Company and Bunge Emissions Holdings Sarl as project participant respectively.</p>		
	<p>B.2. Has it been ensured that the approval of participation has been issued from the relevant DNA?</p> <p>If in doubt, has it been verified with the DNA that the approval of participation is valid for the proposed CDM project participant?</p>	Para.53	/17/ /18/	Document Review	<p>1. Checked: It is confirmed by comparing to the other published LoAs that the LoAs are authentic.</p>	OK	
	<p>C. Project Design Document</p> <p><i>In this section, it is assessed that the PDD used as a basis for validation shall be prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website.</i></p>	Para 55					
	<p>C.1. Has it been determined whether the PDD is in accordance with the applicable CDM requirements for completing PDDs?</p>	Para.56	/1/	Document Review	<p>1. Checked: The PDD is in accordance with the latest template (version 03) and guidance published by the CDM EB.</p>	OK	
	<p>D. Project Description</p> <p><i>In this section, it is assessed that the PDD shall contain a clear description of the project activity that provides the reader with a clear understanding of the precise nature of the project activity</i></p>	Para 58					


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	<i>and the technical aspects of its implementation.</i>						
	D.1. Has it been confirmed that the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	Para.59	/1/ /5/	Document Review Interview	1. Checked: the proposed project aims to generate renewable-based electricity by capturing potential energy from the vertical fall of the water from the upstream level to the downstream level in a new run-of-river reservoir. Specifically, the following details of the proposed project were validated during the site visit: run-of-river (spillway) dam, 8 MW×3 units, net head of 37.5 m.	OK	
	D.2. For proposed CDM project activities in existing facilities or utilizing existing equipments, Has a physical site inspection been conducted to confirm that the description in the PDD reflects the proposed CDM project activity for the following types of CDM project activities unless other means are specified in the methodology? (a) Large scale projects; (b) Non-bundled small scale projects with emission reductions exceeding 15,000 tonnes per year; (c) Bundled small scale projects, each with emission reductions not exceeding 15,000 tonnes per year; in such case the number of physical site visits may however be based on	Para 60	/1/ /5/	Document Review	1. Checked: On 31 March 2009, the Validation Team performed a site visit and interview with project stakeholders to confirm selected information and to resolve issues identified in the document review	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	sampling, if the sampling size is appropriately justified through statistical analysis.						
	D.3. For other individual proposed small scale CDM project activities with emission reductions not exceeding 15,000 tonnes per year a physical site visit may be conducted as appropriate.	Para.61			N.A.		
	D.4. For all other proposed CDM project activities not referred to in paragraphs 59–61, has the validation been undertaken by reviewing available designs and feasibility studies and comparison analysis to equivalent projects been conducted, as appropriate? <i>The DOE may conduct physical site visit to assess the plan. For proposed CDM project activities for which the DOE does not undertake a physical site inspection this shall be appropriately justified.</i>	Pars.62			N.A.		
	D.5. If the proposed CDM project activity involves the alteration of an existing installation or process, does the project description clearly state the differences resulting from the project activity compared to the pre-project situation?	Para.63	/1/ /5/	Document Review	1. Checked: the proposed project is a new hydropower project.	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	E. Baseline and Monitoring Methodology <i>In this section, it is assessed that the baseline and monitoring methodologies selected by the project participants comply with the methodologies previously approved by the CDM Executive Board.</i> <i>To ensure that the project activity meets this general requirement, the DOE shall determine whether: (a) The selected methodology is applicable to the project activity; (b) The PP has correctly applied the selected methodology.</i> <i>The DOE shall ensure that the selected methodology applies to the project activity and has been correctly applied with respect to following: (a) Project boundary; (b) Baseline identification; (c) Algorithms and/or formulae used to determine emission reductions; (d) Additionality; (e) Monitoring methodology.</i>	Para 65 Para 66 Para 67					
	<i>Applicability of the selected methodology to the project activity: it should be validated that the selected baseline and monitoring methodology previously approved by the CDM Executive Board, is applicable to the project activity, including that the used version is valid. And it should be applied specific guidance provided by the CDM Executive Board in respect to any approved methodology.</i>	Para 68 Para 69					
	E.1. Is the methodology correctly quoted and applied by comparing it with the actual text of the applicable version of the methodology available on the UNFCCC CDM website?	Para 70	/1/ /2/ /21/ /22/ /23/	Document Review	1. Checked: the ACM0002 (ver 11) has been applied, which is valid until 10 Feb. 2010.	OK	
	E.2. A selected approved methodology applies to the project activity if the applicability conditions of the methodology are met and the project activity is not expected to result in emissions other than those allowed	P Para 71 (Para76) (Para77)	/1/ /2/ /21/ /22/	Document Review	1. Checked: the ACM0002 (version 11) relates to renewable electricity generation for a grid like the proposed project. It is	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	<p>by the methodology.</p> <p>Has it been determined whether the choice of methodology is justified and the project participants have shown that the project activity meets each of the applicability conditions of the approved methodology or any tool or other methodology component referred to therein? <i>This shall be done by validating the documentation referred to in the PDD and by verifying that its content is correctly quoted and interpreted in the PDD. If the DOE, based on local and sectoral knowledge, is aware that comparable information is available from sources other than that used in the PDD, then the DOE shall cross check the PDD against the other sources to confirm that the project activity meets the applicability conditions of the methodology.</i></p>		/23/		<p>shown transparently in Section B.2 that the proposed project meets the applicability conditions.</p> <p>2. For hydro power plants, emissions of CH₄ from the reservoir should be accounted for if the power density (PD) of power plant is greater than 4 W/m² and less than or equal to 10 W/m². In this regard, the surface area of the run-of-river reservoir was validated by cross-checking the Basic Design Report. It is thus confirmed that the power density of the proposed project is 4.76 W/m² and the project emissions from the reservoir are properly calculated with the formulae presented in the baseline methodology.</p>		
	<p>E.3. If the DOE cannot make a determination regarding the applicability of the selected methodology to the proposed CDM project activity then the DOE shall request clarification of the methodology in accordance with the guidance provided by the CDM Executive Board. <i>If the DOE has requested clarification of, revision to or deviation from a methodology, the DOE shall not submit a request for registration until the CDM Executive Board has approved the proposed deviation or revision. Under no circumstance shall the DOE consider the submission of</i></p>	Para 72 Para 74 Para 75			<p>1. Checked: no clarification is required.</p>	OK	


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	<i>a request for registration as a means of seeking clarification from the CDM Executive Board on the applicability of a methodology.</i>						
	E.4. If the DOE determines that the proposed CDM project activity does not comply with the applicability conditions of the methodology the DOE may proceed by means of requesting revision to or deviation from the methodology in accordance with the guidance provided by the CDM Executive Board. <i>If the DOE has requested clarification of, revision to or deviation from a methodology, the DOE shall not submit a request for registration until the CDM Executive Board has approved the proposed deviation or revision.</i>	Para 73 Para 74			1. Checked: no revision to or deviation from the methodology is required.	OK	
	<i>Project boundary: The PDD shall correctly describe the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.</i>	Para 78					
	E.5. Based on documented evidence and corroborated by a site visit where required by paragraphs 59–62 above, has it been determined whether the delineation in the PDD of the project boundary is correct and meets the requirements of the selected baseline methodology? Has it been confirmed that all sources and GHGs required by the methodology have been included within the project boundary?	Para 79 (Para80)	/1/ /2/ /21/ /22/ /23/	Document Review	1. Checked: The project boundary established encompasses the physical, geographical site of the proposed project and the connected electricity system in Viet Nam. 2. Only CO ₂ emissions are included within the project boundary in line with the baseline methodology.	OK	


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	<p>If the methodology allows project participants to choose whether a source or gas is to be included within the project boundary, has it been determined whether the project participants have justified that choice?</p> <p>Has it been confirmed that the justification provided is reasonable, based on assessment of supporting documented evidence provided by the project participants and corroborated by observations if required?</p>				<p>3. Since the power density (PD) of the proposed project is 4.76 W/m^2, greater than 4 W/m^2 and less than or equal to 10 W/m^2, the project emissions from the reservoir are properly calculated with the formulae presented in the baseline methodology.</p>		
	<p><i>Baseline identification: The PDD shall identify the baseline for the proposed CDM project activity, defined as the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed CDM project activity.</i></p> <p><i>The DOE shall confirm that any procedure contained in the methodology to identify the most reasonable baseline scenario, has been correctly applied. If the selected methodology requires use of tools (such as the Tool for the demonstration and assessment of additionality and the Combined tool to identify the baseline scenario and demonstrate additionality) to establish the baseline scenario, the DOE shall consult the methodology on the application of these tools. In such cases, the guidance in the methodology shall supersede the tool. The DOE shall check each step in the procedure described in the PDD against the requirements of the methodology.</i></p>	<p>Para 81 Para 82</p>					
	<p>E.6. If the methodology requires several alternative scenarios to be considered in the identification of the most reasonable baseline scenario, has it been determined, based on financial expertise and</p>	<p>Para 83</p>		<p>Document Review</p>	<p>1. Checked: three alternatives to the proposed project activity are identified and deemed relevant to the project activity in the context of the host country</p>	<p>OK</p>	


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	local and sectoral knowledge, whether all scenarios that are considered by the project participants and are supplementary to those required by the methodology, are reasonable in the context of the proposed CDM project activity and that no reasonable alternative scenario has been excluded?				and proposed project. It is justified that the continuation of the current situation is the baseline scenario by describing that other two scenarios are neither credible nor realistic in the context of the host country and proposed project.		
	<p>E.7. Has it been determined whether the baseline scenario identified is reasonable by validating the assumptions, calculations and rationales used, as described in the PDD?</p> <p>Has it been ensured that documents and sources referred to in the PDD are correctly quoted and interpreted? <i>The DOE shall cross check the information provided in the PDD with other verifiable and credible sources, such as local expert opinion, if available.</i></p>	Para 84 (Para87) (Para88)	/1/ /2/ /21/	Document Review	1. Checked: The analysis of why other two alternatives are eliminated is properly carried out: the coal power is not the option for the project company and other renewable energy projects like PV and wind powers are not widely spread.	OK	
	<p>E.8. Has it been determined whether all applicable CDM requirements have been taken into account in the identification of the baseline scenario for the proposed CDM project activity, including relevant national and/or sectoral policies and circumstances? <i>Drawing on its knowledge of the sector and/or advice from local experts, the DOE shall confirm that all relevant policies and circumstances have been identified and correctly considered in the PDD, in accordance with the guidance by the CDM Executive Board.</i></p>	Para 85	/1/ /2/ /21/	Document Review	1. Checked: it was found that an electricity tariff for IPP hydropower plants is generally determined under the Power Purchase Contract with Electricity of Vietnam (EVN). It was further confirmed during the site visit that no further financial incentives were provided by the government for the proposed project.	OK	


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	E.9. Has it been determined whether the PDD provides a verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity?	Para 86	/1/ /2/ /21/ /22/	Document Review	1. Checked: Based on the national grid information from EVN, it is confirmed that other renewable energy projects like PV and wind powers are not widely spread.	OK	
	<i>Algorithms and/or formulae used to determine emission reductions: The steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions shall comply with the requirements of the selected baseline and monitoring methodology.</i>	Para 89					
	E.10. Has it been determined whether the equations and parameters in the PDD have been correctly applied by comparing them to those in the selected approved methodology? If the methodology provides for selection between different options for equations or parameters, has it been confirmed that adequate justification has been provided (based on the choice of the baseline scenario, context of the proposed CDM project activity and other evidence provided) and that the correct equations and parameters have been used, in accordance with the methodology selected?	Para 90	/1/ /2/ /4/ /21/ /22/	Document Review	1. Checked: Emission factor for calculating the baseline emission was calculated as per Tool to calculate the emission factor for an electricity system. In addition, project emissions are accounted for because the power density (PD) of power plant is greater than 4 W/m ² and less than 10 W/m ² . In particular, it is validated that the surface area of the run-of-river reservoir is based on the Basic Design Report for the project activity. 2. Since the power density (PD) of the proposed project is 4.76 W/m ² , greater than 4 W/m ² and less than or equal to 10 W/m ² , the project emissions from the reservoir are properly calculated with the	CL	OK


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					formulae presented in the baseline methodology. 3. CL 2: According to PDD, Viet Nam is importing electricity from China. It should be therefore clarified in the PDD how to deal with the electricity imports in accounting for the baseline emission factor.		
	<p>E.11. Has the justification given in the PDD for the choice of data and parameters used in the equations been verified?</p> <p>If data and parameters will not be monitored throughout the crediting period of the proposed CDM project activity but have already been determined and will remain fixed throughout the crediting period, has it been assessed that all data sources and assumptions are appropriate and calculations are correct, applicable to the proposed CDM project activity and will result in a conservative estimate of the emission reductions?</p> <p>If data and parameters will be monitored on implementation and hence become available only after validation of the project activity, has it been confirmed that the estimates provided in the PDD for these data and parameters are reasonable?</p>	Para 91 (Para92) (Para93)	/1/ /2/ /4/ /21/ /22/	Document Review	1. CAR 2: It was found the GEF (grid emission factor) in Vet Nam in the PDDs was not updated in line with the latest version of Tool to calculate the emission factor for an electricity system which requires the GEF to be calculated with the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. It is requested to take conservative values in accounting for GEF. It should be further confirmed that the most up-to-date data is used to account for the baseline emission factor.	CAR	OK


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	F. Additionality of a Project Activity <i>In this section, it is assessed that the proposed CDM project activity is additional.</i>	Para 94					
	F.1. Have the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality, been assessed and verified? <i>This requires the DOE to critically assess the presented evidence, using local knowledge and sectoral and financial expertise.</i>	Para 95 (Para97)	/3/ /25/ /26/ /27/	Document Review	1. Checked: refer to F.9 below	OK	
	F.2. Have tools and documents provided by the CDM Executive Board to demonstrate the additionality of proposed CDM project activities, as well as specific complementary or alternative requirements included in approved CDM methodology, been considered?	Para 95	/3/ /25/ /26/ /27/	Document Review	1. Checked: Glossary of CDM terms (ver05), Additionality Tool (ver05.2), and the Guidance on the Assessment of Investment Analysis (ver03) has been followed.	OK	
	<i>Prior consideration of the clean development mechanism: If the project activity start date is prior to the date of publication of the PDD for stakeholder comments it shall be demonstrated that the CDM benefits were considered necessary in the decision to undertake the project as a proposed CDM project activity.</i>	Para 98					
	F.3. Has it been confirmed that the start date of the project activity, reported in the PDD, is in accordance with the Glossary of CDM terms? <i>If the reported date is not in accordance with the glossary, the DOE shall raise a CAR to ensure that the start date is correctly reported in a revised PDD. In</i>	Para 99 (Para104)	/3/ /25/ /26/ /27/	Document Review	1. Checked: The start date of the project activity, 25 Jan. 2008, was verified by checking the Construction Contract.	OK	


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	<i>particular, for project activities that require construction, retrofit or other modifications, the date of commissioning cannot be considered the project activity start date.</i>						
	F.4. Has it been determined, in accordance with the guidance from the CDM Executive Board, whether it is a new project activity (a project activity with a start date on or after 02 August 2008) or an existing project activity (a project activity with a start date before 02 August 2008)?	Para 100	/3/ /25/ /26/ /27/	Document Review	1. Checked: it is confirmed that the proposed project is classified as an existing project activity since it started before 2 August 2008.	OK	
	F.5. For a new project activity with a start date on or after 2 August 2008, for which PDD has not been published for global stakeholder consultation or a new methodology proposed to the Executive Board before the project activity start date, had the Project Participants informed the Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status? <i>If such a notification has not been provided by the project participants within six months of the project activity start date, the DOE shall determine that the CDM was not seriously considered in the decision to implement the project activity.</i>	Para 101			N.A.		
	F.6. For an existing project activity with a start date before 2 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, has the Project	Para 102	/3/ /12/ /14/ /25/ /26/	Document Review	1. Checked: it was checked if the CDM benefits were sufficiently considered in the decision to proceed with the project activity because the project had already	OK	


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	<p>Participant's prior consideration of the CDM been sufficiently evidenced as follows?</p> <p>(a) Evidence that must indicate that awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. Evidence to support this would include, inter alia, minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a proposed CDM project activity.</p> <p>(b) Reliable evidence from project participants that must indicate that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this should include, inter alia, contracts with consultants for CDM/PDD/methodology services, Emission Reduction Purchase Agreements or other documentation related to the sale of the potential CERs (including correspondence with multilateral financial institutions or carbon funds), evidence of agreements or negotiations with a DOE for validation services, submission of a new methodology to the CDM Executive Board, publication in newspaper, interviews with DNA, earlier</p>		/27/		<p>started before application for validation. The start date of the project activity, 25 Jan. 2008, was verified by checking the Construction Contract. To validate the prior consideration of CDM benefits the Validation Team then checked the Board Resolution on Investment in the proposed project dated 30 Oct. 2007 stating that without CDM development with revenues from carbon credits the project is not feasible, and Carbon Asset Management Agreement between Hoang Anh Gia Lai Hydropower JSC and KYOTOenergy dated 12 Mar. 2008. It was therefore concluded that CDM benefits were sufficiently considered by decision-makers in the decision to proceed with the project activity before the project activity started. In addition, the project proponent presented in the PDD the chronology of events to reveal that parallel action had been taken to implement the project and to get the project registered as a CDM activity.</p>		


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	correspondence on the project with the DNA or the UNFCCC secretariat.						
	F.7. If evidence to support the serious prior consideration of the CDM as indicated above is not available, has it been determined that the CDM was not considered in the decision to implement the project activity?	Para 103			1. Checked: refer to F.6 above	OK	
	<i>Identification of alternatives: The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required.</i>	Para 105					
	F.8. Has the list of alternatives given in the PDD, been assessed and has it been ensured that: (a) The list of alternatives includes as one of the options that the project activity is undertaken without being registered as a proposed CDM project activity; (b) The list contains all plausible alternatives that the DOE, on the basis of its local and sectoral knowledge, considers to be viable means of supplying the outputs or services that are to be supplied by the proposed CDM project activity; (c) The alternatives comply with all applicable and enforced legislation.	Para 106 (Para107)	/3/ /25/ /26/ /27/	Document Review	1. Checked: the alternatives identified in the PDD include the option that the proposed project activity is undertaken without being registered as a CDM project activity. 2. The alternatives provide the same outputs, i.e. electricity with the proposed project activity and have been implemented previously or are currently being introduced in the host country. 3. The alternatives identified are in compliance with all Vietnamese legal and	OK	


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					regulatory requirements.		
	<p><i>Investment analysis: If investment analysis has been used to demonstrate the additionality of the proposed CDM project activity, the PDD shall provide evidence that the proposed CDM project activity would not be:(a) The most economically or financially attractive alternative; or(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).</i></p> <p><i>Project participants can show this through one of the following approaches, by demonstrating that: (a) The proposed CDM project activity would produce no financial or economic benefits other than CDM-related income. Document the costs associated with the proposed CDM project activity and the alternatives identified and demonstrate that there is at least one alternative which is less costly than the proposed CDM project activity;(b) The proposed CDM project activity is less economically or financially attractive than at least one other credible and realistic alternative;(c) The financial returns of the proposed CDM project activity would be insufficient to justify the required investment.</i></p> <p><i>The DOE shall comply with the latest version of the Guidance on the Assessment of Investment Analysis as provided by the CDM Executive Board and with other relevant guidance including the latest guidelines on plant load factors guidelines for the reporting and validation of plant load factors.</i></p>	Para 108 Para 109 Para 110					
	<p>F.9. Has the accuracy of financial calculations carried out for any investment analysis, been verified as follows?</p> <p>(a) Conduct a thorough assessment of all parameters and assumptions used in</p>	Para 111 (Para 114)	/1/ /3/ /5/ /6/ /7/ /8/ /9/	Document Review	1. Checked: in terms of demonstration of investment barriers, the project proponent selects the benchmark analysis and calculated Project IRR for the project activity.	CAR	OK


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	<p>calculating the relevant financial indicator, and determine the accuracy and suitability of these parameters using the available evidence and expertise in relevant accounting practices;</p> <p>(b) Cross-check the parameters against third-party or publicly available sources, such as invoices or price indices;</p> <p>(c) Review feasibility reports, public announcements and annual financial reports related to the proposed CDM project activity and the project participants;</p> <p>(d) Assess the correctness of computations carried out and documented by the project participants;</p> <p>(e) Assess the sensitivity analysis by the project participants to determine under what conditions variations in the result would occur, and the likelihood of these conditions.</p>		/19/ /25/ /26/ /27/		<p>2. Investment cost: it is confirmed that total investment costs was based on the Basic Design Report on the proposed project activity. The appropriateness of total investment costs of the proposed project, i.e. around 22 million VND/kW, is reinforced by cross-checking the Vietnamese Master plan for Electricity production, “Development Plan for National Electricity, Period 2006-2015, Vision 2025 (June 2006)” which states that per kW investment costs for hydropower projects in Vietnam have a range of 15,000,000 VND/kW to 25,000,000 VND/kW.</p> <p>3. O&M costs: O&M costs for the proposed project were validated by reviewing the Tentative Decisions on Assessment of Economy and Finance for Electricity Generation Projects as announced by the Ministry of Industry (13 June 2007), which describes the typical O&M costs for less than 30MW hydropower projects as 1~2% of total investment costs.</p> <p>4. Electricity tariff: the electricity tariff for</p>		


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					<p>the project activity was confirmed by checking the Basic Design Report and Vietnamese Government decision 2014QD. The amount of the electricity tariff, viz. 732.96 VND/kWh is within the officially stipulated ranges and furthermore the value is deemed conservative comparing to other registered CDM hydropower projects whose electricity tariffs offered by EVN (Electricity of Vietnam) are around 600 VND/kWh.</p> <p><Power tariffs of registered large scale CDM hydropower projects in Veitnam></p> <table><tr><th>Ref. (registered date)</th><th>Capa. (MW)</th><th>Power tariff (VND/kWh)</th></tr><tr><td>2878 (14 Dec. 2009)</td><td>15.6</td><td>608</td></tr><tr><td>2978 (12Mar. 2010)</td><td>18</td><td>602</td></tr><tr><td>3051 (08 May. 2010)</td><td>19.5</td><td>603</td></tr></table>	Ref. (registered date)	Capa. (MW)	Power tariff (VND/kWh)	2878 (14 Dec. 2009)	15.6	608	2978 (12Mar. 2010)	18	602	3051 (08 May. 2010)	19.5	603		
Ref. (registered date)	Capa. (MW)	Power tariff (VND/kWh)																	
2878 (14 Dec. 2009)	15.6	608																	
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3051 (08 May. 2010)	19.5	603																	


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					<p>5. Tax rate: as per Law No. 14/2008/QH12 of June 3, 2008 detailing the implementation of the Law on Enterprise Income Tax, Gia Lai Province where the proposed project is located, is classified as the geographical area with special socio-economic difficulties and thus entitled to tax exemption.</p> <p>6. Plant load factor (PLF): PLF is estimated properly by A Dong Construction and Investment Consulting Joint Stock Company, considering natural conditions including water flow and net head.</p> <p>7. Formulae and calculation processes of Project IRR are validated by reviewing calculation spreadsheets submitted by the project proponent.</p> <p>8. It was found that the sensitivity analysis for the project activity was carried out considering both negative and positive variations in major variables such as total investment costs, O&M costs, power generation, and feed-in-tariff.</p>		


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					9. CAR 1: It was found that the sensitivity analysis excluded one favorable condition, the increased power tariff, which can significantly influence the IRR value for the proposed project. It is therefore requested to complete the sensitivity analysis. In addition, the calculation spreadsheets for the sensitivity analysis are slightly wrong. The error should be therefore corrected.		
	<p>F.10. Has the suitability of any benchmark applied in the investment analysis, been confirmed as follows?</p> <ul style="list-style-type: none"> (a) Determine whether the type of benchmark applied is suitable for the type of financial indicator presented; (b) Ensure that any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity; (c) Determine whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark by, for example, assessing previous investment decisions by the project participants involved and determining whether the same benchmark has been applied or if there are verifiable 	Para 112	/1/ /3/ /26/ /27/ /28/	Document Review	1. Checked: the selected benchmark value is deemed conservative in that local commercial lending rates which could be considered appropriate by the project proponent at the time of investment decision, viz. Oct. 2007, were highly likely to be in the range of 12.38% and 13.7%. Particularly, it was noted that 12.38%, the lowest value in the range above, was theoretically determined because the relevant civil code requires that commercial banks, when lending, charge up to 150% of the base rate (8.25%) as determined by the Bank of Vietnam while some banks were going	OK	


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	circumstances that have led to a change in the benchmark.				beyond their permitted limits.		
	<p>F.11. In cases where project participants rely on values from Feasibility Study Reports (FSR) that are approved by national authorities for proposed CDM project activities, has it been ensured that:</p> <p>(a) The FSR has been the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision 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;</p> <p>(b) The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE should validate the appropriateness of the values;</p> <p>(c) On the basis of its specific local and sectoral expertise, confirmation is provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision.</p>	Para 113	/1/ /3/ /5/	Document Review	1. Checked: the Basic Design Report for the proposed project was prepared by an engineering company, A Dong Construction and Investment Consulting Joint Stock Company in Dec. 2007. Comparing to the start date of the project activity (Jan. 2008), the date of investment decision (Oct. 2007), and the publishing date of the Report, it is deemed reasonable to conclude that the investment decision was based on the Basic Design Report.	OK	
	<i>Barrier analysis: If barrier analysis has been used to demonstrate the additionality of the proposed CDM project activity, the PDD</i>	Para 115					


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	<i>shall demonstrate that the proposed CDM project activity faces barriers that: (a) Prevent the implementation of this type of proposed CDM project activity²⁹;(b) Do not prevent the implementation of at least one of the alternatives.</i>						
	F.12. Has the barrier analysis referred to either? (a) Risk related barriers, for example risk of technical failure, that could have negative effects on financial performance; or (b) Barriers related to the unavailability of sources of finance for the project activity.	Para 116	/1/	Document Review Interview	1. Checked: The Validation Team assessed other barriers than investment barriers based on the documents submitted by the project participants.	OK	
	F.13. Has the barrier analysis performed been assessed as follows: (a) Determine whether the barriers are real. <i>The DOE shall assess the available evidence and/or undertake interviews with relevant individuals (including members of industry associations, government officials or local experts if necessary) to determine whether the barriers listed in the PDD exist. The DOE shall ensure that existence of barriers is substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics. If existence of a barrier is substantiated only by the opinions of the project participants, the DOE shall not consider this barrier to be adequately substantiated. If the DOE considers, on the basis of its sectoral or local expertise, that a barrier is</i>	Para 117 (Para118)	/1/	Document Review Interview	1. Technological barriers: the Validation Team reviewed the Decree No. 164-2003 (22 Dec. 2003) and confirmed the project site was classified as a geographical area meeting with special socio-economic difficulties, which are entitled to investment preferences. 2. Barriers due to government policy: the Validation Team confirmed that there was currently no preferential treatment for hydropower projects in terms of promotion of renewable energy in an interview with a local project developer. 3. Barriers due to macro economic conditions: highly-increasing inflation rate has been evidenced by the IMF	OK	


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	<p><i>not real or is not supported by sufficient evidence, it shall raise a CAR to have reference to this barrier removed from the project documentation;</i></p> <p>(b) Determine whether the barriers prevent the implementation of the project activity but not the implementation of at least one of the possible alternatives. <i>Since not all barriers present an insurmountable hurdle to a project activity being implemented, the DOE shall apply its local and sectoral expertise to judge whether a barrier or set of barriers would prevent the implementation of the proposed CDM project activity and would not equally prevent implementation of at least one of the possible alternatives, in particular the identified baseline scenario.</i></p>				<p>Country Report (Vietnam: Statistical Appendix), December 2007 and the newspaper report (Financial Times dated 28th February 2008). Barriers due to unfavorable geological conditions were also evidenced by the Feasibility Study Report.</p> <p>4. Checked: it is assessed the barriers above are unlikely to equally prevent implementation of the possible alternatives, e.g. projects invested by Electricity of Vietnam (EVN) which is a state-owned company that dominates power production, transmission, and sales in Vietnam.</p>		
	<p><i>Common practice analysis: For proposed large-scale CDM project activities, unless the proposed project type is first-of-its kind, common practice analysis shall be carried out as a credibility check of the other available evidence used by the project participants to demonstrate additionality. This is a test to complement the investment analysis (Step 2 of the additionality tool) or barrier analysis (Step 3 of the additionality tool) to confirm that the project activity is not widely observed and commonly carried out in the region.</i></p>	Para 119					
	<p>F.14. Has the common practice analysis been assessed using local and sectoral expertise as follows?</p>	Para 120 (Para121)	/1/ /10/ /11/	Document Review	1.Checked: It is deemed reasonable the common practice analysis for the proposed project was carried out across	CL	OK


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	<p>(a) Assess whether the geographical scope (e.g. the defined region) of the common practice analysis is appropriate for the assessment of common practice related to the project activity's technology or industry type. For certain technologies the relevant region for assessment will be local and for others it may be transnational/global. If a region other than the entire host country is chosen, the DOE shall assess the explanation why this region is more appropriate;</p> <p>(b) Using official sources and local and industry expertise, determine to what extent similar and operational projects (e.g. using similar technology or practice), other than CDM project activities, have been undertaken in the defined region;</p> <p>(c) If similar and operational projects, other than CDM project activities, are already widely observed and commonly carried out in the defined region, assess whether there are essential distinctions between the proposed CDM project activity and the other similar activities.</p>				<p>the national boundary.</p> <p>2. CL1: the common practice analysis for the proposed project was carried out across the national boundary. But, the list of hydropower plants for the Common Practice Analysis is not clearly referenced.</p> <p>3. Checked: it is shown that the majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (76% of projects listed). Of the plants remaining, there are a few that would cross the large scale threshold of 15MW generation capacity as Dak Srong 2 does (only 21% of projects)</p>		
	<p>G. Monitoring Plan</p> <p><i>It is assessed in this section that the monitoring plan is based on the approved monitoring methodology</i></p>	Para 122					


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 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	<i>applied to the proposed CDM project activity</i>						
	<p>G.1. Has the compliance of the monitoring plan with the approved methodology been assessed as follows?</p> <p>(a) By means of document review, identify the list of parameters required by the selected approved methodology;</p> <p>(b) Confirm that the monitoring plan contains all necessary parameters, that they are clearly described and that the means of monitoring described in the plan complies with the requirements of the methodology.</p> <p>Has it been assessed, by means of review of the documented procedures, interviews with relevant personnel, project plans and any physical inspection of the proposed CDM project activity site in accordance with paragraphs 59, 62, whether:</p> <p>(a) The monitoring arrangements described in the monitoring plan are feasible within the project design;</p> <p>(b) The means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, are sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified.</p>	Para 123 (Para124)	/1/	Document Review	<p>1. Checked: in line with the ACM0002 (version 11), electricity supplied to the grid by the hydropower plants, will be monitored.</p> <p>2. Net electricity supplied to the grid, excluding auxiliary electricity consumption within the hydropower plants, will be directly measured by electric meters and double-checked with the receipt for sales.</p> <p>3. The electricity generation data is directly measured by kilowatt hour meters at the project site and collated according to the organization plan. The data collected is archived in and dispatched to the EVN for reporting and to identify the consistency and reliability of the metering data.</p> <p>4. As per Viet Nam DNA requirements, onsite staff will be trained in the use and handling of transformer oil and an appropriately certified company will dispose of used transformer oil.</p>	CAR	OK


VALIDATION REPORT

 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					<p>5. The data from electricity sales receipts will be cross checked against meter readings taken at the project site.</p> <p>6. Hoang Anh Gia Lai Hydropower Joint Stock Company is the project owner and responsible for project management. The position and corresponding responsibilities to monitor emission reductions are described in detail in the PDD.</p> <p>7. In conclusion, it is confirmed that the project participants has the ability to implement the monitoring plan.</p> <p>8. CAR 3: The monitoring plan states that the meters are to be calibrated by the relevant authority in accordance with Article 6.3 of the Power Purchase Agreement. But, it was found during the site visit that the Power Purchase Agreement had not been signed yet. This discrepancy should be addressed in the PDD.</p>		


VALIDATION REPORT

 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
H. Local Stakeholder Consultation <i>In this section, it is assessed whether local stakeholders have been invited by the PPs to comment on the proposed CDM project activity prior to the publication of the PDD on the UNFCCC website.</i>							
H.1. Has it been determined, by means of document review and interviews with local stakeholders as appropriate, whether: (a) Comments by local stakeholders that can reasonably be considered relevant for the proposed CDM project activity, have been invited; (b) The summary of the comments received as provided in the PDD is complete; (c) The project participants have taken due account of any comments received and have described this process in the PDD.		Para 129 (Para 130)	/1/	Document Review Interview	1. Checked: the stakeholder meeting was held near the project site. Personal invitations were sent to community leaders, local People's Committee representatives, media etc. and public notices of the planned consultations were placed in National Resources and Environmental Newspaper which is widely published and read in provinces. In the consultation meeting, presentations were made by the project owner and consultant who outlined the planned project activity in a non-technical manner (including environmental, social and technological considerations), climate change, the role of the Clean Development Mechanism and annual emission reductions potential. 2. There were twenty participants attending the meeting. The questions received in the stakeholder meetings and answers	OK	

VALIDATION REPORT

 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					from the project developers, are summarized in Section E.2. 3. How to handle comments from stakeholders are provided appropriately in Section E.3.		
	I. Environmental Impacts <i>In this section, it is assessed that project participants shall submit documentation on the analysis of the environmental impacts of the project activity in accordance with paragraph 37(c) of the CDM modalities and procedures.</i>	Para 131					
	I.1. Has it been confirmed, by means of a document review and/or using local official sources and expertise, whether the project participants have undertaken an analysis of environmental impacts and, if required by the host Party, an environmental impact assessment?	Para 132 (Para133)	/1/ /16/	Document Review Interview	1. Checked: the Validation Team checked the EIA report which included potential environmental impacts by the proposed project to the neighboring area and how to minimize the identified impacts. The Validation Team noted the approval letters issued by the Gia Lai Provincial People's Committee on 31 Jan. 2008. It was therefore concluded that project does not have any significant environmental impacts.	OK	
	J. Duration of the Project/ Crediting Period <i>It is assessed whether the temporal boundaries of the project are clearly defined.</i>						
	J.1. Is the operational lifetime of the project activity		/1/	Document	1. Checked: the lifetime of the proposed	OK	

VALIDATION REPORT

 KEMCO	Validation Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	clearly defined and reasonable?			Review	project is 30 years		
	J.2. Is the assumed crediting time clearly defined and reasonable (renewable crediting period of max. two times 7 years or fixed crediting period of max. 10 years)?		/1/	Document Review	1. Checked: the crediting period for the proposed project activity is seven years with renewal.	OK	
	J.3. Is the assumed crediting time chosen as below the operational lifetime of the project activity?		/1/	Document Review	1. Checked: it is confirmed that the assumed crediting time is chosen as below the operational lifetime of the project activity.	OK	

 VALIDATION REPORT

Table 3. Resolution of Corrective Action and Clarification Requests

Non-conformities	Reference	Corrective Actions	Comments
1. CAR 1: It was found that the sensitivity analysis excluded one favorable condition, the increased power tariff, which can significantly influence the IRR value for the proposed project. It is therefore requested to complete the sensitivity analysis. In addition, the calculation spreadsheets for the sensitivity analysis are slightly wrong. The error should be therefore corrected.	Table 2. Section F.9	The sensitivity analysis has been elaborated by calculating the IRR with a 10% increase of power tariff. In addition, minor calculation errors have been corrected.	It is confirmed that the sensitivity analysis is properly corrected. Therefore, the NC is closed.
2. CAR 2: It was found the GEF (grid emission factor) in Vet Nam in the PDDs was not updated in line with the latest version of Tool to calculate the emission factor for an electricity system which requires the GEF to be calculated with the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. It is requested to take conservative values in accounting for GEF. It should be further confirmed that the most up-to-date data is used to	Table 2. Section E.11	The project proponent has submitted to the Validation Team the letter from the responsible person from EVN (Electricity of Viet Nam) confirming that the data from power plants in the report “Report on the Operation of Vietnam National Electricity System in years 2005-7” is the latest data available.	It is properly evidenced that the project proponent uses the most up to-date data in calculating the grid emission factors (GEF). In addition, the GEF was properly updated in line with the latest version of Tool to calculate the emission factor for an electricity system which requires the GEF to be calculated with the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. The NC therefore is closed.

VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
account for the baseline emission factor.		Further Corrective Action : Based on the request for review, the project proponent voluntarily decided to use the GEF which the Vietnamese DNA has published through the report “STUDY, DEFINITION OF VIET NAM GRID EMISSION FACTOR”. This has been published in order to provide one standardised grid emission factor for the country. It is the official version and its use is now required by the DNA of Viet Nam. At the time the PDD for the proposed project went to validation (25/03/2009) and submission to EB (10/02/2010), the report had not yet been made available to DOEs. The PDD was amended to use the DNA GEF which is more conservative and also uses more recent (2006-8) data.	It is properly evidenced that the project proponent uses the most up-to-date data in calculating the grid emission factors (GEF). KEMCO interviewed with the responsible person of DNA in Vietnam and confirmed that the GEF was properly calculated in line with Tool to calculate the emission factor for an electricity system. The NC therefore is closed.
3. CAR 3: The monitoring plan states that the meters are to be calibrated by the relevant authority in accordance with Article 6.3 of the Power Purchase Agreement. But, it was found during the site visit that the Power Purchase Agreement had not been signed yet. This discrepancy should be addressed in the PDD.	Table 2. Section G.1	The relevant paragraphs mentioning PPA has been revised considering that the monitoring practice will follow the PPA after it is signed.	The monitoring plan is properly corrected. Therefore, the NC is closed.

VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
<p>4. CL 1: The common practice analysis for the proposed project was carried out across the national boundary. But, the list of hydropower plants for the Common Practice Analysis is not clearly referenced.</p>	<p>Table 2. Section F.14</p>	<p>For the common practice analysis, all the existing and planned plants in Viet Nam between 2004 and 2008 are assessed with reference to National Master Plan 2006, EVN report, and EU background report. It is then demonstrated that the majority of hydro power plants are developed by the State in the form of state owned IPPs, EVN ownership or by the state taking a shareholding in the power producer (76% of projects listed). In addition, of the plants remaining, there are few that would cross the CDM large scale / small scale threshold of 15MW generation capacity as Dak Srong 2 does (only 21% of projects). It is hence concluded construction of hydro power plants of the size of Dak Srong 2 by private corporations is not a common practice in Vietnam. Further it is noted that for those plants for which no information could be publically found, it has been conservatively assumed that there is private ownership.</p>	<p>The Validation Team particularly noted that among 34 hydropower plants with a capacity of 15 to 100 MW, most of them were invested by the state-owned IPP or EVN (state-owned electricity company), and only one project was invested by a private company and three projects provided no specific information on investors. Considering projects invested by the government side can maintain stronger positions than ones invested by the private sector, it is concluded that similar activities to the project activity which are invested by the private IPP are not widely observed and commonly carried out in the region. Furthermore, the selected power plants for the common practice analysis are evidenced by the letter from the responsible person in the government confirming that there are no later or more accurate sources data on hydro power plants in comparison with Master Plan 2006 in Viet Nam. Therefore, the NC is closed.</p>

VALIDATION REPORT

Non-conformities	Reference	Corrective Actions	Comments
5. CL 2: According to PDD, Viet Nam is importing electricity from China. It should be therefore clarified in the PDD how to deal with the electricity imports in accounting for the baseline emission factor.	Table 2. Section E.10	Vietnam currently imports electricity from China to make up for the shortfall in supply from its own generation system. Whilst the emission factor of China's grid is higher than that of Vietnam's, as a conservative approach, this PDD has considered these imports as zero emissions whilst taking into account their contribution to the overall power generation of Vietnam.	It is confirmed that a conservative approach has been taken in considering electricity imported from China. Therefore, the NC is closed.
		Further Corrective Action: Following request for review, the project proponent elected to change the GEF used in the PDD to that described in the report "STUDY, DEFINITION OF VIET NAM GRID EMISSION FACTOR". It is seen that this report takes a conservative approach by considering the emissions due to electricity imported from China to be zero.	It is confirmed that a conservative approach has been taken by the DNA in considering electricity imported from China. Therefore, the NC is closed.




Appendix B

CVs of Validation Team




 VALIDATION REPORT

 KEMCO	<h2>Personal History</h2>		
Family name	HAN	Date of Birth	23/06/1971
Given name	Seung-Ho	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4883
Position	Manager	Fax No.	+82-31-260-4886
Address	1157, Pungdukchun 2, Suji, Yongin, Gyeonggi, 448-994, Republic of Korea		E-mail shhan@kemco.or.kr
Title	Proposed Title		Qualification
	Full-time Lead Validator/verifier - KEMC-B-1100, Paragraph 6.2(1)		<input checked="" type="checkbox"/>
Sectoral Scope	Proposed Sectoral Scope		Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-1 Renewable Energy Power Generation	<input checked="" type="checkbox"/>
	14. Afforestation and reforestation	14-1 Afforestation and Reforestation	<input checked="" type="checkbox"/>
	15. Agriculture	15-1 Manure Management	<input checked="" type="checkbox"/>
Work experience			
* Please describe every employment you have had			
From	to	Details of Duties	
2000-03-01	2002-01-01	Supporting National Climate Change Policy, Climatic Change Mitigation Department, KEMCO	
2006-01-23	present	Conducting validation and verification of GHG reduction projects, GHG Certification Office, KEMCO	




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 KEMCO	Personal History			
	Family name	HWANG	Date of Birth	12/02/1969
	Given name	In-Chul	Sex	Male
	Organization	KEMCO	Phone No.	+82-31-260-4555
	Position	Associate Manager	Fax No.	+82-31-260-4549
	Address	1157, Pungdukchun-2-dong, Yongin, Gyeonggi, 448-994, Republic of Korea	E-mail	manmandi@kemco.or.kr
Title	Proposed Title			Qualification
	Full-time Validator/verifier - KEMC-B-1100, Paragraph 6.2(2)			<input checked="" type="checkbox"/>
Sectoral Scope	Proposed Sectoral Scope			Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-1 Renewable Energy Power Generation		<input checked="" type="checkbox"/>
Work experience				
* Please describe every employment you have had				
From	to	Details of Duties		
1994-05-09	1998-12-03	Management of accounting related activities, General affairs Department, KEMCO		
1998-12-04	2002-01-01	Assessment of finance on energy efficiency projects, Financial Planning team, KEMCO		
2002-01-02	2004-01-31	Support of national climate change policy, Climatic Change Mitigation Department, KEMCO		
2004-02-01	2004-08-19	Management of accounting related activities, General affairs Department, KEMCO		
2004-08-20	2005-12.31	Development of national energy efficiency policy, Policy Research Department, KEMCO		
2006.01.01	2006.07.31	Support of NRE policy, New&Renewable Energy Center, KEMCO		
2006-08-01	2008-07-31	Master Degree Study at Univ. Of Texas at Austin(Energy&Earth Resources)		
2008-08-01	2009-05-10	Validation & verification of GHG reduction projects, GHG Certification Office, KEMCO		
2009-05-11	present	Support of national climate change policy, Carbon Market Department, KEMCO		



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 KEMCO	<h2>Personal History</h2>		
Family name	KIM	Date of Birth	05/01/1955
Given name	Chul-Ha	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4506
Position	Process Consultancy Team Leader	Fax No.	+82-31-260-4439
Address	1157, Pungdukchun-2-dong, Yongin, Gyeonggi, 448-994, Republic of Korea	E-mail	chkim@kemco.or.kr
Title	Proposed Title		Qualification
	Full-time Lead Validator/verifier		<input checked="" type="checkbox"/>
Sectoral Scope	Proposed Sectoral Scope		Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-1 Renewable Energy Power Generation	<input checked="" type="checkbox"/>
		1-2 Fuel consumption for Power or/and Heat Generation	<input checked="" type="checkbox"/>
	3. Energy demand	3-1 Efficiency Improvement for Electricity Consumption	<input checked="" type="checkbox"/>
Work experience			
* Please describe every employment you have had.			
From	to	Details of Duties	
1973-01-01	1974-06-21	Management of pharmaceutical products manufacturing, Dong A Pharmaceutical Co., Ltd	
1974-06-22	1982-03-08	Management of energy related industrial products manufacturing, Dong Myeong Industry Co., Ltd	
1982-03-09	1985-11-19	Management of energy related industrial products manufacturing, Keumkang Co., Ltd	
1985-11-20	1986-07-31	Demand side management on industry sector, Industrial Energy Department, KEMCO	
1986-08-01	1991-03-15	Process consultancy, Energy Consulting Department, KEMCO	
1991-03-16	1993-08-15	Demand side management on industry sector, Community Energy Department, KEMCO	
1993-08-16	1998-01-14	Operation of co-generation plant, Business Promotion Department, KEMCO	
1998-01-15	1998-11-30	Process consultancy, Energy Consulting Department, KEMCO	
1998-12-01	2002-01-01	Demand side management on industry sector, DSM Department, KEMCO	
2002-01-02	2004-08-19	R&D project management of electricity sector, R&D Department/Electric Energy Team, KEMCO	
2004-08-20	present	Process consultancy, Energy Consulting Department, KEMCO	



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