VERIFICATION REPORT

THANH THUY HYDROPOWER PROJECT

REPORT NO. GHGCC(E)12-002

REVISION NO. 3.3

GHG CERTIFICATION OFFICE

KOREA ENERGY MANAGEMENT CORPORATION

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Approved by: Chang Hoo, LEE	Organisational unit: GHG Certification Office, Korea Energy Management Corporation
Client: Bunge Emissions Holdings Sarl	Client ref.: Francois Louis Gigante
Monitoring Period	03/05/2011 ~ 29/02/2012
Category (Sectoral Scope)	Energy Industries (renewable/non-renewable sources) (1)
First Monitoring Report (version and date)	Version 1.0, 14/03/2012
Final Monitoring Report (version and date)	Version 2.0, 26/07/2012

Summary:

The Korea Energy Management Corporation (KEMCO) verification team has conducted the first verification of the "Thanh Thuy Hydropower Project" to ensure that the claimed emission reductions attributable to the project during the monitoring period are 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.

The verification of Thanh Thuy Hydropower Project consisted of following three phases:

1) Desk review of the monitoring methodology and monitoring plan, and relevant data and information;
2) On-site assessment of monitoring practices and records, and interviews with relevant monitoring and management personnel; and,
3) Resolution of outstanding issues and issuance of the final verification report and statement.

During the verification, the team assessed, using objective evidence, the completeness and accuracy of the claimed emission reductions and conservativeness of the assumptions made in the monitoring report. In addition, the team assessed whether the monitoring of emission reductions were carried out in compliance with the relevant requirements set out in the CDM modalities and procedures, the applicability conditions of the selected monitoring methodology and guidance issued by the CDM Executive Board.

In conclusion, the verification team is of the opinion that the Thanh Thuy Hydropower Project has achieved an emission reduction of 12,721 tCO_2e in the period of 03/05/2011 to 29/02/2012 in compliance with all applicable requirements for the CDM by properly implementing the data management system and quality control system.

Report No.: GHGCC(E)12-002	Subject Group:	
Report title: Thanh Thuy Hydropower Project		
Work carried out by: Kim, Dae-Hwan (Team Leader), Lee, Young-seop (Under Observation)		
Work reviewed by: Han, Seoung-Ho		
Date of this revision: 19/10/2012	Rev. No.: 3.3	Number of pages: 51

Indexing terms

UNFCCC/Kyoto Protocol/CDM
Validation / Verification

Abbreviations

AM	Automatic Meter
BM	Backup Meter
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification Request
CMP	CDM Modalities and Procedures
COP/MOP	Conference of the Parties serving as the meeting of the Parties to thy Kyoto Protocol
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DOE	Designated Operational Entity
EVN	Electricity of Viet Nam
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KEMCO	Korea Energy Management Corporation
LOA	Letter of Approval
MM	Main Meter
MP	Monitoring Plan
MoV	Means of Verification
PDD	Project Design Document
QA	Quality Assurance
QC	Quality Control
UNFCCC	United Nations Framework Convention on Climate Change
(CDM) VVM	Clean Development Mechanism (CDM) Validation and Verification Manual

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1 INTRODUCTION

Bunge Emissions Holdings Sarl has commissioned Korea Energy Management Corporation (KEMCO) to perform the first verification of the "Thanh Thuy Hydropower Project" (hereafter called "the project").

It was identified that the project has undergone a permanent change in the project design as compared to the registered project design document. The change is in terms of capacity of the Thanh Thuy hydropower plant from 18 MW to 20 MW. Indeed the capacity of cascade 1 was changed to 11 MW from 10 MW and the capacity of cascade 2 was changed to 9 MW from 8 MW. This change needed to request approval of changes with relevant documentation in accordance with the "Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document" before verification. According to the Procedures, the verification team requested approval of the changes with the revised PDD (v 3.3) and supplemental documentation on 20/04/2012 and the request was approved on 20/07/2012 at the UN 68th EB meeting (please see meeting report paragraph 82).

All the verification by KEMCO was implemented based on the revised PDD. This report summarizes the verification findings for the project, as well as means of verification to assess the correctness of the information provided by the project participants.

The verification team consisted of the following personnel:

Role	Name	Organization	Technical areas	Participation	
				Desk review	Site visit
Team Leader, Technical Area Expert	Kim, Dae-Hwan	KEMCO GHG Certification Office	1-2, 13-1	✓	✓
Team Member	Lee, Young-seop (Under observation)	KEMCO GHG Certification Office	1-2	✓	✓
Technical reviewer	Han, Seung-Ho	KEMCO GHG Certification Office	1-2, 13-2, 14-1, 15-2	-	-

1.1 Objective

The purpose of verification is to ensure that the project activity has been implemented and operated as per the registered PDD. In particular, it will be verified that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place, and actual monitoring practices and data management are in accordance with the monitoring methodology and all applicable CDM requirements.

1.2 Scope

The verification scope is defined as an independent and objective review of:
- Physical features of the project;
- GHG sources and types to be included within the project boundaries;
- Monitoring plan and practices;
- Calculation of emission reductions;
- Accuracy of data collected, transferred, and reported; and,
- Data management system.

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

1.3 Project Description

Thanh Thuy Hydropower Project is a grid-connected hydropower project which is situated in Xin Chai, Thanh Duc and Thanh Thuy communes, Vi Xuyen District, Ha Giang Province in the north of Viet Nam and utilizes the Thanh Thuy stream which starts from mountain ranges in Viet Bac region with a steep gradient.

The project consists of a run-of-river hydropower plant and does not utilize an accumulation or a run-of-river reservoir for water storage during times of low rain fall or water flow. The main constructive structures of the project consist of two cascades with intake points with a gate, forebay/pressure intakes, penstocks and powerhouses containing turbines and generators, transformer etc. But the construction of cascade 1 has been being delayed due to economic difficulties. The total installed capacity of the project shall be 20 MW once completed, with total expected annual net generation of 76,665 MWh of electricity (as described in the PDD v3.3, henceforth referred to as "the registered PDD", please see Section 3.1). The project delivers electricity to the national grid system via a new 35kV transmission line and subsequently a 110kV line at the outgoing feeder. As per the registered PDD, it was expected that CO_2 emission reductions achieved by the project activity to be approximately 44,190 tCO2e/yr. The expected emission reduction of the cascade 2 was ex-ante estimated to 19,885 tCO2e/yr).

The project activity for registration is validated by another DOE (SQS) and the registration date is 03/05/2011. The project participants selected the renewable crediting period of which the first period spans from 03/05/2011 to 02/05/2018. The first monitoring period which the project participants claim emission reductions is about ten months, from 03/05/2011 to 29/02/2012, and resulting emission reductions are 12,721 tCO_2. The emission reductions claimed by the project participants for this monitoring period are below the expected annual amount of emission reductions during the crediting period in the registered PDD.

2 METHODOLOGY

The verification may consist of the following three phases:

1. Desk review of the monitoring methodology and monitoring plan, and relevant data and information;
2. On-site assessment of monitoring practices and records, and interviews with relevant monitoring and management personnel; and,
3. Resolution of outstanding issues and issuance of the final verification report and statement.

In order to ensure transparency, a verification 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 verifying the identified criteria. The verification protocol serves the following purposes.

- It organizes, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the results of the verification.

The verification protocol consists of two tables. The different columns in these tables are described in Figure 1. The completed verification protocol is enclosed in Appendix A to this report.

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

1. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
2. Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impair the estimate of emission reductions;
3. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

The verification team may also raise Clarification Request (CL), which would be where:

1. Information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

The verification team may raise a forward action request (FAR) during verification for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

Figure 1 Verification protocol tables

Verification Protocol Table 1: Requirement checklist				
Checklist Question /VVM Criteria	***Reference***	***Means of verification (MoV)***	***Comments***	***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 verification team has identified a need for further clarification.*

Verification Protocol Table 2: 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***	***Verification conclusion***
If the conclusions from the draft Verification 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 verification team should be summarised in this section.*	*This section should summarise the verification team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

2.1 Review of Documents

The Monitoring Report (Version 2.0) dated 26/07/2012 (Monitoring Period: 03/05/2011 ~ 29/02/2012) was assessed along with additional background document /3/ - /27/ related to the project design, baseline and monitoring were assessed as a part of verification. The desk review focused mainly on the following aspects:

- Implementation in accordance with the registered project design document;
- Compliance of the monitoring plan with the monitoring methodology;
- Compliance of monitoring with the monitoring plan; and,
- Assessment of data and calculation of greenhouse gas emission reductions.

2.2 Site Visit and Interviews

On 05/04/2012, KEMCO conducted the site visit and performed the physical site inspection and interviews with project stakeholders in order to confirm compliance of the project implementation with all applicable CDM requirements and to resolve issues identified in the desk review. As a part of the site visit, site manager and operators of Viet Long Industry Joint Stock Company and project consultants of Kyoto Energy Pte Ltd. were interviewed. The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
Viet Long Industry Joint Stock Company	➢ Facilities installation and project implementation ➢ Monitoring methods and frequency ➢ Data collection, transfer, and reporting ➢ Monitoring data QA/QC ➢ Data management system
Kyoto Energy Pte Ltd.	➢ Application of monitoring methodology ➢ Monitoring plan ➢ Emission reduction calculation

2.3 Clarification, Corrective Action and Forward Action Requests

As a result of the desk review and subsequent site visit, the KEMCO verification team raised Clarification and Corrective Action which were presented to the project participants in the form of KEMCO's NC report as of 10/04/2012. In addition, it was informed to the project participants that the verification team could not request issuance of CERs claimed during the selected monitoring period unless all CARs and CLs are closed out. To guarantee the transparency of the verification process, the concerns raised are documented in the verification protocol in Appendix A.

2.4 Internal Quality Control

The final verification report gone through technical review before requesting issuance of CERs claimed during the selected monitoring period. The technical review was performed by the technical reviewer qualified in accordance with KEMCO's Procedure for Review of Validation and V&C mainly in terms of verification procedures and results, and approved by Director of KEMCO's GHG Certification Office.

3. VERIFICATION FINDINGS

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

1) The findings from the desk review of the monitoring report and relevant documents, and the findings from physical site inspection and interviews during the site visit are summarized. These findings are described in detail in the verification protocol in Appendix A.
2) Where the verification team had identified issues that needed clarification or that represented a risk to the fulfillment 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 Verification Protocol in Appendix A. The verification of the project resulted in one Corrective Action Requests and three 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 summarized.
4) In conclusion, the verification opinion of the verification team has been presented.

The final verification findings are based on the revised monitoring report (Version 2.0, dated 26/07/2012) and re-submitted supporting documentation.

Based on the results of this assessment, the verification team issued one Corrective Action Request (CAR), and three Clarification Requests (CLs) which were cleared. In addition, it is confirmed that the four Forward Action Requests (FARs) that were raised during the validation of the project were satisfactorily closed out.

3.1 Project implementation in accordance with the registered project design document

As per section 1.3, the project underwent a design change which was approved by the CDM Executive Board at EB68 (meeting report paragraph 82). In order to check whether any deviation from the registered PDD occurs in terms of the project facilities, the verification team reviewed a schematic technical diagram and looked carefully at all the structures, plant and surroundings during the site visit on 05/04/2012. Through the document review and physical inspection, the verification team confirmed that an intake, penstock, pressure tank and a powerhouse containing three turbines and three generators for the cascade 2 hydropower plant in place in accordance with the registered PDD.

During the site visit, it could be verified that only cascade 2, with an installed capacity of 9MW has come into operation and the construction and operation of cascade 1, with 11MW capacity, has been delayed due to economic difficulties.

It was also confirmed by checking a schematic technical diagram, direct observation during site visit and interview of the project participant that land clearance and compensation process

for the cascade 1 are fully completed and the construction is expected to be completed by June 2014.

The verification team also checked monitoring parameters and monitoring equipments. It was confirmed by consulting a schematic technical diagram and direct observation during the site visit that as described by the registered PDD, the main meter which measures exported electricity and imported electricity at the same time was located in the powerhouse of the hydropower plant to measure net electricity supplied to the grid. In addition, it was also identified that two backup meters were installed beside the main meter for emergency situations and ensuring QA/QC of the monitoring system although one BM was planned in the PDD. And the verification team checked by review of calibration reports that the main meter and backup meter installed at the project site were calibrated as defined in the registered monitoring plan. Particularly it was also confirmed by checking the serial number at the monitoring parameters that meters were properly installed. All the meters were initially calibrated on 25/04/2011 before installation. The second backup meter (BM2) malfunctioned in November 2011 and started to be operated again on 15/11/2011 after recalibration by EVN (Electricity of Viet Nam), as it could be verified by checking the new calibration certificate.

Upon examination of data log books, commissioning reports and electricity sales receipts to confirm the operational status of the project, the verification team concluded that the net electricity by the project is delivered to the national grid system via a 35kV transmission line and subsequently 110kV transmission line. The project owner, Viet Long Industry Joint Stock Company, started to sell the electricity to the power purchasing company, EVN, from 29/06/2011 in accordance with the power purchasing contract.

But one CL is raised and closed in regard with the monitoring as follows;

- **CL1**: The monitoring of the project was started on 29/06/2011 although the starting date of the monitoring period in the monitoring report the project participant submitted was 03/05/2011. It should be checked and clarified. (See Appendix A. Checklist A.2);
  - **Corrective Action**: The commercial operation of the cascade 2 was expected in 04/2011. But it was delayed around 3 months to 29/06/2011 due to some difficulty in loan disbursement from bank during the last stages of the construction, which resulted in delay in the originally planned completion of construction of the project activity.
  - **Conclusion**: It was confirmed by checking the UNFCCC website and a commissioning report of the project that the start date of the monitoring period is 03/05/2011 on which the project was registered, and the project has been operated from 29/06/2011. As a result, the Table 5 showing the monthly emission reductions in the monitoring report was a little corrected by the PP to clarify the operation delay. The raised NC is closed.

During the site visit, the verification team also checked whether there is any fossil fuel consumption for the project activity. The team confirmed that the project's internal needs are satisfied in one of two ways; using a part of the electricity generated by the project itself when the hydropower plant is operational or by using electricity imported from the grid when the

hydropower plant is not operational. In either case there are no fossil fuel consumptions onsite. In both cases, the electricity consumed is taken into account for the calculation of emission reductions. In the first case, the consumption occurs before the monitoring point for the main (and backup) meter(s). Hence the exported electricity monitored is the net electricity generation excluding this internal consumption. In case of the electricity from the grid, this amount is monitored by the main (and backup) meter(s) and is properly deducted from the exported electricity to account for the net generated electricity delivered to the grid which is used to calculate emission reductions.

The emission reductions claimed by the project participants are below the amount estimated at the project design stage. It is considered that the difference comes from water availability because there was not any downtime for the monitoring period. But the clarification was raised and closed regarding the emission reductions as below;

- **CL3**: Actual emission reductions claimed by the PP during this monitoring period were compared with estimates in the registered PDD. The estimated amount in the PDD was based on the full operation of two cascades during a full of one year, but the monitored emission reductions come from the operation of just cascade 2 during 8 months. It should be checked and clarified (See Appendix A. Checklist A.2);
  - **Corrective Action**: The ex-ante value in E.5 of the monitoring report was recalculated based on operation of just cascade 2, operating for 8 months. 19,885 CERs is the ex-ante estimation of emission reduction over a whole year in the registered PDD for cascade 2. Only 8 months are claimed in this monitoring report, and the missing 4 months belong to the project's dry season. These 8 months of monitoring correspond to 69.22% of the yearly average river flow according to the project feasibility study. The comparable value is then: 13,764 = 19,885 * 69.22%.
  - **Conclusion**: The validation team confirmed by the revised monitoring report and the historical data of feasibility study report that the ex-ante emission reductions were properly calculated considering that the value come from just cascade 2 operation during 8 months and was based on the historical data during 47 years(1960~2006). The raised NC is closed.

In conclusion, verification team confirmed that all physical features of the newly registered PDD (v3.3) are in place and the CDM project activity has been operated as per the newly registered PDD.

3.2 Compliance of the monitoring plan with the monitoring methodology

The methodology applied for this project, ACM0002 (Version 11) stipulates that monitoring shall consist of metering the electricity generated by the renewable technology.
The verification team reviewed a schematic technical diagram, data log books of monitored data and calculation sheets to check compliance of monitoring plan with the monitoring methodology. It was confirmed that the net electricity generated and delivered to the grid by the project activity is monitored continuously by the backup meters as well as a main meter as

stipulated in the applied methodology, ACM0002 (Version 11) and as per the registered monitoring plan. The baseline emissions are calculated by multiplying the monitored net quantity of electricity generated and delivered to the grid by the CO_2 emission factor according to the methodology. It was also confirmed that considering project emissions as zero is in accordance with the applied methodology because the project does not have a reservoir and does not utilize fossil fuels for the activity as mentioned in Section 3.1 of this report. And leakage emissions are also considered as zero according to the applied methodology and the registered PDD.

All monitoring parameters and monitoring method were reviewed to decide necessity of a revision or a deviation on the monitoring plan. It was confirmed by data log books and calculation sheets that the project does not need to request a revision or a deviation of the monitoring plan because the monitoring plan conforms to the monitoring methodology, and the project activity has been also conducted in accordance with the applied methodology. An interview with the Vice Director during the site visit supports these conclusions.

The verification team reviewed whether monitoring aspects that are not specified in the methodology exist on this monitoring plan. Each backup meter has been installed to be used in case of failure of the main meter. This point was confirmed by direct observation, calibration report, reading of the EVN receipts and interview with an operator during the site visit.

The verification team has verified that the validated monitoring plan is in accordance with the approved methodology applied by the proposed CDM project activity. No monitoring aspects that were not specified in the methodology could be identified.

Hence, the verification team confirms that the monitoring plan of the proposed CDM project activity is complying with the applied methodology.

3.3 Compliance of monitoring with the monitoring plan

The verification team checked whether emission sources and monitoring parameters are in accordance with the registered monitoring plan. It was confirmed by a schematic technical diagram and direct observation during the site visit that quantity of net electricity generation supplied by project activity is the only monitoring parameter and the project activity does not use fossil fuel (e.g. in a backup generator), as described in the PDD. It was also found during the site visit that some of the electricity generated by the hydropower facilities is used for lighting and operating purposes in the project site, but the amount of electricity used in the project boundary is automatically excluded from emission reductions because after electricity used for the site, the net electricity is monitored before the connection point with the national grid.

It was confirmed that the monitoring procedure is established and performed in line with the monitoring plan contained in the registered PDD. The monitoring report describes that net electricity delivered to the grid as a monitored parameter is measured continuously and

recorded monthly. In order to confirm whether in practice the monitoring has been conducted in accordance with the monitoring plan or not, the verification team reviewed a schematic technical diagram and data log books and performed direct observation and interview with an operator during the site visit. It was confirmed that the project activity has been properly implemented and monitored in line with the monitoring plan and the applied methodology; The amount of net electricity by project activity was measured continuously by a main meter (MM), a backup meter 1 (BM1) and a backup meter 2 (BM2). And as per Power Purchasing Agreement between the Project owner and EVN (Electricity of Viet Nam), an operator of project site and an EVN staff member as a representative of power purchasing company read together and record respectively net electricity value of the last day of each month, at 12 o'clock midnight which is stored in the memory of the meters. The operator records the values of each month in log books and files them in a computer at the powerhouse, and the Project owner and EVN agree the minutes of meter value confirmation task which is subsequently used to make electricity sales receipts. Finally, the EVN issues an electricity sales receipt after the Project owner's confirmation.. Hence the parameters stated in the monitoring plan have been sufficiently monitored and updated as applicable.

It was also confirmed that the monitored data is recorded and kept in safety to ensure continuous project management. During the site visit, the verification team confirmed that the data monitored by the MM and the two BMs is handwritten in a log book on monthly basis and then the data is stored in a computer of the project site as log files. All the data collected in the computer at the project site is sent to a project consultant's computer to ensure safe data archiving. This point was confirmed by review of data log books, the files stored in a site computer and an operator's statement which was in agreement with the monitoring report and documented evidences.

With regards to monitoring organization, the monitoring report describes concretely the structure, staff and responsibilities of the monitoring team. The cascade 2 of the proposed project activity operated by four shifts, of which one shift consists of one head and 1~3 operators, and a site supervisor, a Project Director and CDM consultants are also included in the monitoring team. The verification team confirmed that operators carried out properly their responsibility for monthly recording. A site supervisor checks initially the recorded data checking for significant changes against previous readings, unexpected values or anomalies and regularly provided such data to the Project Director for monthly cross-check with EVN records to issue electricity sales receipts against metered data. Finally, a Project Director cross-checks the recorded date of the project site with a confirmation report from EVN. The recorded data is transferred to the PP's CDM consultant monthly for external audit.

The monitoring report explains that a training program for the monitoring staff was conducted on 14/09/2011 to inform them of project details and its monitoring plan requirements. During the site visit, the verification team interviewed a site operator and it was found that the operator had a proper understanding of the training program contents. Training material and the attendance list were checked during the site visit showing that the training program was successfully performed.

The verification team assessed whether all parameters stated in the monitoring plan and the applied methodology have been sufficiently monitored and updated as applicable. Net

electricity, the only monitoring parameter, is measured continuously by a main meter and backup meters to calculate baseline emissions as described in the monitoring plan. This point was confirmed by log books, log files, electricity sales receipts and interview with a Vice Director and a supervisor during the site visit.

With regard to a fixed parameter for the baseline emissions, it was confirmed that 0.5764 tCO_2/MWh is used for a CO_2 emission factor as described in the registered PDD. And it was also verified by review of calculation sheets that the claimed emission reductions do not consider leakage emissions as none are attributable to the project (in line with the applied baseline and monitoring methodology).

The verification team also reviewed the compliance of monitoring with the registered monitoring plan relating to the monitoring equipment and their management. The verification team confirmed by calibration reports and a commissioning report that the main meter and backup meters were calibrated on 25/04/2011 before commercial operation of cascade 2 of the hydropower plant. It was also confirmed by the calibration reports that recalibration of the meters was not needed because validity term of the meters is three years. And the accuracy of the main meter, backup meter 1 and backup meter 2 is 0.2%, 0.2% and 0.5% respectively. The meters were calibrated by the power purchasing company's testing center (Northern Electrical Testing Company) which is in charge of the meter management according to the power purchasing contract and is authorized by the Viet Nam accreditation body for calibration. In case of BM 2, the meter malfunctioned in November 2011 and has been being operated again after recalibrating by the testing company. It was confirmed by reviewing the Instrument Incident Report, the new calibration certificate and through the interview with an operator. The verification team concluded that the calibrations of the meters for monitoring net electricity were done according to the monitoring plan. Indeed, the monitoring results are consistently recorded as per approved frequency and the quality assurance and quality control procedures have been applied in accordance with the monitoring plan.

But a Clarification Request is raised and closed in regard with the backup meter 2 as follows ;

- **CL2** : Serial number and recalibration date of the backup meter 2 in the monitoring report are different with a calibration report of the meter. The discrepancy should be checked and clarified. (See Appendix A. Checklist C.1);
  - **Corrective Action**: The actual serial number of the backup meter 2 is 96648542, however, in the first calibration certificate issued by the EVN on 25/04/2011, the serial number was incorrectly recorded as 96645842. This was a typographical error. Hence, the project owner requested that the EVN provided another one with the correct serial number. The EVN then reissued the calibration certificate on 23/02/2012 for backup meter 2, with the correct serial number. There was a typo of the recalibration date of backup meter 2 in the monitoring report. The recalibration date of backup meter 2 in the monitoring report is now corrected in the monitoring report to be in line the date in the calibration (15/11/2011).
  - **Conclusion**: The validation team checked the calibration certificate of the backup meter 2 reissued by EVN and confirmed the serial number of the meter in the certificate was in accordance with the monitoring report and with the serial number of the meter installed onsite. And it was also confirmed that the

recalibration date of the backup meter 2 was properly corrected showing that it is same with the recalibration certificate. The raised NC is closed.

It was confirmed that the QA/QC procedures of the monitoring report are in line with the registered monitoring plan and the procedures are properly implemented. The monitoring report describes that data recorded from a main meter cross-checked with electricity sales receipts and backup meters are operated to be used in the event of the main meter failure as described in the monitoring plan. Upon investigation of monthly log files, the minute of meter value confirmations and calibration reports of a backup meter, it was identified that main meter values have been recorded on a monthly basis and electricity sales receipts have been made monthly by a project owner and a power purchaser, and backup meters have been operated and calibrated as per the monitoring plan. In addition, the data is kept as an electronic form in a computer of the site and sent to project consultants monthly for archiving.

During the initial validation of the project implemented by SQS, four FARs were raised regarding the monitoring of the project. The verification team identified that the raised issues had been naturally covered as part of the verification process, but the verification team assessed again the raised issues according to the VVM v1.2 para 183 and finally closed the issues as below;

- **FAR1** : The calibration status of Monitoring equipments has to be submitted to DOE to be concluded at the verification stage;
  - **Corrective Action**: Calibration reports /9/ - /13/ and evidence of commissioning /6/ were submitted., and details are provided in Annex 1 of the monitoring report.
  - **Conclusion**: The PP submitted the commissioning report dated on 29/06/2011 to the verification team. Each calibration report of the main meter (MM), backup meter 1 (BM1) and backup meter 2 (BM2) issued on 25/04/2011 was also submitted. Recalibration report of BM2 due to malfunction in November 2011 was also identified by the verification team. And the calibration report reissued by EVN due to a mistype error in the serial number (please refer to the CL2) was also submitted to the validation team. The verification team could confirm by the commissioning report and calibration reports that the calibrations of the meters for monitoring net electricity were done according to the monitoring plan. Indeed, the monitoring results are consistently recorded as per approved frequency and the quality assurance and quality control procedures have been applied in accordance with the monitoring plan. Annex 1 of the monitoring report was found to be accurate. Thus this FAR is closed.

- **FAR2** : The monitoring manual has to be established to be concluded at the verification stage;
  - **Corrective Action**: The monitoring manual has been established and supplied to DOE during the verification process.
  - **Conclusion**: The verification team confirmed by reviewing the Internal Monitoring Plan (IMP) /14/ (equivalent of "Monitoring Manual") that it was completed on 08/05/2011 that the PP established the monitoring manual. A copy of the IMP was also seen at the control room in the project site. The IMP included

the guidelines to monitor the project including position and responsibilities of a monitoring team, monitoring parameters, detailed monitoring tasks, maintenance and calibration of monitoring instruments, emergency procedures, monitoring plan improvement and external audit procedure. And it was also confirmed that the monitoring system has been sufficiently explained in the section C of the monitoring report in accordance with the IMP. This FAR is closed.

- **FAR3** : The training plan and the training proofs have to be submitted to the DOE to be concluded at the verification stage;
  - **Corrective Action:** Internal monitoring plan (including training frequency), training presentation materials and attendance list have been supplied to DOE during verification process.
  - **Conclusion** : It was confirmed that the IMP submitted by the PP also includes training plan to ensure adequate training of staff. The verification team also checked the training material and the attendance list, and confirmed that the training program was successfully performed on 14/09/2011. And the verification team interviewed with a site operator during the site visit and it was found that the operator had a proper understanding of the training program contents /14/ -/16/. This FAR is closed.

- **FAR4** : The monitoring system shall be described in more detail. Do the EVN receipts show the net amount of electricity delivered to the grid? Is on-site metering placed at output to the grid? Does it exclude internal consumption? An electric scheme could be useful. To be concluded at the verification stage.
  - **Corrective Action**: The monitoring system is described in more detail in Section C1 of the submitted monitoring report, and the submitted Internal Monitoring Plan. EVN receipts show the net amount of electricity supplied to the grid (both the exported amount as well as any electricity imported by the project from the grid are shown).
  - **Conclusion**: It was confirmed that the monitoring system is concretely described in the Internal Monitoring Plan (IMP) /14/ completed on 08/05/2011. And the section C of the monitoring report /2/ sufficiently reflected the IMP. It was confirmed that the EVN receipts /8/ show the amount of exported electricity and imported electricity. The verification team identified that the meters as monitoring point were installed at the outgoing feeder of the plant and measure the exported electricity after internal consumption and imported electricity from the grid. The schematic diagram checked during the site visit supports the net amount of electricity to the grid after internal consumption. The EVN receipts show the amount of net electricity exported to the grid and the amount of imported electricity from the grid at the same time. And the PP calculated the total electricity for emission reduction that the imported electricity from the grid is deducted from the net amount of exported electricity to the grid. The verification team confirmed that the monitoring system and and monitoring parameters are in accordance with the registered PDD. This FAR is closed.

To conclude, the verification team could check and confirm that the monitoring of reductions in GHG emissions to result from the proposed CDM project activity has been implemented in

accordance with the monitoring plan contained in the registered PDD. Besides, the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan.

3.4 Assessment of data and calculation of GHG emission reductions

In order to confirm a complete set of data for the monitored period available, the verification team reviewed data records during the whole monitoring period. The verification team confirmed that an entire data set for the monitored period is available and continuous measurement of net electricity by an electronic meter and record of measured values as various types such as log books, log files and electricity sales receipts make it possible.

But regarding the electricity monitored by the project participant, a Corrective Action Request are issued and closed as follows;

- **CAR1** : The first month of monitoring period was started from 29th of the month not 1st. But the data log and electricity sales receipts were recorded and issued on a monthly basis not a daily basis without clear statement on monitored dates. And the verification team could not find when the main meter was begun to operate from and it's scale was reset to zero at the beginning of the monitoring period. Net electricity of the first monitoring month should be rechecked and clarified considering the above review. (See Appendix A. Checklist D.1);
  - **Corrective Action**: Since the project was registered by CDM EB on 03/05/2011 before 29/06/2011, the start of the commercial operation of the project activity, the monitoring period covers the very beginning of the commercial operation date of the project activity. Hence, the first month's EVN receipt provide information related to the commissioning of the project activity; the electricity sales value in that month was recorded from the end of commissioning period of 72 hours. The meters were set to "0" value after the end of commission period and before commencing supplying electricity to the grid from 29/06/2011. The PP resubmitted the first month's EVN receipt with additional translation of the information as mentioned above.
  - **Conclusion**: The validation team checked the resubmitted EVN receipt of the first month which included additional translation of information showing clearly that the first month's data corresponds to electricity generated excluding the commissioning period and the indeed the initial value of the meters starts from "0" value and hence can confirm that the electricity generation of the first month had been properly measured after 72 hours commissioning and reset of the meter. The raised issue is closed.

By means of interviews with a Vice Director and a supervisor during the site visit the verification team assessed whether the procedures to ensure reliability of the monitored data were properly implemented. It was confirmed that abnormality of an electricity data by a main meter is checked in stages by an operator, site supervisor, director and power purchaser. And a

CDM consultant also checked continuously the monitored data which is sent to them monthly from the project participant.

In order to assess the monitored data, the verification team cross-checked the data monitored by a main meter with backup meters data. Comparison results showed that the values of a main meter and the backup meters were as almost same as substitutable each other in case of one meter breakdown. And the verification team concluded that the monitored data is reliable and authentic because the values recorded by the project participant are equal to the values of electricity sales receipts which are made by a power purchasing company for the whole monitoring period.

The verification team assessed whether calculation of baseline emission is in accordance with the monitoring plan and the applied methodology. It was confirmed by the calculation sheets submitted to the DOE that baseline emissions are calculated by multiplying the monitored electricity by a CO_2 emission factor according to the monitoring plan and the applied methodology, ACM0002 (Version 11). It was also checked that the CO_2 emission factor used for calculating the emission reductions is in accordance with the registered PDD, which is appropriate. The verification team also confirmed that the project emissions and leakage emissions need not be considered which is in compliance with the monitoring plan and the applied methodology.

The verification team confirmed that the amount of electricity to calculate emission reductions was crosschecked with monthly log books and computer files for the whole monitoring period. These points made a complete set of data available for the entire monitoring period and therefore it could be verified that any assumptions used in emission calculations have been justified and hence correctly applied.

Hence it can be concluded that GHG emission reductions have been calculated applying the methods and formulae of the selected methodology and of the registered monitoring plan.

4. PUBLICATION OF MONITORING REPORT

In accordance with the "Procedures for making the monitoring report available to the public in accordance with paragraph 62 of the modalities and procedures for the CDM," the monitoring report for the period of 03/05/2011 to 29/02/2012 for the CDM project activity "Thanh Thuy Hydropower Project (Ref. no. 4338)" had been posted on the UNFCCC CDM website on 19/03/2012.

5. VERIFICATION STATEMENT

The KEMCO verification team has undertaken verification of the emission reductions reported by the registered project: Thanh Thuy Hydropower Project. The verification is based on the requirements of the CDM, i.e. UNFCCC, Kyoto Protocol, Marrakesh Accords, Decision 3, 4/CMP.1 and relevant decisions of the CDM executive board.

For a risk-based approach to verification of the reported emission reductions, the Internal Monitoring Plan /14/ and Monitoring Report were reviewed against the registered Project Design Document in terms of their completeness, accuracy, consistency, transparency, conservativeness, and materiality. As a result, several potential risks of departures from the requirements for the CDM were identified. The assessment of management controls was made in order to examine such potential risks and then additional audit testing was performed through sample check to identify residual risk areas. Based on the results of this assessment, the verification team issued one Corrective Action Request (CAR), and three Clarification Requests (CLs).

In response to the request for such corrective actions, the project participants provided to the verification team the revised Monitoring and Reporting Procedure, Monitoring Report, and relevant documentation, and the verification team then made through review of the corrective actions and agreed that the raised non-conformities were cleared. In addition, it is confirmed that the four Forward Action Requests (FARs) that were raised during the validation of the project were satisfactorily closed out.

In conclusion, the verification team is of the opinion that the Thanh Thuy Hydropower Project has achieved an emission reduction of 12,721 tCO_2e in the period of 03/05/2011 to 29/02/2012 in compliance with all applicable requirements for the CDM by properly implementing the data management system and quality control system.

Reporting period: From 03/05/2011 to 29/02/2012
Verified emissions in the above reporting period:

- Project emissions: 0 tCO_2e
- Leakage emissions: 0 tCO_2e
- Baseline emissions: 12,721 tCO_2e
- Emission reductions: 12,721 tCO_2e

6 REFERENCES

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

/1/ Monitoring Report (Version 1.0, 14/03/2012)

/2/ Monitoring Report (Version 2.0, 26/07/2012)

/3/ CER Calculation Spreadsheets (Version 2.0)

/4/ Technical description of installed SFW3000-6/1730 generator, Lingling Hengyuan Generating Equipment Co., LTD.

/5/ Power purchasing contract including monitoring parameter and methodology between Viet Long Industry Joint Stock Company and Northern Power Company of EVN, 04/2011

/6/ Minutes of Performance Test for commissioning, Ha Giang province and Viet Long Industry Joint Stock Company, 29/06/2011

/7/ Data log books of monitoring parameter, Viet Long Industry Joint Stock Company, 06/2011 ~ 02/2012

/8/ Electricity sales receipts by EVN, 06/2011 ~ 02/2012

/9/ Calibration certificate of main meter by Northern Electrical Testing Company of EVN, 25/04/2011

/10/ Calibration certificate of backup meter 1 by Northern Electrical Testing Company of EVN, 25/04/2011

/11/ Calibration certificate of backup meter 2 by Northern Electrical Testing Company of EVN, 25/04/2011

/12/ Calibration certificate of backup meter 2 by Northern Electrical Testing Company of EVN, Correction of the typographical mistake done in the calibration certification issued on 25/04/2011,23/02/2012

/12/ Calibration certificate of back-up meter 2 by Northern , 15/11/2011

/13/ Instrument Incident Report of back-up meter 2, Viet Long Industry Joint Stock Company, 06/11/2011

/14/ Internal Monitoring Plan (Version 0.2), Kyoto Energy Pte Ltd., 08/05/2011

/15/ Training presentation material, Kyoto Energy Pte Ltd., 14/09/2011

/16/ Training attendance list, Viet Long Industry Joint Stock Company, 14/09/2011

/18/ Hydrological report of Thanh Thuy Hydropower Project, Ba Dinh Construction Consultancy JSC, 2010

Category 2: Documents and websites referred to by KEMCO

/19/ Clean Development Mechanism Validation and Verification Manual (Version 01.2)

/20/ ACM0002 Consolidated Methodology for Grid Connected Electricity Generation from Renewable Sources (Version 11)

/21/ Tool to calculate the emission factor of an electricity system (Version 1.1)

/22/ Project Design Document, Viet Long Industry Joint Stock Company (Version 2.2, 30/04/2011)

/23/ Project Design Document revised for request for post registration changes, Viet Long Industry Joint Stock Company (Version 3.3, 19/04/2012)

/24/ CDM Validation Report, Swiss Association for Quality and Management Systems (Report No : P29492.33, 03/05/2011)

/25/ Guidelines for Assessing Compliance with the Calibration Frequency Requirements (Version 01)

/26/ Homepage of a main meter and backup meter manufacturer, www.landisgyr.com

/27/ Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document, EB48 Annex66

Persons interviewed:

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

Viet Long Industry Joint Stock Company.

Mr. Luc Quang Hung (Chairman of Viet Long Industry Joint Stock Company)

Mr. Nguyen Van Bo (Vice Director of the Thanh Thuy Hydropower Plant)

Mr. Le Van Xuyen (Supervisor of the Thanh Thuy Hydropower Plant)

Mr. Vu Thuong Hai (Operator of the Thanh Thuy Hydropower Plant)

Kyoto Energy Pte Ltd.

Mr. Arijit Paul (Regional Manager)

Mr. Nguyen Manh Khuong (CDM Project Executive)

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APPENDIX A

VERIFICATION PROTOCOL

Table 1. Verification Checklist

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A	**Project Implementation in accordance with the registered project design document** *In this section, the DOE shall identify any concerns related to the conformity of the actual project activity and its operation with the registered project design document.*	Para 195					
	A.1. Are all physical features of the proposed CDM project activity proposed in the registered PDD in place and has the project participants operated the proposed CDM project activity as per the registered PDD by means of an on-site visit? *If an on-site visit is not conducted, the DOE shall justify the rationale of the decision.*	Para 196	/1/, /2/ /4/, /5/ /7/, /9/ /10/, /11/ /12/, /20/ /22/	Document review, Observation, Interview	1. Checked: It was confirmed by review of a schematic technical diagram, data log files and direct observation during site visit on 05/04/2012 that there are an intake, penstock, pressure tank and powerhouse around the Thanh Thuy stream. And it was also confirmed by specifications of installed equipments and direct observation that the powerhouse is containing three turbines and three generators for the cascade 2 hydropower plant in place in accordance with the registered PDD. 2. But at present only cascade 2 plant with an installed capacity of 9MW has come into operation and the cascade 1 plant of 11MW has been delayed due to economic difficulties. It was confirmed by a schematic technical diagram and direct observation during site visit and the project participant said that land clearance and compensation process for the cascade has been done and the construction is expected to be completed	OK OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					by June 2014. 3. Electricity generated by each generating system is transformed to 35kV at the powerhouse and is delivered to the national grid system via new 35kV transmission line and subsequently 110kV transmission line. These points were confirmed by direct observation during the site visit and review of a schematic technical diagram in a computer of the power house. 4. It was confirmed by review of a schematic technical diagram, calibration certifications and direct observation during site visit that monitoring points and monitoring equipments are in line with the registered PDD; a main meter (MM) was installed to measure the amount of electricity transmitted to the grid, and the meters measure exported electricity and imported electricity at the same time. Two backup meters were installed to ensure QA/QC of the monitoring system although one BM was planned in the PDD. 5. And it is expected that transmission loss is negligible because the distance between the power house the meters were installed and a national grid is only about 50 meters	OK OK OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
A.2.	Does the implementation or operation of CDM project activity conform with the description contained in the registered PDD? *If not, the DOE shall conduct an assessment on the potential impacts due to these changes following the relevant guidelines established by the CDM Executive Board and based on this assessment the DOE shall submit a notification or a request for approval of changes from the project activity as described in the registered PDD prior to the conclusion of the verification/certification for the corresponding monitoring period.*	Para 197 *(Para 198)*	/1/, /2/ /6/, /7/ /8/, /13/ /22/, /23/ /27/	Document review, Observation	1. Checked: The project has undergone a permanent change in the project design as compared to the registered project design document. The change is in terms of capacity of the Thanh Thuy hydropower plant from 18 MW to 20 MW and causes the differences in expected electricity generation and emission reduction during crediting period: The capacity of cascade 2 was changed to 9MW from 8MW and the capacity of cascade 1 was changed to 11MW from 10MW. 2. This change needs to request approval of changes with relevant documentation in accordance with the "Procedures for notifying and requesting approval of changes from the project activity as described in the registered project design document." According to the Procedures, the verification team requested approval of the changes with the revised PDD and supplemental documentation on 20/04/2012 and the request was approved on 20/07/2012 by UN EB. All the verification by KEMCO was implemented based on the revised PDD. 3. The verification team reviewed monthly	OK OK OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					log books, monthly monitored record and electricity sales receipts to check operation status of the units and facilities in the project site. It was confirmed that the plant has been operated from 29/06/2011 to 29/02/2012.		
					4. CL1: The monitoring of the project was started on 29/06/2011 although the starting date of the monitoring period in the monitoring report the project participant submitted was 03/05/2011. It should be checked and clarified.	CL	OK
					5. The backup meter 2 was recalibrated on 15/11/2011 because the backup meter 2 was in failure in November 2011. This fact was confirmed by 'Instrument Incident Report of the backup meter 2' and monthly recorded log.	OK	
					6. The project activity consists of one project site only. This fact was confirmed by direct observation during the site visit and a schematic technical diagram of this project.	OK	
					7. The emission reductions claimed by the project participants are 12,721 tCO_2 and below the amount estimated at the project design stage.	OK	
					8. CL3: Actual emission reductions claimed by the PP during this monitoring period were compared with estimates in the	CL	OK

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					registered PDD. The estimated amount in the PDD was based on the full operation of two cascades during a full of one year, but the monitored emission reductions come from the operation of just cascade 2 during 8 months. It should be checked and clarified.		
B	**Compliance of the monitoring plan with the monitoring methodology** *The monitoring plan of the proposed CDM project activity shall comply with the applied methodology.*	Para 199					
B.1.	Is the validated monitoring plan in accordance with the approved methodology applied by the proposed CDM project activity?	Para 200 *(Para 203)*	/1/, /2/ /3/, /20/ /22/	Document review	1. Checked: It was confirmed that net electricity by project activity is monitored continuously by the metering equipment as it has been stipulated in the applied methodology, ACM0002 (Version 11). It was also verified that baseline emissions are calculated as per the applied methodology, and project emissions as zero is in accordance with the applied methodology because the project does not have reservoir and utilize fossil fuel for the project. And leakage emissions are considered as zero in accordance with the methodology.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	B.2. If during verification the DOE concludes that the monitoring plan is not in accordance with the monitoring methodology, the DOE shall request a revision to the monitoring plan prior to concluding its verification and making its certification decision. *The DOE may request for revision of the monitoring plan covering the monitoring period under verification, for approval by the CDM Executive Board.*	Para 201	/1/, /2/ /3/, /7/ /8/, /20/ /22/	Document review	1. Checked: It does not need to request a revision or a deviation of the monitoring plan because the verification team confirmed by review of the recorded log files and calculation sheets that the monitoring plan conforms to the monitoring methodology, and the project activity has been also conducted in accordance with the applied methodology.	OK	
	B.3. Are there monitoring aspects that are not specified in the methodology, particularly in the case of small-scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency)? *If so, the DOE is encouraged to bring to the attention of the CDM Executive Board issues which may contribute in enhancing the level of accuracy and completeness of the monitoring plan.*	Para 202	/1/, /2/ /11/, /12/ /22/, /23/	Document review, Observation, Interview	1. Checked: Besides the monitored parameter as described in the monitoring plan, the backup meter 2 besides the backup meter 1 was installed to check the trend of generated electricity and use in case of failure of the main meter and the backup meter 1. This point was confirmed by direct observation, calibration report and interview with an operator during the site visit.	OK	
	C Compliance of monitoring with the monitoring plan *Monitoring of reductions in GHG emissions to result from the proposed CDM project activity shall be implemented in accordance with the monitoring plan contained in the registered PDD or the accepted revised monitoring plan.*	Para 204					

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
C.1. Has it been confirmed that: (a) The monitoring plan and the applied methodology been properly implemented and followed by the project participants;		Para 205 *(Para 206)*	/1/, /2/ /5/, /7/ /8/ /9/ /11/ /12/ /22/, /23/	Document review, Observation Interview	1. Checked: It was confirmed by the monitored records, electricity sales receipts and direct observation and interview during the site visit that the project activity has been properly implemented in line with the monitoring plan; The amount of net electricity by project activity was measured continuously by a main meter (MM), a backup meter 1 (BM1) and a backup meter 2 (BM2). And as per Power Purchasing Agreement between the PP and EVN (Electricity of Viet Nam), an operator of project site and an EVN staff as a representative of power purchasing company read together and record respectively net electricity value of the last day of each month, 24hr, which is stored in the memory of the meter, in the first day of next month. The operator stores the values of each month as log books and files in a computer of the powerhouse, and the PP and EVN made the minute of meter value confirmation which is used as electricity sales receipts. Finally the EVN issues an electricity sales receipt. In addition an operator monthly records electricity monitored by the main meter to review operation status of the plant and cross-check with monthly data. 2. This monitoring process meets the monitoring plan of the registered PDD which describes that the electricity is measured continuously by an electronic meter and recorded monthly. In addition	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
			/1/, /2/ /5/, /7/ /8/, /9/ /10/, /11/ /20/, /22/	Document review, Observation, Interview	2. Checked: Project emissions are not required according to the applied methodology and the monitoring plan of PDD. But the verification team checked a schematic technical diagram and the operating equipment for the site visit to review any source of project emissions such as fossil fuel generation equipment, and confirmed that there is no source of project emissions at the project site because the on-site power consumption is covered by the imported electricity.	OK	
					3. It is confirmed that net electricity to calculate baseline emissions is measured automatically by a MM and BMs and the juristic representatives of both parties (a project participant and a power purchasing company) record net electricity of each month on the first day of next month. This issue was verified by monthly recorded log books, electricity sales receipts and direct observation during the site visit. And explanation of a site supervisor at the site was in accordance with the monitoring procedures on a baseline emission parameter. * Refer to the Annex.1 "Details of monitored parameters" in this checklist.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					4. Checked: It was checked that a CO_2 emission factor used for calculating baseline emissions is in accordance with the registered PDD.	OK	
					5. Checked: The applied baseline and monitoring methodology does not consider leakage emissions attributable to the project.	OK	
			/1/, /2/ /7/, /8/ /9/, /10/ /11/, /12/ /13/, /14/ /15/, /16/ /23/ /25/	Document review, Observation, Interview	6. Checked: The Section C.5. in the monitoring report describes the responsibilities of the monitoring staff which follow the registered monitoring plan; an operator of the monitoring team reads monthly generated electricity with EVN and records the data. And a site supervisor checks initially the recorded data comparing with significant changes against previous readings or expected values for anomalies. Finally a project director cross-checks the recorded date of the project site with the monthly records from EVN. The recorded data transfer to CDM consultant monthly for external audit. The verification team confirmed by the recorded log books, electricity sales receipts and interview with an operator that the staffs of the monitoring team have conducted properly their responsibilities.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					7. Checked: The Section C.6. in the monitoring report explains that training program to the monitoring staff was conducted on 14/09/2011 to inform the management details and its monitoring plan requirements. This point was confirmed by attendance list and training material, and interview with an operator who had a proper understanding of the training contents.	OK	
					8. Checked: The Section C.8. of the monitoring report, the 'data archiving' describes that net electricity data measured via a MM and BMs is stored as a log file type in computers of the project site and the consultant company. The log files are kept for a minimum of 2 years after the end of the crediting period according to the monitoring plant and relevant guidelines. These facts to ensure preservation and reliability of monitored data were confirmed by review of data log files in the project site computer and internal monitoring plan. Interview with an operator was in accordance with the monitoring report and documented evidences.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					9. Checked: The verification team confirmed by calibration reports and a commissioning report that the main meter and backup meters were calibrated on 25/04/2011 before commercial operation of the hydropower plant.	OK	
					10. It was also confirmed by the calibration reports that recalibration of the meters was not needed because validity term of the meters is three years. And the accuracy of the main meter, backup meter 1 and backup meter 2 is 0.2%, 0.2% and 0.5% respectively.	OK	
					11. The meters was calibrated by the power purchasing company's testing center (Northern Electrical Testing Company) which is in charge of the meter management according to the power purchasing contract and is authorized by the Viet Nam accreditation body for calibration.	OK	
					12. In case of BM 2, the meter malfunctioned in November 2011 and has been being operated again after recalibrating by the testing company. It was confirmed by Instrument Incident Report and interview with an operator.	OK	
					13. CL2: Serial number and recalibration date of the backup meter 2 in the	CL	OK

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					monitoring report are different with calibration report of the meter. The discrepancy should be checked and clarified.		
					14. Checked: It was confirmed that the QA/QC procedures of the monitoring report are in line with the registered monitoring plan and the procedures are properly implemented. The monitoring report describes that data recorded from a main meter cross-checked with electricity sales receipts and backup meters are operated to use in the event of a main meter failure as described in the monitoring plan. Upon investigation of monthly log books, the minute of meter value confirmations and calibration reports of a backup meter, it was identified that main meter values have been recorded on a monthly basis and electricity sales receipts have been made monthly by a project owner and a power purchaser, and backup meters have been operated with periodic calibration. In addition, the data is kept as an electronic form in a computer of the site and sent to project consultants monthly for archiving.	OK	
D Assessment of data and calculation of greenhouse gas emission reductions		Para 207					

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	GHG emission reductions achieved by/resulting from the proposed CDM project activity shall be calculated applying the selected methodology.						
	D.1. The DOE shall determine whether: (a) A complete set of data for the specified monitoring period available. *If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, the DOE shall opt to either make the most conservative assumption theoretically possible in finalizing the verification report, or raise a request for deviation prior to submitting request for issuance, if appropriate;*	Para 208 *(Para 209)*	/1/, /2/ /7/, /8/ /9/, /10/	Document review	1. Checked: The monitored values were reviewed to confirm that a complete set of data is available for the monitoring period. The verification team confirmed that the amount of electricity to calculate emission reductions is monitored continuously and recorded as various types such as monthly recorded log files and electricity sales receipts for the whole monitoring period. These points made a complete set of data available for the entire monitoring period.	OK	
	(b) Information provided in the monitoring report has been cross-checked with other sources such as plant log books, inventories, purchase records, laboratory analysis;		/1/, /2/, /7/, /8/	Document review	2. Checked: The verification team cross-checked the monthly recorded data by a main meter with monthly monitoring data and the monthly monitoring data was compared to the electricity sales receipts which is made monthly by the power purchasing company for the whole monitoring period. It was confirmed that the monitored data is reliable because the data matched completely one another.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	(c) Calculations of baseline emissions, proposed CDM project activity emissions and leakage, as appropriate, has been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document;		/1/, /2/, /3/, /7/ /8/, /9/ /20/, /22/ /23/	Document review	3. Checked: Baseline emissions were calculated by multiplying the monitored electricity by a CO_2 emission factor in accordance with the monitoring plan and the applied methodology, ACM0002 (Version 11).	OK	
					4. CAR1: The first month of monitoring period was started from 29th of the month not 1st. But the data log and electricity sales receipts were recorded and issued on a monthly basis not a daily basis without clear statement on monitored dates. And the verification team could not find when the main meter was begun to operate from and it's scale was reset to zero at the beginning of the monitoring period. Net electricity of the first monitoring month should be rechecked and clarified considering the above review.	CAR	OK
					5. Checked: It was confirmed that the project emissions and leakage emissions need not be considered which is in compliance with the monitoring plan and the applied methodology.	OK	
	(d) Any assumptions used in emission calculations have been justified;		/1/, /2/ /3/, /23/ /24/	Document review	6. Checked: There are no assumptions used in calculating emission reductions.	OK	

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
	(e) Appropriate emission factors, IPCC default values and other reference values have been correctly applied?		/1/, /2/ /3/, /23/ /24/	Document review	7. Checked: It was checked that the CO_2 emission factor used for calculating emission reductions is in accordance with the registered PDD.	OK	
E	***Previous issues assessment(where applicable)***						
	E.1. Have the remaining issues from the previous verification period been assessed?	Para 221	/1/, /2/ /22/, /23/	Document review	1. Checked: This is the first verification for the monitoring period. The section is not available for this project.	OK	
	E.2. Have the remaining issues from the project's validation been assessed?	Para 221	/24/	Document Review	2. Checked: 4 FARs were raised during the validation and each have been closed out during the verification process: FAR 1: The calibration status of Monitoring equipments has to be submitted to DOE. [1] To be concluded at the verification stage. FAR 2: The Monitoring manual has to be established. To be concluded at the verification stage. FAR 3: The training plan and the training proofs have to be submitted to the DOE. To be concluded at the verification stage. FAR 4: The monitoring system shall be	FAR	OK

KEMCO	Verification Checklist	VVM Criteria	Ref.	MoV	Comments	Draft Concl.	Final Concl.
					described in more detail. Do the EVN receipts show the net amount of electricity delivered to the grid? Is on-site metering placed at output to the grid? Does it exclude internal consumption? An electric scheme could be useful. To be concluded at the verification stage.		

<Annex.1 >

DETAILS OF MONITORED PARAMETERS

Data/Parameter	$EG_{facility,y}$ (quantity of net electricity generation supplied by the project plant to the grid by the project activity)
Measuring frequency	Continuously
Is measuring frequency in accordance with the monitoring plan and monitoring methodology?(yes/no)	Yes (continuous measurement)
Type of monitoring equipment	Electronic meter (Landis Gyr E650) - SN : 97539302(MM), 97539306(BM1), 96648542(BM2)
Is the accuracy of the monitoring equipment used for monitoring in accordance with the relevant guidance provided by the CDM Executive Board?	Yes (Certificates : 0.2s for MM and BM1 0.5s for BM2, PDD : no specification)
Calibration frequency in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes (Monitoring report : 3 years, PDD : 3 years)
Is(are) calibration(s) valid for whole reporting period?	Yes. Calibration of the main meter and backup meter is valid up to 24/04/2014. Recalibration is not needed. But the backup meter 2 was recalibrated and reinstalled on 15/11/2011 because of its malfunction in November 2011.
How were the values in the monitoring report verified?	The verification team checked the monthly records and monthly records, and the monthly records were cross-checked with the electricity sales receipts by the power purchasing company, EVN.
Is QA/QC process for data management proper?	Yes. The net electricity by project activity is measured continuously and read monthly and recorded monthly. Calibrations of meters were conducted periodically in accordance with the monitoring plan. And measurement results are cross checked with records for sold/purchased electricity. In addition, recorded data are achieved up to 2 years after the end of the crediting period.

Table 2. Resolution of Corrective Action and Clarification Requests

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
CL1: The monitoring of the project was started on 29/06/2011 although the starting date of the monitoring period in the monitoring report the project participant submitted was 03/05/2011. It should be checked and clarified.	Checklist A.2	The commercial operation of the cascade 2 was expected in 04/2011. But it was delayed around 3 months to 29/06/2011 due to some difficulty in loan disbursement from bank during the last stages of the construction, which resulted in delay in the originally planned completion of construction of the project activity.	It was confirmed by checking the UNFCCC website and a commissioning report of the project that the start date of the monitoring period is 03/05/2011 on which the project was registered, and the project has been operated from 29/06/2011. As a result, the Table 5 showing the monthly emission reductions in the monitoring report was a little corrected by the PP to clarify the operation delay. The raised NC is closed.
CL2: Serial number and recalibration date of the backup meter 2 in the monitoring report are different with a calibration report of the meter. The discrepancy should be checked and clarified.	Checklist C.1	The actual serial number of the backup meter 2 is 96648542, however, in the first calibration certificate issued by the EVN on 25/04/2011, the serial number was incorrectly recorded as 96645842. This was a typographical error. Hence, the project owner requested that the EVN provided another one with the correct serial number. The EVN then reissued the calibration certificate on 23/02/2012 for backup meter 2, with the correct serial number. There was a typo of the recalibration date of backup meter 2 in the monitoring report. The recalibration date of backup meter 2 in the monitoring report	The validation team checked the calibration certificate of the backup meter 2 reissued by EVN and confirmed the serial number of the meter in the certificate was in accordance with the monitoring report and with the serial number of the meter installed onsite. And it was also confirmed that the recalibration date of the backup meter 2 was properly corrected showing that it is same with the recalibration certificate. The raised NC is closed.

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
		is now corrected in the monitoring report to be in line the date in the calibration (15/11/2011).	
CL3: Actual emission reductions claimed by the PP during this monitoring period were compared with estimates in the registered PDD. The estimated amount in the PDD was based on the full operation of two cascades during a full of one year, but the monitored emission reductions come from the operation of just cascade 2 during 8 months. It should be checked and clarified.	Checklist A.2	The ex-ante value in E.5 of the monitoring report was recalculated based on operation of just cascade 2, operating for 8 months. 19,885 CERs is the ex-ante estimation of emission reduction over a whole year in the registered PDD for cascade 2. Only 8 months are claimed in this monitoring report, and the missing 4 months belong to the project's dry season. These 8 months of monitoring correspond to 69.22% of the yearly average river flow according to the project feasibility study. The comparable value is then: 13,764 = 19,885 * 69.22%.	The validation team confirmed by the revised monitoring report and the historical data of feasibility study report that the ex-ante emission reductions were properly calculated considering that the value come from just cascade 2 operation during 8 months and was based on the historical data during 47 years(1960~2006). The raised NC is closed.
CAR1: The first month of monitoring period was started from 29th of the month not 1st. But the data log and electricity sales receipts were recorded and issued on a monthly basis not a daily basis without clear statement on monitored dates. And the verification team could not find when the main meter was begun to operate from and it's scale was reset to zero at the beginning of the monitoring period. Net electricity of the first monitoring month should be rechecked and clarified considering the above review.	Checklist D.1	Since the project was registered by CDM EB on 03/05/2011 before 29/06/2011, the start of the commercial operation of the project activity, the monitoring period covers the very beginning of the commercial operation date of the project activity. Hence, the first month's EVN receipt provide information related to the commissioning of the project activity; the electricity sales value in that month was recorded from the end of commissioning period of 72 hours. The meters were set to "0" value after the end of commission	The validation team checked the resubmitted EVN receipt of the first month which included additional translation of information showing clearly that the first month's data corresponds to electricity generated excluding the commissioning period and the indeed the initial value of the meters starts from "0" value and hence can confirm that the electricity generation of the first month had been properly measured

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
		period and before commencing supplying electricity to the grid from 29/06/2011. The PP resubmitted the first month's EVN receipt with additional translation of the information as mentioned above.	after 72 hours commissioning and reset of the meter. The raised issue is closed.
FARs from Validation			
FAR 1: The calibration status of monitoring equipments has to be submitted to DOE. To be concluded at the verification stage.	Checklist E.2	Calibration reports /9/ - /13/ and evidence of commissioning /6/ were submitted., and details are provided in Annex 1 of the monitoring report.	The PP submitted the commissioning report dated on 29/06/2011 to the verification team. Each calibration report of the main meter (MM), backup meter 1(BM1) and backup meter 2 (BM2) issued on 25/04/2011 was also submitted. Recalibration report of BM2 due to malfunction in November 2011 was also identified by the verification team. And the calibration report reissued by EVN due to a mistype error in the serial number (please refer to the CL2) was also submitted to the validation team. The verification team could confirm by the commissioning report and calibration reports that the calibrations of the meters for monitoring net electricity were done according to the monitoring plan. Indeed, the monitoring results

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
			are consistently recorded as per approved frequency and the quality assurance and quality control procedures have been applied in accordance with the monitoring plan. Annex 1 of the monitoring report was found to be accurate Thus this FAR is closed.
FAR 2: The monitoring manual has to be established. To be concluded at the verification stage.	Checklist E.2	The monitoring manual has been established and supplied to DOE during the verification process.	The verification team confirmed by reviewing the Internal Monitoring Plan (IMP) /14/ (equivalent of "Monitoring Manual" that it was completed on 08/05/2011 that the PP established the monitoring manual. A copy of the IMP was also seen at the control room in the project site. The IMP included the guidelines to monitor the project including position and responsibilities of a monitoring team, monitoring parameters, detailed monitoring tasks, maintenance and calibration of monitoring instruments, emergency procedures, monitoring plan improvement and external audit procedure. And it was also confirmed that the monitoring system has been sufficiently explained in the section C of the

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
			monitoring report in accordance with the IMP. This FAR is closed.
FAR 3: The training plan and the training proofs have to be submitted to the DOE. To be concluded at the verification stage.	Checklist E.2	Internal monitoring plan (including training frequency), training presentation materials and attendance list have been supplied to DOE during verification process .	It was confirmed that the IMP submitted by the PP also includes training plan to ensure adequate training of staff. The verification team also checked the training material and the attendance list, and confirmed that the training program was successfully performed on 14/09/2011. And the verification team interviewed with a site operator during the site visit and it was found that the operator had a proper understanding of the training program contents /14/ -/16/. This FAR is closed.
FAR 4: The monitoring system shall be described in more detail. Do the EVN receipts show the net amount of electricity delivered to the grid? Is on-site metering placed at output to the grid? Does it exclude internal consumption? An electric scheme could be useful. To be concluded at the verification stage.	Checklist E.2	The monitoring system is described in more detail in Section C1 of the submitted monitoring report, and the submitted monitoring plan. EVN receipts show the net amount of electricity supplied to the grid (both the exported amount as well as any electricity imported by the project from the grid are shown).	It was confirmed that the monitoring system is concretely described in the Internal Monitoring Plan (IMP) /14/ completed on 08/05/2011. And the section C of the monitoring report /2/ sufficiently reflected the IMP. It was confirmed that the EVN receipts /8/ show the amount of exported electricity and imported electricity. The verification team

Clarifications and Corrective Action Requests	Ref. to Checklist Questions	Summary of Responses from Project Participants	Verification Conclusions
			identified that the meters as monitoring point were installed at the outgoing feeder of the plant and measure the exported electricity after internal consumption and imported electricity from the grid. The schematic diagram checked during the site visit supports the net amount of electricity to the grid after internal consumption. The EVN receipts show the amount of net electricity exported to the grid and the amount of imported electricity from the grid at the same time. And the PP calculated the total electricity for emission reduction that the imported electricity from the grid is deducted from the net amount of exported electricity to the grid. The verification team confirmed that the monitoring system and the monitoring parameters are in accordance with the registered PDD. This FAR is closed

No new FARs were raised during this, the first verification.

APPENDIX B

CVS OF VERIFICATION TEAM AND THE TECHNICAL REVIEWER

KEMCO

Personal History

Family name	KIM	Date of Birth	-
Given name	Dae-Hwan	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4884
Position	Manager	Fax No.	+82-31-260-4886
Address	1157, Pungdukchun 2, Suji, Yongin, Gyeonggi, 448-994, Republic of Korea	E-mail	goodwin@kemco.or.kr

Title	Proposed Title		Qualification
	Full-time Lead Validator/verifier		☒
Sectoral Scope	Proposed Sectoral Scope		Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-1 Renewable Energy Power Generation	☒
	5. Chemical industries	5-4 Other chemical industries	☒
	13. Waste handling and disposal	13-2 Waste/Wastewater Treatment	☒

Work experience

*** Please describe every employment you have had**

From	to	Details of Duties
2001-01-02	2005-10-31	Managing the projects on the development, performance assessment and demonstration assessment of new and renewable energy, the New and Renewable Center, KEMCO.
2005-11-01	2010-01-25	Supporting national climate change policy and corporation plan management, Climate Change Strategy department, KEMCO.

KEMCO

Personal History

Family name	LEE	Date of Birth	-
Given name	Young-Seop	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4885
Position	Assistant Manager	Fax No.	+82-31-260-4886
Address	1157, Pungdukchun 2, Suji, Yongin, Gyeonggi, 448-994, Republic of Korea	E-mail	youngseopl@kemco.or.kr

Title	Proposed Title	Qualification
	Full-time Validator/verifier	☒

Sectoral Scope	Proposed Sectoral Scope		Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-2 Energy generation from renewable energy sources	☒

Work experience

*** Please describe every employment you have had**

From	to	Details of Duties
2005-01-01	2011-01-23	Managing the projects on the performance assessment of new and renewable energy, the New and Renewable Center, KEMCO
2011-01-24	2012-01-17	Managing the projects on dissemination of new and renewable energy, Kang-won Regional Headquarters, KEMCO
2012-01-18	Present	CDM auditing, GHG Certification Office, KEMCO

KEMCO

Personal History

Family name	HAN	Date of Birth	-
Given name	Seung-Ho	Sex	Male
Organization	KEMCO	Phone No.	+82-31-260-4883
Position	Manager	Fax No.	+82-31-260-4886
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Title	Proposed Title	Qualification
	Full-time Lead Validator/verifier	☒

Sectoral Scope	Proposed Sectoral Scope		Qualification
	1. Energy industries (renewable - / non-renewable sources)	1-2 Energy generation from renewable energy sources	☒
	13 Waste handling and disposal	13-2 Animal waste management	☒
	14. Afforestation and reforestation	14-1 Forestry	☒
	15. Agriculture	15-2 Animal waste management	☒

Work experience

*** Please describe every employment you have had**

From	to	Details of Duties
2000-03-01	2006-01-22	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