VALIDATION REPORT

REGARDING CHANGES FROM THE PROJECT ACTIVITY AS DESCRIBED IN THE REGISTERED PDD

WORLD BANK GROUP

EL CANADÁ HYDROELECTRIC PROJECT

Report No: 8000371442 – 09/40

Date: 2012-03-05

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Validation Report on requested changes	***Report No.***	***Rev. No.***	***Date of 1st issue:***	***Date of this rev.***
	8000371442 – 09/40	0	2012-03-05	-
Project:	***Title:***		***Registration date:***	***UNFCCC-No.:***
	El Canadá Hydroelectric Project		2006-12-02	0606
Project Participant(s):	***Host party:***		***Other involved parties:***	
	Generadora de Occidente Ltada. (GdO)		Other perties invloved see http://cdm.unfccc.int/Projects/DB/DNV-CUK1158755634.57/view	
Applied methodology/ies:	***Title:***		***No.:***	***Scope:***
	Consolidated methodology for grid-connected electricity generation from renewable sources		ACM0002 ver. 6	1
Requested Changes:	***Kind of requested changes***		***Effective as of:***	***Last issuance:***
	☒ From the start	☐ After implementation	2003-11-23	2008-10-06
Revised PDD:	***Title:***			***Final version:***
	El Canadá Hydroelectric Project			2011-11-18, v.4
Validation team / Technical Review and Final Approval	***Validation Team:***		***Technical review:***	***Final approval:***
	Raul Gonzalez Mitre		E. Martin	A. Nebel
Validation Opinion:	The changes do not raise concerns with respect to aspects outlined in paragraph 10(c) of EB 48 Annex 66 i.e. a. additionality of the project b. scale of the CDM project activity and c. applicability and application of the Approved Baseline Methodology under which the project activity has been registered. Thus a notification of changes from the project activity as described in the registered PDD to the UNFCCC is deemed appropriate, in line with the requirements outlined in EB 48 Annex 66.			
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Abbreviations

AMM	**Wholesale Market Administrator (*Administrador del Mercado Mayorista)***
CA	**Corrective Action / Clarification Action**
CAR	**Corrective Action Request**
CDM	**Clean Development Mechanism**
CER	**Certified Emission Reduction**
CO_2	**Carbon dioxide**
CO_{2eq}	**Carbon dioxide equivalent**
COMEGSA	**Commercial distributor**
CL	**Clarification Request**
ER	**Emission Reduction**
FAR	**Forward Action Request**
GdO	**Generadora de Occidente**
GHG	**Greenhouse gas(es)**
INDE	**Eletrification National Institute *(Instituto Nacional de Electrificación)***
MP	**Monitoring Plan**
MR	**Monitoring Report**
NoC	**Notification of Changes**
PDD	**Project Design Document**
PP	**Project Participant**
QA/QC	**Quality Assurance / Quality Control**
UNFCCC	**United Nations Framework Convention on Climate Change**
XLS	**Emission Reduction Calculation Spread Sheet**

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1 OBJECTIVE / SCOPE

The World Bank has commissioned the TÜV NORD JI/CDM Certification Program (CP) to carry out the to carry out the verification of monitoring period # 2 of the project

"El Canada Hydroelectric Project"

In this context of this verification the need was identified to carry out a *validation regarding changes from the project activity as described in the registered PDD*.

This specific report covers the validation regarding changes from the project activity as described in the registered PDD with regard to the relevant requirements for CDM project activities (esp. EB 48 Annex 66 / 67). The purpose of a validation regarding changes is to have an independent third party assess whether the project is still in compliance with the

- approved CDM Methodology under which it was registered; esp. w.r.t. the applicability criteria,
- category of the CDM project activity,
- CDM additionality requirements.

The validation scope is given as a thorough independent and objective assessment to ensure that the CDM project activity still meets all relevant and applicable CDM criteria after the implementation of changes of the project design, as described in the registered PDD.

2 DESCRIPTION OF THE PROJECT AND REQUESTED CHANGES

2.1 Project Characteristics

Essential data of the project is presented in the following Table 2-1.

Table 2-1: Project Characteristics

Item	Data		
Project title	El Canada Hydroelectric Project		
Project size	☒ Large Scale ☐ Small Scale		
Project Scope *(according to UNFCCC sectoral scope numbers for CDM)*	☒	1	Energy Industries (renewable- /non-renewable sources)
	☐	2	Energy distribution
	☐	3	Energy demand
	☐	4	Manufacturing industries
	☐	5	Chemical industry
	☐	6	Construction
	☐	7	Transport
	☐	8	Mining/Mineral production
	☐	9	Metal production
	☐	10	Fugitive emissions from fuels (solid, oil and gas)
	☐	11	Fugitive emissions from production and consumption of halocarbons and hexafluoride
	☐	12	Solvents use
	☐	13	Waste handling and disposal
	☐	14	Afforestation and Reforestation
	☐	15	Agriculture
Applied Methodology	ACM0002 – ver.6		
Technical Area(s)	1.2 Energy Generation from Renewable Sources		
CDM registration No.	0606		
Crediting period	☐ Renewable Crediting Period (7 y) ☒ Fixed Crediting Period (10 y)		

2.2 Project Verification History

Essential events since the registration of the project are presented in the following Table 2-2.

Table 2-2: Project verification history

#	Item	Time	Status
1	Date of registration	2006-12-02	-
2	Start of crediting period[1]	2003-11-23	-
3	1st Monitoring period	2003-11-23 to 2007-06-30	Issued
4	Request for revision of the monitoring plan	2010-09-13	Approved
5	2nd Monitoring period	2007-07-01 to	On going

[1] As per the registered PDD (version 1)

#	Item	Time	Status
		2008-12-31	
6	Notification of Changes		On going

2.3 Involved Parties and Project Participants

The following parties to the Kyoto Protocol and project participants are involved in this project activity (Table 2-3).

Table 2-3: Project Parties and project participants

Characteristic	Party	Project Participant
Host party	Guatemala	Generadora de Occidente Ltda. (GdO)
Other involved party/ies	For the complete list of other parties involved refer to: http://cdm.unfccc.int/Projects/DB/DNV-CUK1158755634.57/view	

2.4 Project Location

The details of the project location are given in table 2-4:

Table 2-4: Project Location

No.	Project Location
Host Country	Guatemala
Region:	Western Guatemala
Project location address:	12 miles south of Quetzaltenango Municipality
Latitude:	14° 41' 08.80'' N
Longitude:	91° 31' 53.35'' E

2.5 Technical Project Description

The registered project activity consists of the construction, installation and operation of a run-of-river hydropower plant with an installed capacity of 43 MW (according to the registered PDD). The project has two Pelton turbines with a capacity of 21.5 MW each and two synchronous generators. A reservoir with a capacity of 184,000 m^3 is considered for this project. The annual average net generation of the project activity according to the registered PDD is approximately 175 GWh

The technical key data are provided in table 2-5 below

Table 2-5: Technical data of the project activity as per registered PDD

Parameter	Unit	Value
Turbine Type	-	Pelton
Number of Turbines	-	2
Installed Capacity	MW	21.5
Maximum Hydraulic Capacity	M^3/sec.	13.4

Parameter	Unit	Value
Generator Type	-	Synchronic
Number of Generators	-	2
Installed Capacity	MW	Not described in the registered PDD

2.6 Requested changes

2.6.1 Type of Changes

The *"Procedure for notifying and requesting approval of changes from the project activity as described in the registered PDD"* distinguishes 2 situations as per table 2-6:

Table 2-6: Type of changes – implementation stage

Category	Implementation stage
a	Changes occur from the start of the project activity, i.e. the project has never been implemented in accordance with the description in the registered PDD
b	Permanent changes occur after the project activity has been implemented in accordance with the description in the PDD and issuance of CERs has taken place.

The changes within this project activity fall under category **a)**.

2.6.2 Description of requested changes

The validation addresses the following changes from the registered PDD:

There is a difference between the installed capacity according to the registered PDD and the installed capacity of the equipments according to its nameplates: from 43 MW to 48.11 MW.

The changes are described in detail in the revised PDD and the supporting documents.

The key parameters for the requested changes are given in table 2-7:

Table 2-7: Technical data of the electricity generation system actually installed

Parameter	Unit	Value
TURBINES (43.9 MW)		
Type	-	Vertical 6 Jet Pelton
Manufacturer	-	GE Energy (Norway) AS
Number	-	2
Serial numbers		3912 / 3913
Total Capacity	MW	**21.95**

Parameter	Unit	Value
Synchronic Speed	rpm	514,29
GENERATORS (48.11 MW)		
Type	-	Synchronic Pelton / ATI
Manufacturer	-	GE Hydro Inepar do Brasil S.A.
Number	-	2
Serial numbers		G061 / G062
Nominal Capacity	kVA	28,300
Capacity Factor		0.850
Total Capacity	MW	**24.055**
Synchronic Speed	rpm	514.3

The other technical data remains the same.

2.6.3 Reasons for requested changes

The changes from the previous project design have been carried out, because according to the registered PDD two generation units with a capacity of 21.5 MW are installed. Nevertheless during the on-site visit it has been evidenced on the name plate of the turbine a capacity of 21.95 MW (x2 = 43.9 MW) and on the name plate of the generator a capacity of 24.055 MW (x2 = 48.11 MW).

The higher capacity of the installed equipment was selected as the installed capacity of the project activity which is the installed capacity of the generator: **48.11 MW.** Nevertheless it is important to remark that is hardly possible that the project activity could deliver 48.11MW using two turbines with a single installed capacity of 21.95 MW, summing up 43.9MW.

2.6.4 Occurence of changes

The changes have occurred when implementing the project activity. The El Canada project started commercial operation as per the Whole Sale Market Norms on November 23, 2003. This is the date reported in the PDD as the starting date of the project activity. The project activity was registered as a CDM project on 2nd December 2006. Therefore prior to the registration of the project the installed capacity of the project activity would have been known by the PP and the validation DOE. Furthermore as another DOE has conducted the validation of the project it is not possible for the validation team to explain why the changes have not been addressed in the course of the validation.

2.6.5 Impact of changes on the ability to deliver emission reductions

The changes have the potential to affect the ability of the project to generate emission reductions as follows:

The increase in the installed capacity leads to higher energy generation and thus higher CER expectations. A further analysis on this impact is discussed below.

3 METHODOLOGY AND VALIDATION SEQUENCE

3.1 Validation Steps

The *validation of requested changes from the project from the Project Activity as described in the Registered PDD* consisted of the following steps:

- Appointment of team members and technical reviewers
- A desk review of the original and revised PDD[/PDD/] submitted by the client and additional supporting documents
- On-Site assessment (if required)
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft validation reporting – in case of CARs or CLs
- Resolution of corrective actions (if any)
- Final validation reporting
- Technical review
- Final approval of the validation,

The sequence of the validation is given in the table 3.1 below:

Table 3.1: Validation sequence

Topic	Date
On-site visit	2009/03/05
Draft reporting finalised	2012/01/17
Final reporting finalised	2012/03/05
Technical review on final reporting finalised	2012/03/05

3.2 Appointment of team members and technical reviewers

On the basis of a competence analysis and individual availabilities a validation team, consistent of one team leader, was appointed. Furthermore also the personnel for the technical review and the final approval were determined.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 3-2 below.

Table 3-2: Involved Personnel

	Name	Company	Function [1]	Qualification Status [2]	Scheme competence	Technical competence [4]	Host country Competence	Team Leading competence
☒ Mr. ☐ Ms.	Raul Gonzalez Mitre	BRTUV	TL	LA	☒	1.2	☒	☒
☒ Mr. ☐ Ms.	Emilio Martin	TÜV NORD, Germany	TR[3]	LA	☒	1.2	☐	☒
☐ Mr. ☒ Ms.	Alexandra Nebel	TÜV NORD, Germany	FA	SA	☒	-	☐	☒

[1] TL: Team Leader; TM: Team Member, TR: Technical review; FA: Final approval

[2] GHG Auditor Status: A: Assessor; E: Expert; SA: Senior Assessor; T: Trainee; TE: Technical Expert

[3] No team member

[4] As per S01-MU03 or S01-VA070 A2 (such as A, B, C.....)

3.3 Review of Documents

The registered as well as the revised PDD and supporting background documents related to the project design and the requested changes were reviewed.

Furthermore, the validation team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

3.4 Follow-up Interviews

The validation team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for CDM.

During validation the validation team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in table 3-3.

Table 3-3: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Project proponent representatives Project consultant	- Details of the project validation and earlier verifications - Project history - Technical details of plant - Intended / implemented changes from the previous project design - Impact of changes on the additionality justification - Impact on the monitoring of the project - Editorial issues of the revised PDD

A comprehensive list of all interviewed persons is part of section 7 ‘References’.

3.5 Resolution of Clarification and Corrective Action Requests

3.5.1 Definition

A **Corrective Action Request (CAR)** will be established where:

- mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- the requirements deemed relevant for validation of the intended / implemented changes,
- there is a risk that the changes can not be approved by the UNFCCC or that emission reductions would not be able to be verified and certified after the implementation of the changes.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the subsequent verification(s).

3.5.2 Draft Validation

After reviewing all relevant documents and taken all other relevant information into account, the validation team issues all findings in the course of a draft validation report and hands this report over to the project proponent in order to respond on the issues raised and to revise the project documentation accordingly.

3.5.3 Final Validation

The final validation starts after issuance of the proposed corrective action (CA) of the CARs CLs and FARs by the project proponent. The project proponent has to reply on those and the requests are “closed out” by the validation team in case the response is assessed as sufficient. In case of raised FARs the project proponent has to respond on this, identifying the necessary actions to ensure that the topics raised in this finding are likely to be resolved at the latest during the next verification. The validation team has to assess whether the proposed action is adequate or not.

In case the findings from CARs and CLs cannot be resolved by the project proponent or the proposed action related to the FARs raised cannot be assessed as adequate, no positive validation opinion can be issued by the validation team.

The CAR(s) / CL(s) / FAR(s) are documented in chapter 4.

3.6 Technical review

Before submission of the final validation report a technical review of the whole validation procedure is carried out. The technical reviewer is a competent GHG auditor being appointed for the scope this project falls under. The technical reviewer is not considered to be part of the verification team and thus not involved in the decision making process up to the technical review.

As a result of the technical review process the validation opinion and the topic specific assessments as prepared by the validation team leader may be confirmed or revised. Furthermore reporting improvements might be achieved.

3.7 Final approval

After successful technical review of the final report an overall (esp. procedural) assessment of the complete validation on requested changes will be carried out by a senior assessor located in the accredited premises of TÜV NORD.

Only after this step the notification or the request for approval of the changes on the project activity can be forwarded to the UNFCCC (in case of a positive validation opinion).

4 VALIDATION FINDINGS

The findings (CARs, CLs and FARs) of validation process are summarized in the tables below.

Finding:	**CAR 01**		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Project Design Document: • Two different installed capacities were included in the PDD: 43.9 MW vs 48.11 MW. Correction is necessary. • Table 1 in section A.3 was incorrectly adapted. Elimination of the last two rows is not justified and it is not in accordance with the template. Correction is necessary.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	• Installed capacity has been corrected accordingly (see changes in Section A.2. and Section A.4.3.). The installed capacity is 48.11 MW which correspond to the generator capacity. • Pending rows have been added to Table 1 (Section A.3.) as per PDD template.		
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	• Correction was done in section A,2 of the PDD. An installed capacity of 48.11 MW is now referred to, which is the installed capacity calculated as the sum of the installed capacity of the generators, according to the nameplates. • Table 1 was corrected accordingly. **CAR is closed.**		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first periodic verification ☐ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements		

Finding:	**CAR 02**		
Classification	☒ CAR	☐ CL	☐ FAR

Finding:	CAR 02
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Investment Comparison Analysis calculation spread sheet: • Please provide the original calculation spread sheet used for validation purposes. • The excel spread sheet contains hidden cells. Correction is necessary. • Clarification is required regarding the plant load factor included in the updated PDD (46.2%) because in the registered PDD there are two different values: 42% (page 39) and 46% (pages 12, 13 & 14) Emission reduction calculation spread sheet • Please provide the emission reduction calculation spread sheet in order to check data from section A.4.4.1
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details.*	Investment Comparison Analysis calculation spread sheet: • Original calculation spread sheet **"Adicionalidad"** has been provided. • Cells have been unhidden in the new excel spread sheet – **"Additionality_InvestmentComparison_18Nov2011-Unhidden Cells".** • In the registered PDD (pages 12, 13 & 14) only two decimal places were displayed when referring to the plant load factor's value. The original plant load factor is 0.462. For further reference, please check to the original calculation spread sheet **"Adicionalidad"** where the original value is 0.462.The PLF is now shown in the PDD with all decimal digits. • The plant load factor value of 42% is a mistake in the registered PDD. Changes have been made accordingly in the updated version of the PDD (see Annex 3). Emission reduction calculation spread sheet • The ER calculation spread sheet has been provided.

Finding:	CAR 02
DOE Assessment #1 *The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	• The original calculation spread sheet used for validation purposes was provided and assessed by the Validation team. • The excel spread sheet was corrected and no hidden cells were identified. • Clarification was given regarding two different PLF identified in the PDD. According to the PP the PLF of 42% is a type mistake. The real and correct PLF of the project activity is 46.2%. The registered PDD and original calculation were checked. All calculations were made using the PLF of 46.2%. It can be concluded that the PLF of 46.2% is indeed correct and the PLF of 42% references once in the registered PDD was only a type mistake. Emission reduction calculation spread sheet • The emission reduction calculation spread sheet was provided and data stated in section A.4.4.1 was checked. No discrepancies were identified. The ER estimated after changed in the installed capacity were correctly calculated. **CAR is closed.**
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the first periodic verification ☐ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

5 VALIDATION ASSESSMENT SUMMARY

5.1 General

The World Bank has commissioned the TÜV NORD JI/CDM Certification Program (CP) to conduct a *validation regarding changes from the Project Activity as Described in the Registered PDD* of the project:

"El Canada Hydroelectric Project"

with regard to the relevant requirements of the UNFCCC esp. the Procedure for notifying and requesting approval of changes from the project activity as described in the registered project design document (EB 48, Annex 66) /PNRAC/ and the Guidelines on assessment of different types of changes from the project activity as described in the registered PDD /GADTC/.

In the course of the validation 2 Corrective Actions Requests were raised and closed successfully. No Clarification Requests (CLs) or Forward Action Request (FAR) was raised.

The review of the revised project design documentation and additional documents related to changes to the project design and monitoring plan; the subsequent background investigation and follow-up interviews have provided TÜV NORD JI/CDM CP with sufficient evidences for assessment.

5.2 Additionality

5.2.1 Methodology

In the original project documentation the additionality was justified in line with the requirements of ACM0002 ver. 6. This methodology requires to make use of the tool for the demonstration and assessment of additionality.

5.2.2 Decisive Route of Additionality Justification

During the original validation of the project the additionality was justified on the basis of investment comparison analysis. A further barrier analysis was also conducted in order to further substantiate the additionality. The unit cost of service (levelized cost of electricity) was selected as financial indicator.

Furthermore sensitivity analysis was applied to the estimated discount rate (12%), life time of the project activity (30 years), investment cost in thermal alternatives and power plant capacity factor, as it was done at the validation stage.

According to Para 8 of the Guidelines on Assessment of different types of changes from the Project Activity as described in the registered PDD , the re-assessment of additionality shall be based on all original input data, thereby – in case, of investment analysis – in principle only modifying the changed key parameters in the original spreadsheet calculations.

The DOE has checked that the investment analysis calculation spreadsheet used for demonstrating the additionality with the new input values is the same which was validated at the validation stage and that only the affected parameters that changed were substituted.

As a result, the investment analysis shows that the value for the levelized cost of electricity calculated is higher than coal in all considered sensitive scenarios. In view of Para 8 of the guidelines, the DOE has not re-assessed the input values that have not changed.

Barrier analysis was also addressed but investment comparison analysis is fundamental to determined project additionality.

A detailed assessment is included in Annex 1 and 2 of this document.

5.2.3 Re-Assessment of Additionality

During this validation regarding changes a revised version of the original validated Excel spreadsheet was considered which was provided by the PPs. The modifications mainly reflect the technical changes done.

The additionality justification is based on investment comparison analysis as well as barrier analysis. The unit cost of service (levelized cost of electricity production in $/MWh) was selected as financial indicator in the investment comparison analysis.

Several parameters needed to be modified in order to reflect the technical changes in the financial analysis. For a detailed analysis of the values applied and their verification pl. refer to annex 1.

5.2.4 Result of Additionality Re-Assessment

The revised Excel sheet shows that the unit cost of service (levelized cost of electricity production in $/MWh) is not significantly influenced by the technical changes to the project design. In all possible scenarios the cost of electricity production of the project activity remains higher than at least one thermal generation alternative.

An impact of the increase of the installed capacity and estimated emission reductions cannot be identified. For further details please refer to table A-2 located in annex 1.

Thus the validation team has arrived at the conclusion that the additionality of the project is not affected by the technical changes carried out as a deviation from the project design originally validated and registered.

5.3 Scale of the Project activity

This is a large scale project activity; therefore this criterion is not applicable in this case.

5.4 Applicability and application of the Approved Baseline Methodology

As the changes only refer to the increase of the capacity of the hydroelectric power plant and the methodology does not restrict the total capacity of the project activity the changes do not affect the applicability and the application of the approved baseline methodology.

5.5 Other issues

Along with this validation regarding changes the PP has taken the initiative to correct inconsistencies in the registered PDD which are not related to the technical changes done. The validation team confirms that the changes are

(i) only of editorial nature and not related to the technical changes in question and

(ii) the editorial changes are justified and correct.

In detail:

- Contact person who determined the baseline was updated in section B.5.
- A type error was identified in table A.3.6 of Annex 3 as a wrong PLF of 42% was referenced instead of the real PLF of 46.2%.
- Application of the monitoring methodology and plan was updated in section D according to the revised monitoring plan approved by the EB on 2010/09/13.

6 VALIDATION OPINION

The changes do not raise concerns with respect to aspects outlined in paragraph 10 c) of EB 48 Annex 66 i.e.

a. additionality of the project

b. scale of the CDM project activity and

c. applicability and application of the Approved Baseline Methodology under which the project activity has been registered.

Thus a notification of changes from the project activity as described in the registered PDD to the UNFCCC is deemed appropriate, in line with the requirements outlined in EB 48 Annex 66.

Mexico, 2012-03-05

TÜV NORD JI/CDM CP

Verification Team Leader

Essen, 2012-03-05

TÜV NORD JI/CDM CP

Final Approval

7 REFERENCES

Table 7-1: Documents provided by the project participant

Reference	Document
/INV/	Investment comparison Analysis
/PDD1/	Project Design Document named "El Canada Hydroelectric Project" registered 2006/12/02 and original investment spread sheet used for investment comparison analysis.
/PDD2/	Revised PDD reflecting the intended / implemented changes
/XLS/	Emission reduction calculation spreadsheet

Table 7-2: Background investigation and assessment documents

Reference	Document
/ACM0002/	Consolidated Baseline Methodology for Grid-connected Electricity Generation from Renewable Sources, version 06
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/GADTC/	Guidelines on assessment of different types of changes from the project activity as described in the registered PDD (EB 48; Annex 67)
/GCP/	UNFCCC: Guidelines for completing CDM-PDD and CDM-NM
/IPCC-GP/	IPCC Good Practice Guidance & Uncertainty Management in National Greenhouse Gas Inventories, 2000
/IPPC-RM/	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
/name/	Photographs of the installed turbines and generators name plates
/PNRAC/	Procedures for notifying and requesting approval of changes from the project activity as described in the registered PDD (EB 48, Annex 66)
/PRC/	Procedure for requesting changes from the project activity as described in the registered project design document (EB 48)

Reference	Document
/RfRMP/	Revised Monitoring Plan and related documents approved on 2010/09/13
/TA/	Tool for the demonstration and assessment of additionality (Ver. 6 – EB 65, Annex 21).
/VVM/	Validation and Verification Manual (Version 01.2, Annex 1; EB 55)

Table 7-3: Websites used

Reference	Link	Organisation
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 7-4: List of interviewed persons

Reference	MoI[1]		Name	Organisation / Function
/IM01/	V	☐ Mr. ☒ Ms.	Claudia Croce	The Word Bank representative

[1)] Means of Interview: (**T**elephone, **E**-Mail, **V**isit)

ANNEX

A1: Assessment of Financial Parameters

A2: Assessment of Barrier analysis

ANNEX 1: ASSESSMENT OF FINANCIAL PARAMETERS

Table A-1: Assessment of Financial Parameters

☐	No financial parameters are used for additionality justification
☒	Assessment of all financial parameters see below

Parameter	Value applied	Unit	Source of Information (please indicate document and page)	Reference	DOE ASSESSMENT		
					Correctness of value applied	Appropriateness of information source	Comment
Total installed capacity	48.11	MW	Nameplate of the installed equipment	/name/ /PDD1/ /PDD2/ /INV/	☒	☒	The value corresponds to the name plate of the turbine a capacity of 21.95 MW (x2 = 43.9 MW) and on the name plate of the generator a capacity of 24.055 MW (x2 = 48.11 MW). The higher capacity of the installed equipment was selected as the installed capacity of the project activity which is the installed capacity of the generator: 48.11 MW. Nevertheless it is important to remark that is hardly possible that the project activity could deliver 48.11MW using a turbine with an installed capacity of 43.9 MW The value was correctly applied by the PP.
Investment Cost	1392	US$/kW	Updated Project Design Document, Registered Project Design Document and Financial	/PDD1/ /PDD2/ /INV/	☒	☒	The values were determined during validation stage and they were not changed as a result of the NoC. The registered PDD and the updated PDD were crosschecked. No discrepancies

			Analysis				were identified. The values are still valid.
Total Investment	66.98	US$ Mio	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The total investment is calculated through simple multiplication of the installed capacity (MW) and the investment cost (US$/kW). The value has increased from US$ US$ 59.86 Mio to US$ 66.98 as a result of the updated installed capacity. The value was correctly applied by the PP.
Capital	8.31	US$ Mio	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The capital is calculated through simple multiplication of the total investment (US$ mio) and the Capital Recovery Factor. The value has increased from US$ 7.43 Mio to US$ 8.31 as a result of the updated total investment which has increased as a result of the updated installed capacity. The value was correctly applied by the PP
Capital Recovery Factor	12.41	%	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The capital recovery factor is calculated through formulae stated in the PDD and determined during validation stage. The formulae were not changed as a result of the NoC. The registered PDD and the updated PDD were crosschecked. No discrepancies were identified. The value which remains the same is still valid.
Discount rate	12	%	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The values were determined during validation stage and they were not changed as a result of the NoC. The discount rate is used in the calculation of the capital recovery factor. The registered PDD and the updated PDD were crosschecked. No discrepancies were

							identified.
Project duration	30	years	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The values were determined during validation stage and they were not changed as a result of the NoC. The project duration is used in the calculation of the capital recovery factor. The registered PDD and the updated PDD were crosschecked. No discrepancies were identified.
O&M Fix	1.13	US$ Mio	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The values were determined during validation stage and they were not changed as a result of the NoC. The registered PDD and the updated PDD were crosschecked. No discrepancies were identified.
Plant Factor	46.2	%	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The values were determined during validation stage and they were not changed as a result of the NoC. The registered PDD and the updated PDD were crosschecked. No discrepancies were identified.
Energy Production	194,7	GWh/ year	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/ /name/	☒	☒	The value corresponds to the capacity of each generator in one year, considering the capacity factor of 46.2%. The expected electricity production has been increased from 174 GWh/year to 194.7 GWh/year. The value was correctly calculated using updated figures of installed capacity.
Total costs	9.44	US$ Mio	Updated Project Design Document, Registered Project Design Document and Financial	/PDD1/ /PDD2/ /INV/	☒	☒	The total costs are calculated through formulae stated in the PDD and determined during validation stage. The formulae were not changed as a result of the NoC. The registered

			Analysis				PDD and the updated PDD were crosschecked. No discrepancies were identified. The value has increased from US$ 8.56 Mio to US$ 9.44 Mio as a result of the updated total investment value (total investment value was calculated from a fixed installed capacity unit cost) which has increased as a result of the updated installed capacity. The value was correctly calculated by the PP using updated figures of installed capacity.
Production cost (financial indicator)	48,5	US$/ MWh	Updated Project Design Document, Registered Project Design Document and Financial Analysis	/PDD1/ /PDD2/ /INV/	☒	☒	The production cost is calculated through simple division between total cost and energy production. The value has decreased from 49.2 US$/MWh to 48.5 US$/MWh as a result of the updated total cost and energy production. The value was correctly applied by the PP The revised Excel sheet shows that the unit cost of service (levelized cost of electricity production in $/kWh) is not significantly influenced by the technical changes to the project design. In all possible scenarios the cost of electricity production of the project activity remains higher than at least one thermal generation alternative. An impact of the increase of the installed capacity and estimated emission reductions

							cannot be identified. Furthermore sensitivity analysis was applied to the estimated discount rate (12%), life time of the project activity (30 years), investment cost in thermal alternatives and power plant capacity factor as it was done at the validation stage. The excel table still shows that the levelised cost of electricity for the project activity is higher than the coal-fired steam plant in all scenarios. Thus the validation team has arrived at the conclusion that the additionality of the project, as it was justified at the validation stage, was not affected by the technical changes carried out as a deviation from the project design originally validated and registered

ANNEX 2: ASSESSMENT OF BARRIER ANALYSIS

Table A-2: Assessment of Barrier Analysis

☐	No barrier parameters are used for additionality justification
☒	Assessment of barriers see below

Kind of Barrier (invest, tech, other)	Description of Barrier	Evidence used	Assessment of validation team	
			Appropriateness of information source	Explanation of final result
Other	Risk associate to with hydroelectric plants Vs thermal plants Relation between system pricing and seasonal hydro Financial barriers Common practice	/PDD1/ /PDD2/	☒	Barriers described in the PDD did not changed and they were not affected by the NoC which is related only to a change in the installed capacity. The PDD describes barriers related to risk associate to hydroelectric projects plants, the relation between system pricing and seasonal hydro resource availability, financial barriers and common practice analysis. The barriers presented in the PDD remain unchanged because they are independent from the change in the installed capacity. All barriers are related to external factors. **Concluding the barrier analysis is not affected by the changes in the installed capacity.**