VERIFICATION / CERTIFICATION REPORT

TROJES HYDROELECTRIC PROJECT IN MEXICO

(UNFCCC Registration Ref. No. 0649)

Monitoring Period:
1 April 2009 to 31 March 2010

REPORT NO. 2010-9282

REVISION NO. 01

DET NORSKE VERITAS

VERIFICATION / CERTIFICATION REPORT

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Approved by: Edwin Aalders	Organisational unit: DNV KEMA Energy & Sustainability, Accredited Climate Change Services
Client: ENEL TRADE SPA	Client ref.: Casiopea Ramírez

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Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Trojes Hydroelectric Project" in Mexico (UNFCCC Registration Ref. No. 0649) for the period 1 April 2009 to 31 March 2010.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (Version 03) of 05 March 2012 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AMS-I.D (version 08) and the monitoring plan contained in the Project Design Document of 31 August 2011.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Trojes Hydroelectric Project" during the period 1 April 2009 to 31 March 2010 amount to 10 543 tonnes of CO_2 equivalent.

Report No.: 2010-9282	Subject Group: Environment
Report title: Trojes Hydroelectric Project in Mexico	
Work carried out by: Gonzalo Sandoval, Ricardo Díaz, Felipe Antunes; Andres Espejo	
Work verified by: S.Ranganathan	
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CFE	Comisión Federal de Electricidad (Federal Commission of Electricity).
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	DNV Climate Change Services AS
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
INELEC	Impulsora Nacional de Electricidad (National Supporter of Electricity)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
N_2O	Nitrous oxide
PDD	Project Design Document
PPA	Power Purchase Agreement
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

ENEL TRADE SPA has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the "Trojes Hydroelectric Project" (the project) in the period 1 April 2009 to 31 March 2010. This report contains the findings from the verification and a certification statement for the certified emission reductions.

1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the "Trojes Hydroelectric Project" for the period 1 April 2009 to 31 March 2010.

1.2 Scope

The scope of the verification is:

- To verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

1.3 Description of the project activity

Project Parties:	*México (Host Party), United Kingdom of Great Britain and Northern Ireland and Switzerland.*
Title of project activity:	*"Trojes Hydroelectric* Project*"*
UNFCCC registration No:	*UNFCCC registration No.*0649
UNFCCC registration date:	*4 November 2006*
Baseline and monitoring methodology	*AMS-I.*D *(version 08)*
Project Participants:	*Impulsora Nacional de Electricidad S. de R. L. de C. V.. Hidroelectricidad del Pacífico S. de R. L. de C. V., BNP Paribas S.A.*

Location of the project activity: *State of Jalisco, 50 kilometers south-east of the city of Colima, Barreras river, México*

Project's crediting period: 1 April 2003 - 31 March 2010

Period verified in this verification: 1 April 2009 to 31 March 2010

The project is a hydro power plant installed in one of the two diversion tunnels of an existing reservoir which were built for diverting storm water during the construction stage of the dam /1/. While one diversion tunnel is used to feed the powerhouse of the project activity, the other diversion tunnel serves currently for irrigation purposes /1/. The installed capacity of the generator is 8 760 kW and the installed capacity of the turbine is 10 567 kW /1/. The objective of "Trojes Hydroelectric Project" is to generate electricity and sell it to Mexican consumers, primarily industrial users and municipalities, through PPAs using for that purpose the national grid owned by CFE for wheeling electrical energy /1/.

The objective of the project activity is to generate electricity from a renewable energy source that will displace electricity from the grid, which has been produced by fossil fuel plants in Mexico /1/. The companies Impulsora Nacional de Electricidad, S. de R.L. de C.V. and Hidroelectricidad del Pacífico S. de R.L. de C.V. are owners and developers of "Trojes Hydroelectric Project" /1/.

The project's emission reductions are determined by multiplying the amount of net electricity delivered to the grid (exported energy minus imported energy minus internal consumption) by the project activity with a grid emission coefficient yielding 0.531 tCO_2/MWh /1/. This coefficient has been validated and is fixed *ex-ante* during the first crediting period.

1.4 Methodology for determining emission reductions

According to the applied methodology AMS-I.D (version 08) /22/, the emission reductions (ER_y) are determined as the electricity produced by the renewable generating unit (EG_y) multiplied by an emission coefficient (EF_y). In case of the Trojes Hydroelectric Project, project and leakage emissions are considered to be zero in line with the provisions of AMS-I.D (version 08). Thus, the emission reductions are:

$$ER_y = BE_y\text{-}PE_y\text{-}L_y = BE_y - 0 - 0 = EG_y * EF_y.$$

Where:

-EF_y is the emission factor of Mexico electricity grid, which was determined *ex-ante* (i.e. 0.531 tCO_2/MWh) in the revised PDD /1/.

-EG_y is the net electricity generation supplied to the grid, which is determined by deducting the electricity consumed from the grid (i.e. parasitic consumption, $E_{consumed,y}$) to the electricity generated and placed into the interconnected grid by the hydroelectric plant (i.e. $EG_{exported,y}$) /1/. The net electricity generation is determined in a monthly basis by monitoring the electricity exported and imported /1/. Therefore:

$$EG_y = EG_{exported,y} - E_{imported,y}$$

2 METHODOLOGY

The verification of the emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project. These include:

i) Review of project documentation;

ii) The net electricity supplied by the project to the grid which is multiplied with a fixed grid baseline combined emission factor of 0.531 tCO_2/MWh;

iii) The actual installed capacity of the hydroelectric power plant to ensure the conformance with the descriptions in the registered PDD;

iv) The recording and registration of the electrical energy dispatched to the grid per month for all months comprised in the monitoring period /9/;

v) Calculation of emissions reductions according to the monitoring plan based in the records of the electrical energy dispatched to the grid /3/;

vi) Fulfilment of the quality control and quality assurance as stated in the revised PDD /1/;

Verification team

				Type of involvement					
Role	***Last Name***	***First Name***	***Country***	Desk review	Site visit	Reporting	Supervision of work	Technical review	TA 1.2 competence
Team leader (Verifier)	Antunes	Felipe	Brazil	✓	✓	✓	✓		✓
Verifier	Sandoval	Gonzalo	Mexico	✓	✓	✓			
Verifier	Díaz	Ricardo	México	✓	✓	✓			✓
Assessor under training	Andres	Espejo	Italy	✓		✓			✓
Technical reviewer	Seshan	Ranganathan	India					✓	✓

Duration of verification

Monitoring report publication: *12 July 2010*

Preparations: *From 30 August 2010 to 3 September 2010*

On-site verification: *From 9 September 2010 to 10 September 2010*

Reporting, calculation checks and QA/QC: *From 13 September 2010 to 22 April 2012*

2.1 Review of documentation

The monitoring report (webhosted version 1 dated 12 July 2010 and final version 3 dated 5 March 2012) /2/ and the emission reduction calculations /3/ were assessed as part of this periodical verification. In addition, the revised PDD /1/, the monitoring plan contained in the revised PDD /1/ as well as the project's validation report /4/ and the verification/certification

reports for first, second and third issuances /5//6//7/ were assessed. Other documents related to the hydro power plant operation were also assessed as part of this verification /9//10//11//13/. In addition to that, DNV also considered the notification of changes accepted on 31 October 2011 by the EB /8/, which served to address the difference between the actual installed power capacity and the installed capacity included in the project description of the PDD dated 19 April 2006 /1/.

The monitoring report version 1 dated 12 July 2010 /2/ was made publicly available on the CDM website 12 July 2010.

2.2 Site visit

Mr. Gonzalo Sandoval, Mr. Ricardo Díaz and Mr. Felipe Antunes performed the site visit on 10 September 2010 to Trojes Hydroelectric Project. During the site visit, interviews were carried out with Mr. Jose Antonio Méndez Fuente /26/. The interview topics were project implementation, implementation of operational and data collection procedures, data management, quality assurance and quality control system. Since not all the documents were available on-site, a second interview was carried out in ENEL's office in Mexico City. This interview was conducted by Mr. Gonzalo Sandoval and Mr. Ricardo Díaz from DNV and Ms. Casiopea Ramírez from the project entity on 11 September 2010 /27/.The interview topics were implementation of operational and data collection procedures, data management, quality assurance and quality control system.

During the site visit, the power house of the project activity was visited in order to check whether the project activity had been implemented as per the project description provided in the registered CDM PDD /1/ and found the implementation as per the revised PDD /1/.

Moreover, it was verified that the procedures followed by project staff for aggregating and reporting the monitoring parameters /16/ were in accordance with the monitoring plan /1/, consistent with readings taken by CFE /9/ and in line with the project entity's internal monitoring procedure /16/. Once per month CFE prepares a memorandum that includes the electrical energy wheeled by the project activity through CFE's grid /9/.

To perform the verification of the reported emissions reductions from "Trojes Hydroelectric Project", the following activities were performed:

- Verification of the implementation and operation of the project activity and the monitoring system.
- Verification of the data collection and aggregation procedures.
- Verification that the readings of electricity produced and exported to the grid is measured through reliable and calibrated instruments /10//11//13/.
- Verification that the readings of electricity imported from the grid is measured through reliable and calibrated instruments /10//11//13/.
- Verification that monitoring and measuring equipment is calibrated and correctly operated and maintained.
- Verification of the calculations in order to assure that no errors and misstatements have occured /3/.

The data presented in the monitoring report was assessed by review of the detailed project documentation and production records, as well as by interviews with personnel at ENEL

TRADE SPA, and observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results; to verify the correct application of the approved monitoring methodology and the determination of the emission reductions.

In addition, all parameters required by the monitoring methodology AMS-I.D, version 08 /22/, and the management system were assessed during the site visit.

2.3 Reporting of findings

A corrective action request (CAR) is issued, where:

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

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

During this period, two CARs was identified and no CLs were identified (refer to Appendix A of this report). CAR1 is related to the change detected in the project implementation (c.f. Section 3.2) which was addressed by the project participant through a Notification of Changes to the PDD which was approved by the EB on 31 October 2011 /24/. CAR2 is related to the FAR2 issued as part of the previous verification requesting to calibrate the internal meter that the project participant uses for comparing the energy generated against energy delivered to CFE /7/. Following paragraph 190 of the VVM (version 1.2) /21/, DNV raised CAR 2 requesting to the project participant to provide a calibration certificate of the mentioned meter. This was closed as this meter is not used for the actual monitoring but for doing an internal cross-check with the figures provided by CFE, and the applicable methodology or the local regulations do not require to calibrate this internal meter, plus this issue does not suppose a limitation for issuing a verification/certification statement.

Furthermore, as part of this periodical verification no FARs were identified, while two FARs were pending from previous verifications. FAR 1 was successfully addressed by the project participant while FAR 2 was closed and raised as CAR 2 in this verification.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Trojes Hydroelectric Project" for the period 1 April 2009 to 31 March 2010.

3.1 Remaining issues, CARs, FARs from previous validation / verification

There are two remaining FAR from the third verification period /7/ (refer to Appendix A).

- FAR 1 was raised by the DOE that performed the third verification requesting that the following verification would have to conduct the on-site assessment with the installations under operation /7/. This FAR was successfully closed as the on-site assessment of the current periodical verification was conducted while the installations were under operation (c.f. Section 2.2).
- FAR 2 was raised by the DOE that performed the third verification requesting to calibrate the internal meter that the project participant uses for comparing the energy generated against energy delivered to CFE /7/. As DNV was able to confirm during the site visit this electricity meter is an internal meter located in the control room that is used to compare its readings against readings provided by CFE's meter, yet it is not used for the actual invoicing to the CFE or as a back-up meter of the main meter (c.f. Section 3.5). At the time of this report the project participant had not yet calibrated this electricity meter, therefore, as per paragraph 190 of the VVM (version 1.2) /21/, DNV raised CAR 2 requesting to the project participant to provide a calibration certificate of the mentioned meter. In response to this CAR, the project participant informed that it was in the process of engaging a metrology and calibration lab in order to conduct the calibration. As this meter is not used for the actual monitoring but for doing an internal cross-check with the figures provided by CFE, and the applicable methodology or the local regulations do not require to calibrate this internal meter, DNV deems that this issue does not suppose a limitation for issuing a verification/certification statement. Hence, DNV has accepted to close CAR 2.

3.2 Project implementation

As part of the site visit DNV was able to confirm that the project implementation is in accordance with the project description contained in the revised PDD of 31 August 2011 /1/.

The project design document of 19 April 2006 /1/ stated that the installed capacity of the project activity is 8.0 MW based on a single synchronous generator coupled to a horizontal Francis turbine. However, during the on-site assessment of this periodical verification, DNV confirmed that the real installed capacity was 8.760 MW and not 8.0 MW. As a result, DNV raised CAR 1 requesting to the project participant to apply for a notification of changes to the PDD or to apply for a request for approval of changes as applicable. A notification of changes to the PDD was sent to the EB and it was accepted on 31 October 2011 /8/. One Francis turbine manufactured by Alstom with an output power capacity of 10.576 MW was installed at the power house of the project activity /14//15/. This turbine is coupled to a synchronous generator of 8.760 MVA with a power factor of 0.95 and an output voltage of 3.8 kV /14//15/. Considering the apparent power (in MVA) and the power factor, the active power that generator is capable to deliver at its rated power factor (minimum power factor) is 8.760

MVA x 0.95 = 8.322 MW /14//15/. However, considering that the power factor is defined by the grid's requirements of active and reactive power, it can be concluded that the maximum active power that the generator can deliver is when power factor is unity yielding 8.760 MVA x 1.0 = 8.760 MW, which is the maximum capacity of the synchronous generator. Since the primary motor (the Francis turbine) of the generator is quite capable of transferring 8.760 MW of mechanical power to the generator (output power of the turbine is 10.576 MW), it can be concluded that 8.760 MW is the real capacity of the synchronous generator /14//15/. All the nameplate data mentioned above were confirmed through visual inspection during the visit to the power house and associated facilities of the project activity.

The electricity generated is supplied generated output to Mexican consumer partners (primarily industrial users and municipalities) on the basis of power purchase agreements (PPA's), using the Comisión Federal de Electricidad (CFE) transmission system to wheel the energy /1/. The main electricity meter and back-up meter are installed at the CFE's substation of "Presa Trojes" which is located at 2.5 km from the power house in the substation and under the control of "CFE" Comisión Federal de Electricidad. These meters are of a precision class CL02 (0.2%).

3.3 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD

The information presented by the project participant shows that the hydroelectric generating station is fully operational, since there are records of the energy generated including other electrical variables as voltage, current, active power, reactive power, apparent power, power factor and frequency, directly measured from the generator /2//3/. During the monitoring period, the total electricity exported to the grid is 20 000.84 MWh, the imported electrical energy from the grid is 145.48 MWh and the net electrical energy delivered to the grid is 19 855.37 MWh /2//3/. The plant load factor of the project activity during the verification period is 25.87% /2//3/ while in the registered PDD the plant load factor was estimated to be 50.4% /1/. According to the revised PDD /1/, the yearly average electricity generation was expected to be 38.7 GWh; thus the electricity dispatched to the grid is 50.4% of the assumed electricity generation in the revised PDD /1/. The reason for this difference is that due to the dry season the National Water Commission (Comisión Nacional del Agua) did not allow "Trojes Hydroelectric Project" to generate electricity /26//27/. The project activity did not generate electricity from July 2009 to the first week of November 2009 /3/. On 9 November 2009 the National Water Supply Commission allowed to "Trojes Hydroelectric Project" to resume the electricity generation /26//27/.

There are no changes in the information provided in the monitoring report for the current verification period that can lead to an increase in the estimation of the emission reductions, neither in this monitoring period, nor in future monitoring periods.

3.4 Compliance of monitoring plan with monitoring methodology

DNV is able to confirm that the monitoring plan contained in the registered PDD of 19 April 2006 /1/ and the revised PDD of 31 August 2011 /1/ is in accordance with the approved methodology applied by the project activity, i.e. AMS-I.D (version 08) /22/.

3.5 Compliance of monitoring with the monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the PDD of 31 August 2011 /1/.

As per the monitoring plan in the revised PDD /1/, the only parameter to be monitored is the net electrical energy dispatched to the grid as the Mexican grid's emission factor for this project is determined to be fixed *ex-ante* as per the revised PDD /1/.

DNV confirmed this parameter stated in the monitoring plan contained in the revised PDD is monitored and reported appropriately. All parameters required to be monitored by the monitoring plan are as per the monitoring methodology AMS-I.D (version 08)/22/ and the management system were assessed during the site visit. DNV confirms that neither a revision nor a deviation to the monitoring plan has been requested to CDM Executive Board.

The following table is related to the parameter in the monitoring plan / methodology:

3.5.1 Monitoring parameters

According to the monitoring plan of the registered PDD, there is one parameters to be monitored:

- Electricity generated by the project delivered to grid (net of parasitic consumption);

The following tables are related to the parameters in the monitoring plan / methodology:

	Assessment/ Observation
Data / Parameter: **(as in monitoring plan of PDD):**	Electricity generated by the project delivered to grid (net of parasitic consumption)
Measuring frequency:	Continuous.
Reporting frequency:	Monthly.
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes.
Type of monitoring equipment:	The project has a main meter and a back-up meter installed for carrying out the monitoring of the electricity generated and delivered to the grid /2/. • Main meter (serial number PR-0506A068-02): ION 8400, manufactured by Schneider Electric, precision class CL02 (0.2%) /17/. • Back-up meter (serial number AR-0012A368-02): ION 8400, manufactured by ABB, precision class CL02 (0.2%) /17/. The CFE reads only the main meter in order to determine the amount of electricity that has been delivered to the grid and for invoicing purposes. The back-up meter is used in the eventual case of malfunctioning or lack of calibration of the main meter. As discussed later, for this monitoring period as the main meter has functioned normally, the CER calculations are based exclusively on the

	reading of the main meter. As DNV confirmed during the site visit, the location of the main and back-up electricity meter is in the CFE's substation of "Presa Trojes" which is located at 2.5 km from the power house in the substation and under the control of "CFE" Comisión Federal de Electricidad.
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	No meter accuracy is not defined in the revised PDD /1/, yet the monitoring equipment used represent good monitoring practise as it is a precision class CL02 (0.2%) /17/.
Calibration frequency /interval:	The CFE (i.e. who is the owner of the metering devices) conducts an annual calibration of the meters in order to check whether they are within specifications /10//11/, i.e. accuracy is below 0.2%. When a meter does not pass the calibration test, CFE sends the meter to the manufacturer to be fixed and calibrated /18/.
Is the calibration interval 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 practise?	No calibration frequency is defined in the revised PDD /1/, yet one calibration per year is considered a good practice for checking metering devices and is in line with the calibration frequency defined in the procedures of the national grid operator CFE. Hence, it can be concluded that the calibration frequency is in line with the 'Guidelines for assessing compliance with calibration frequency' (version 01) /25/ as the calibration frequency follows national standards.
Company performing the calibration:	Annual calibrations are conducted by CFE /10//11/.
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, the two calibrations conducted in the main meter ION 8400 s/n PR-0506A068-02 confirmed proper functioning /10//11/: • Calibrated on 5 December 2008 by CFE having determined a maximum error of 0.1283% /10/. • Calibrated on 5 November 2009 by CFE having determined a maximum error of 0.1067% /11/.

	However, a calibration of the back-up meter ION 8400 s/n AR-0012A368-02 showed a lack of calibration /18/: • Tested on 5 November 2007 by CFE having determined a maximum error of 0.3525% /18/. This electricity meter was retired and sent to the manufacturer to be fixed and calibrated, being re-installed 8 May 2009 /12/. • Calibrated on 27 June 2009 by Schneider Electric having a maximum error of 0.01% /13/. All the certificates were provided by the project participant and assessed by DNV. The maximum error of the main meter showed to be within electricity meter specifications, i.e. within the permissible limit of 0.2% during the current monitoring period.
Is(are) calibration(s) valid for the whole reporting period?	Yes, the two calibrations of the main electricity meter ION 8400 s/n PR-0506A068-02 cover the whole monitoring period (1 April 2009 to 31 March 2010): • Calibration on 5 December 2008 by CFE which would cover one year until 5 December 2009 /10/. • Calibration on 5 November 2009 by CFE which would cover one year until 5 November 2010 /11/. Hence, the calibration of the main electricity meter has been done in an annual basis, in line with the procedures of the CFE and they cover the whole monitoring period. Hence, in line with the provisions of 'Guidelines for assessing compliance with calibration frequency' (version 01) /25/. The back-up electricity meter ION 8400 s/n AR-0012A368-02 due to a lack of calibration was uninstalled 5 November 2007 /18/; it was later fixed and re-installed 8 May 2009 /12/ and was calibrated 27 June 2009 /13/. Therefore, the back-up meter only operated from 8 May 2009 and the calibration of the back-up meter would only cover the period from 27 June 2009 till the end of the monitoring period. Although this means that the back-up electricity meter ION 8400 s/n AR-0012A368-02 operated

	without a calibration certificate that covered the period 8 May 2009 to 27 June 2009, this would not have an effect on the estimation of the emission reductions in the monitoring period as the electricity generated were sourced exclusively from the electricity meter ION 8400 s/n PR-0506A068-02 which operated within specifications; this was confirmed through the invoices from the CFE which make reference to this meter /9/.
If applicable, has the reported data been cross-checked with other available data?	Yes. The data in the monitoring report have been cross-checked against the reports of wheeled energy provided by CFE to the project participant which is then used by the project participant for invoicing to its customers /9/ and invoices on consumed electricity provided by the CFE /20/.
How were the values in the monitoring report verified?	Values were verified by direct comparison of the information provided in the project participant /3/ and the reports of wheeled energy provided by CFE to the project participant /9/ and invoices on consumed electricity provided by the CFE /20/.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes. There are two metering devices owned by CFE and both readings are taken and calibrated by CFE's staff.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable.

Calibration records and accreditation certificates have been provided for verification team. DNV can confirm that the meters were calibrated covering this monitoring period as per the registered PDD.

3.6 Assessment of data and calculation of emission reductions

DNV confirms that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed for this project activity, and the assumptions, emission factors and default values that are applied have been justified. The GHG emissions reductions for the monitoring period were calculated correctly on the basis of:

a) the approved methodology AMS-I.D version 08 /22/; b) the formulae given in the revised PDD /1/; and c) the reports of the electrical energy wheeled to the grid /9/.
As stated in the section 1.4, the emission reductions ER_y by the project activity during the monitoring period are equal to the difference between baseline emission, project emission and leakage:

$$ER_y = BE_y - PE_y - L_y$$

3.6.1 Baseline emissions

The CO_2 baseline emissions (BE_y in tCO_2) are the product of the net electricity exported to the grid by "Trojes Hydroelectric Project" (EG_y in MWh) and the validated grid emission factor of 0.531 tCO_2/MWh /1/, calculated *ex-ante* as a combined margin, according to the methodology AMS-I.D (version 08) /22/ (EF_y in tCO_2/MWh).

- EF_y: The grid emission factor of the grid, which was calculated *ex-ante* and will not be updated during the first crediting period. The grid emission factor is equal to 0.531 tCO_2/MW as evidenced by the revised PDD /1/.
- EG_y: During the monitoring period from 1 April 2009 to 31 March 2010 the total electricity exported to the grid is 20 000.84 MWh and the electricity imported from the grid is 145.48 MWh /2//3/. After deducting the electricity imported and considering decimals, the net amount of electricity supplied to the grid (EG_y) is 19 855.37 MWh /2//3/. The electricity exported to the grid and the electricity imported from the grid has been respectively cross checked with the reports on electricity exported /9/ and the invoices on imported /20/ issued by the CFE. Therefore, the claimed emission reductions of 10 543 tCO_2e reported for this period was verified by reviewing the presented relevant documents /2//3//9//20/. The plant load factor of the project activity during the verification period is 25.87% /3/ while in the revised PDD the plant load factor was estimated to be 50.4% /1/.

The net electricity supplied by the project to the grid in this reporting period is as shown in the following table.

Period	*Electricity exported to the grid (MWh)* $EG_{exported,y}$				*Electricity imported from the grid (MWh)* $E_{imported,y}$		
	Values from meter reading	*Values from invoices /9/*	*Verified*	*PLF*	*Values from meter reading*	*Values from invoices /20/*	*Verified*
	A	*B*	*C=Min(A, B)*	*%*	*D*	*E*	*F=Max(D, E)*
April 2009	*3 728.12*	*3 728.12*	*3 728.12*	*59%*	*1.80*	*1.80*	*1.80*
May 2009	*3 263.62*	*3 263.62*	*3 263.62*	*50%*	*5.93*	*5.93*	*5.93*
June 2009	*2 161.03*	*2 161.03*	*2 161.03*	*34%*	*9.53*	*9.53*	*9.53*
July 2009	*0.00*	*0.00*	*0.00*	*0%*	*17.99*	*17.99*	*17.99*
August 2009	*0.00*	*0.00*	*0.00*	*0%*	*18.63*	*18.63*	*18.63*
September 2009	*42.45*	*42.45*	*42.45*	*1%*	*19.02*	*19.02*	*19.02*
October 2009	*53.15*	*53.15*	*53.15*	*1%*	*15.06*	*15.06*	*15.06*
November 2009	*836.64*	*836.64*	*836.64*	*13%*	*15.58*	*15.58*	*15.58*
December 2009	*1 972.09*	*1 972.09*	*1 972.09*	*30%*	*11.96*	*11.96*	*11.96*
January 2010	*2 440.19*	*2 440.19*	*2 440.19*	*37%*	*10.83*	*10.83*	*10.83*

February 2010	*2 022.36*	*2 022.36*	*2 022.36*	*34%*	*10.44*	*10.44*	*10.44*
March 2010	*3 481.19*	*3 481.19*	*3 481.19*	*53%*	*8.71*	*8.71*	*8.71*
Total	*20 000.84*	*20 000.84*	*20 000.84*	*26%*	*145.48*	*145.48*	*145.48*

Table 1. Values of electricity exported to the grid and electricity imported.

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Hence, $BE_y = EG_y \times EF_y$

BE_y = 19 855.37 MWh×0.531 tCO_2/MWh= 10 543 tCO_2e.

3.6.2 Project emissions

The project emissions are regarded as zero according to the methodology AMS-I.D (version 08) /22/.

3.6.3 Leakage

There are no leakages that need to be considered in applying the methodology AMS-I.D (version 08) /22/.

3.6.4 Emission reductions

Therefore, the emission reductions in this monitoring period are:

$$ER_y = BE_y - PE_y - L_y = 10\,543 - 0 - 0 = 10\,543\ tCO_2e.$$

The yearly expected emission reductions in the revised PDD /1/ are 20 550 tonnes of CO_2 equivalents while in the monitoring period are equal to 10 543 tonnes of CO_2 equivalents. The reason for this reduction is the lower electricity generation in the monitoring period. According to the revised PDD /1/, the yearly average electricity generation was expected to be 38.7 GWh; this means that the electricity dispatched to the grid in the monitoring period is 51.3% of the assumed electricity generation in the revised PDD /1/. The reason for this difference is that due to the dry season the National Water Commission (Comisión Nacional del Agua) did not allow to "Trojes Hydroelectric Project" to generate electricity /26//27/. The project activity did not generate electricity from July to the first week of November /3/. On 9 November 2009 the National Water Supply Commission allowed to "Trojes Hydroelectric Project" resume the electricity generation /26//27/. Another reason for this low generation is due to the reduced precipitation during the rainy season /2/. DNV deems that these two reasons have caused a significant reduction in the electricity generated causing in turn a reduction in the emission reductions.

As outlined above, the input data for calculating the emission reductions, the calculating process and the result are complete and transparent, hence DNV is able to confirm the accuracy of emission reductions.

Therefore, the emission reductions achieved are deemed reasonable. As per para 209 (c) of VVM version 1.2 /21/, DNV confirms that appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed for this project activity, and as per para 209 (d) of VVM version 1.2, DNV confirms that the assumptions, emission factors and default values that were applied in the calculations have been justified.

3.7 Quality of evidence to determine emission reductions

DNV confirmed that a complete set of data for this monitoring period is available to be monitored and are in accordance with the revised PDD /1/.

All necessary documentation is collected, referenced and aggregated and is easily accessible in hard-copy or electronic format as evidenced by the internal monitoring procedures /16/. DNV was able to verify that "Trojes Hydroelectric Project" has an automated control system where the operation and electricity generated is continuously monitored. Measurements are performed by calibrated equipment, and the key data were cross-checked via other sources, such as invoices /9/. No assumptions are used that have any material impact on the reported emission reductions.

DNV is able to conclude that the emission reductions during this verification period have been sufficiently and reasonably determined, and the calculation of emission reductions is reliable.

DNV has confirmed that a complete set of data for the specified monitoring period is available.

3.8 Management system and quality assurance

Hidroelectricidad del Pacífico S. de R. L. de C. V. is responsible for the operation and maintenance of the project. The CFE is responsible of the monitoring equipment (i.e. a principal meter and a backup meter which are located in a separate facility of the project activity) and data collection (i.e. the readings of these meters are used exclusively by CFE's staff to determine the amount of electrical energy wheeled to the grid).

The management system for the project /16/ has been verified to be in place by DNV on site. The organization structure with the responsibilities, personnel competencies, monitoring procedure and monitoring management have been properly identified /16/ and put into operation. During the site visit to the project activity and to ENEL's facilities in Mexico City it was verified that all the information related to calibration and verification of both meters and reports of electrical energy dispatched to the grid is properly classified and stored in hardcopies and digital files.

The management system for the project is in place. In order to make the monitoring system more efficient, before operation of this project, the project entity edited the "Instruction for registration of plant operational information" /16/. In the manual, the organization structure with the responsibilities, personnel competencies, monitoring procedure and monitoring management have been properly identified and put in place /16/. By interview with the staff and check records during on-site visit, it can be confirmed that the monitoring management system is implemented following the "Instruction for registration of plant operational information" /16/.

DNV confirms that the responsibilities and authorities in the management and operational system for monitoring and reporting are in accordance with the responsibilities and authorities stated in the registered PDD and monitoring plan.

4 CERTIFICATION STATEMENT

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the "Trojes Hydroelectric Project" (UNFCCC Registration Reference No. 0649) for the period 1 April 2009 to 31 March 2010.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project..

DNV conducted the verification on the basis of the monitoring methodology AMS-I.D (version 08), the monitoring plan contained in the registered Project Design Document of 31 August 2011 and the monitoring report (Version 03) dated 05 March 2012. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions of the "Trojes Hydroelectric Project" (UNFCCC Registration Ref. No. 0649) for the period 1 April 2009 to 31 March 2010 are fairly stated in the monitoring report (Version 03) dated 05 March 2012.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS-I.D (version 08) and the monitoring plan contained in the revised PDD of 31 August 2011.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Trojes Hydroelectric Project" during the period 1 April 2009 to 31 March 2010 amount to 10 543 tonnes of CO_2 equivalent.

Rio de Janeiro and Oslo, 22 April 2012

Felipe Antunes
CDM Verifier
DNV Río de Janeiro, Brazil

Edwin Aalders
Approver,
Det Norske Veritas Certification AS

5 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

/1/ ENEL Green Power: Project Design Document of "Trojes Hydroelectric Project", version 4, 31 August 2011 (revised PDD accepted on 31 October 2011).
INELEC: Project Design Document of "Trojes Hydroelectric Project", version 3, 19 April 2006.

/2/ ENEL Green Power and Hidroelectricidad del Pacífico S. de R.L. de C.V.: 4th Monitoring Report of "Trojes Hydroelectric Project", version 01 dated 12 July 2010 and Version 03, dated 05 March 2012.

/3/ ENEL Green Power and Hidroelectricidad del Pacífico S. de R.L. de C.V.: Spreadsheet for emission calculations for the 4th verification period of "Trojes Hydroelectric Project", version 1, 12 August 2010.

/4/ Det Norske Veritas AS: Validation Report of "Trojes Hydroelectric Project", report No. 2004-005, Rev. 03, 13 September 2006.

/5/ Det Norske Veritas AS: Verification Report of "Trojes Hydropower Project", report No. 2006-2174, Rev. 01, 8 January 2007.
Note: The project name in the verification report is "Trojes Hydropower Project", however, the real name is "Trojes Hydroelectric Project".

/6/ Det Norske Veritas As: Verification Report of "Trojes Hydropower Project", report No. 2007-2071, Rev. 02, 6 August 2008.
Note: The project name in the verification report is "Trojes Hydropower Project", however, the real name is "Trojes Hydroelectric Project".

/7/ TUV-SUD: Verification Report of "Trojes Hydropower Project", report No. 1333946, Rev. 04, 14 April 2011.
Note: This request for issuance was rejected by the CDM EB; however, DNV considered the findings of the report and the raised FARs.

/8/ Det Norske Veritas As: Notification of changes 4Ver accepted on 31 October 2011.

/9/ CFE: Report of parameters for invoicing, April 2009.
CFE: Report of parameters for invoicing, May 2009.
CFE: Report of parameters for invoicing, June 2009.
CFE: Report of parameters for invoicing, July 2009.
CFE: Report of parameters for invoicing, August 2009.
CFE: Report of parameters for invoicing, September 2009.
CFE: Report of parameters for invoicing, October 2009.
CFE: Report of parameters for invoicing, November 2009.
CFE: Report of parameters for invoicing, December 2009.
CFE: Report of parameters for invoicing, January 2010.
CFE: Report of parameters for invoicing, February 2010.
CFE: Report of parameters for invoicing, March 2010.

/10/ CFE: Calibration report of ION 8400 meter s/n PR-0506A068-02 5 December 2008

/11/ CFE: Calibration report of ION 8400 meter s/n PR-0506A068-02, 5 November 2009.

/12/ CFE: Letter indicating the return of the 8400 meter s/n AR-0012A368-02 which was uninstalled due to a lack of calibration, 8 May 2009

/13/ Schneider Electric: Certificate of Compliance and Calibration of ION 8400 meter s/n AR-0012A368-02, 27 June 2009.

/14/ Alstom: Technical specification of generator – C.H. Trojes, May 2011

/15/ Alstom: Technical specification of turbine – C.H. Trojes, May 2011

/16/ ENEL: Instruction for registration of plant operational information - "Central Hidroeléctrica Trojes" (daily, monthly, and Historical Annual Operation), procedure INST-HPA-OP-2009- 01, revision 01, year 2009

/17/ Power measurement: User guide of 8000 series electricity meter, 2009

/18/ CFE: Calibration report of ION 8400 meter s/n AR-0012A368-02 indicating that the equipment has an accuracy below the equipment's specification (i.e. 0.2%), 5 November 2007.

/19/ CFE: Calibration report of ION 8400 meter s/n PR-0506A068-02, 5 November 2007.

/20/ CFE: Invoices of electricity consumption of the installation indicating the electricity consumption in the period 1 April 2009 to 31 March 2010 based on readings of the main electricity meter (meter ION 8400 s/n PR-0506A068-02).

Background documents related to the design and/or methodologies employed in the design or other reference documents.

/21/ CDM Executive Board: Validation and Verification Manual. Version 01.2

/22/ CDM Executive Board: Methodology AMS-I.D, version 08, for "Grid connected renewable electricity generation", 3 March 2006.

/23/ CDM Executive Board: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - General Guidelines to SSC CDM methodologies (version 17), Annex 21, EB61.

/24/ CDM Executive Board: *Email named APPROVED - Notification for changes in PDD of 0649 Trojes Hydropower project*, 31 October 2011

/25/ CDM Executive Board: 'Guidelines for assessing compliance with calibration frequency' (version 01), Annex 60, EB52

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

/26/ Jose Antonio Mendoza Fuente, Responsible of mechanical maintenance of "Trojes Hydroelectric Project" - 10 September 2010

/27/ Casiopea Ramírez, Business Development, ENEL Green Power – 11 September 2010

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APPENDIX A

CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS

Corrective action requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	During the site visit it was identified that the current installed capacity is different than stated in the registered PDD. This has to be explained through a notification of changes to the project activity in the registered PDD.	The NOC was approved on Oct 31, 2011 by the EB indicating that the there are no changes in the implementation of the project activity. A revised PDD was submitted to DNV in order to correct the mistake in the registered PDD regarding the statement of the installed capacity of the turbine (8MW) and the generator (8MW). In the revised PDD, the actual installed capacity of generator is 8 760 kW and the installed capacity of turbine is 10 576 kW.	As DNV was able to confirm, the Notification of Changes to the PDD was approved by the EB on 31 October 2011 /24/. The registered PDD /1/ was effectively revised in order to change the installed capacity of the installation from 8 MW to the real 8.760 MW which is the real capacity of the synchronous generator /14//15/. **CAR 1 is closed.**

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 2	Internal meter with S/N 001067302 is operating since the beginning of the project (01/04/2003) and is used to compare information from CFE. This meter has never been calibrated. The meter should be calibrated at least once every 3 years to achieve better certainty of the collected data; however, the project participant has not provided any calibration certificate.	This meter has not been calibrated due to this device is not part of the project activity (this meter is used for comparison only). When the site visited was performed project participant was establishing contact with metrology and calibration labs in order to get the meter calibrated.	As DNV was able to confirm during the site visit this electricity meter is an internal meter located in the control room that is used to compare its readings against readings provided by CFE's meter, yet it is not used for the actual invoicing to the CFE or as a back-up meter of the main meter as it was confirmed during the site visit. The project participant is in the process of engaging a metrology and calibration lab in order to conduct the calibration of the mentioned meter. As this meter is not used for the actual monitoring but for doing an internal cross-check with the figures provided by CFE and the applicable methodology or the local regulations do not require to calibrate this internal meter, DNV deems that this issue does not suppose a limitation for issuing a verification/certification statement. Hence, DNV has accepted to close this CAR. **CAR 2 is closed.**

Clarification requests

CL ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	No CL were raised.	Not applicable.	Not applicable.

Forward action requests from previous verification

FAR ID	Forward action request	Summary of how FAR has been addressed in this reporting period	Assessment of how FAR has been addressed
FAR 1	As per Paragraph 62 b) of Annex of Decision 3/CMP1 (CDM M&P); http://cdm.unfccc.int/Reference/COPMOP/08a01.pdf#page=6); "Conduct on-site inspections, as appropriate, that may comprise, inter alia, a review of performance records, interviews with project participants and local stakeholders, collection of measurements, observation of established practices and testing of the accuracy of monitoring equipment". In order to perform a correct verification audit and comply with this requirement is necessary to visit the project installations when the activity is performed / ongoing. Please be aware of this requirement in order to coordinate the visit in a way that could allow visiting the installations when they are running.	The site visit was scheduled during a period when the project activity was fully operational.	The project activity was generating and producing electrical energy as per the PDD which could be confirmed during the site visit on 10 September 2010. FAR 1 is considered completely addressed. **This FAR is closed.**
FAR 2	Internal meter with S/N 001067302 is operating since the beginning of the project (01/04/2003) and is used to compare information from CFE. This meter has never been calibrated. The meter should be calibrated at least once every 3 years to achieve better certainty of the collected data.	This meter has not been calibrated due to this device is not part of the project activity (this meter is used for comparison only). When the site visited was performed project participant was establishing contact with metrology and calibration labs in order to get the meter calibrated.	Since this metering device has not been calibrated, this FAR is not considered addressed by the project participant. Following the provisions of paragraph 190 of the VVM version 1.2. /21/, DNV has opened CAR 2 requesting to the project entity to provide the calibration certificate for this electricity meter. **This FAR is closed.**

Forward action requests from this verification

FAR ID	Forward action request	Response by Project Participants	DNV's assessment of response by Project Participants
FAR 1	Not applicable	Not applicable	Not applicable

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APPENDIX B

CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS

Felipe Antunes

Felipe Antunes holds a Master's Degree in Production Engineering (Quality) and a Post Graduate Diploma in Environmental Management and Industrial Waste Management and Treatment. Possesses an International experience of more than 10 years in the field of quality and environmental auditing, working two years as the responsible of the QMS of Rede Metrológica RS and since 1999 as a QMS and EMS auditor in DNV.

He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV, both in South America & abroad. He has also been actively involved in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 10 years in DNV.

His qualification and experience in CDM demonstrate him sufficient sectoral competence in energy generation from renewable energy sources, waste handling and disposal, and animal waste management.

Andres Espejo

Holds a Bachelor/Master Degree in Forestry Engineering. Having an overall experience of around five years. Prior to joining DNV having 6 years experience in biomass generation, forest management, and generation with other renewables, covering the management of forestry operations, procurement of timber and biomass, management of forest states, pre-feasibility studies for renewable generation projects, etc.

He has experience of around one year in validation and verification of numerous CDM projects.

His qualification, industrial experience and experience in CDM demonstrate him sufficient sectoral competence in Energy Generation from renewable energy sources (Technical Area 1.2) and Forestry (Sectoral Scope 14).

Ricardo Diaz

Ricardo Díaz holds a Bachelor's Degree in Mechanical Engineering and has done a Energy Savings Systems Master Degree and a Business Administration Master Degree having an overall experience of around 10 years. Prior to joining DNV having 8.5 years experience in Power generation facilities (thermo power plants, wind and hydro power plants, energy efficiency process and energy demand. Responsible for operation, maintenance, project management and evaluation for energy facilities (fossil fuel and renewable sources) as well as energy efficiency improves. In addition, experience with limited scope to operation and maintenance duty for hospitality facilities and water treatment process. He has experience of around 1.5 years in validation and verification of numerous CDM projects.

His qualification, industrial experience and experience in CDM demonstrate him sufficient sectoral competence in:

1.1 Thermal energy generation from fossil fuels as well as thermal electricity from solar

1.2 Energy Generation from renewable energy sources and

3.1 Energy demand.

Gonzalo Sandoval holds a degree in electrical engineering with a specialty in electrical power systems, having an overall experience of around 14 years. Prior to joining DNV having 12.5 years of experience in electricity distribution, electrical energy demand and electrical equipment, covering power requirements and installation of electrical equipment in a nationwide media broadcaster, performing electrical studies in low and medium voltage grids for paper mills, food storage facilities, corporate offices, laboratories, refineries among others, assessing effects of electrical disturbances in the grid, electrical equipment and sensitive electronic devices plugged to the grid. Additionally, he has had experience in academia since 1999 as an electrical engineering professor of the National University of Mexico (UNAM).

Since joining DNV, he has performed several validations and verifications of CDM projects, including four inclusions of the first CDM PoA in Mexico, for over one and a half years in Mexico, Honduras, Guatemala and El Salvador.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sector competence in Electrical Equipment, Electricity Distribution and Energy Demand.

Seshan Ranganathan, holds a Bachelor's Degree in Chemical Engineering and has done diploma course in Management and completed the graduate ship course in Industrial Engineering and has an overall working experience of around twenty nine years. Prior to joining DNV has around twenty four years' experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers ,power plants , safety audits and pollution control activities including waste water treatment, project management, corporate planning, sales, logistics in fertilizer & petrochemical industry . With respect to the thermal power plant the job assignment included the monitoring of flue gas exit temperatures, excess air used efficiency of fuel additives, condition of boiler refractory, insulation of steam lines etc. The experience also includes 5 years in process design & engineering for chemical process industry.

He is qualified validator and verifier for CDM projects. He has completed the EMS lead auditor course. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in areas of (a) 1.1 Thermal energy generation from fossil fuels and Biomass including thermal electricity from solar (b) 1.2 Energy generation from renewable energy sources (c) 2.2 Heat distribution (d) 5.1/11.1/12.1 Chemical Processes Industries and (e) 13.1 Waste handling and disposal.