

CAPACITY UPGRADE OF GUNUNG SALAK GEOTHERMAL POWER PLANT PROJECT, INDONESIA

2ND VERIFICATION REPORT



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Summary:

PT. Indonesia Power has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” in Awibengkok-Ratu, Indonesia with regard to the requirements of VCS Version 3.0 Standard.

The project activity is a capacity up gradation of geothermal power plant from 3x55MW to 3x60MW which leads to increase in power production of 15MW. The steam required for the energy generation is supplied under Energy Sales Contract (ESC) from Chevron Geothermal, Indonesia. The capacity up gradation is done by modifying turbine and gas ejectors. The generated electricity is supplied to the Jawa-Madura-Bali grid (JAMALI grid, Indonesia). The steam recovered from Geo thermal energy is used for producing electricity which is a renewable form of energy.

Reporting period: From 2009-04-01 to 2011-03-31 (both days included)

In the course of the verification 6 Corrective Action Requests (CARs), 5 Clarification Requests (CLs) were raised and closed successfully. Furthermore 1 FAR is raised which need to be checked during next verification period.

The verification is based on the draft monitoring report^{/MR1/}, the monitoring plan as set out in the validated PD^{/VCS-PD/}, the validation report^{/VAL-R/}, emission reduction calculation spreadsheet^{/ER/} and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant. The TÜV NORD JI/CDM CP has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

As the result of the 2nd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Emission reductions	261, 713 t CO₂ equivalents
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Table of Contents

1	Introduction	6
1.1	Objective	6
1.2	Scope and Criteria	6
1.3	Level of assurance	6
1.4	Summary Description of the Project	6
2	Validation Process, Findings and Conclusion	8
2.1	Validation Process	8
2.2	Validation Findings	9
2.2.1	Gap Validation	9
2.3.2	Methodology Deviations	9
2.3.3	New Project Activity Instances	9
2.4	Validation Conclusion	9
3	Verification Process	10
3.1	Method and Criteria	10
3.2	Document Review	10
3.3	Interviews	11
3.4	Site Inspections	12
3.5	Resolution of Any Material Discrepancy	14
4	Verification Findings	14
4.1	Project Implementation Status/ Remaining issues, including any material discrepancy	14
4.2	Completeness of Monitoring/Accuracy of GHG Emission Reduction or Removal Calculations	20
4.3	Quality of Evidence to Determine GHG Emission Reductions or Removals	27
4.4	Management and Operational System	29
5	Verification conclusion	36

6	References:.....	38
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1 INTRODUCTION

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follow.

- To verify that the project is implemented as described in the project design document;
- To assess the implementation of the monitoring plan (MP) content in the VCS-PD;
- To assess the project's compliance with other relevant rules, including the host country (India) legislation;
- To confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated project design document ^{/VCS-PD/}, the monitoring report ^{/MR1/}, emission reduction calculation spread sheet ^{/ER/}, supporting documents made available to the verifier and information collected through performing interviews ^{/IM01/ & /IM02/} and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TÜV NORD JI/CDM CP has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 Level of assurance

The verification has been planned and organized to achieve a

- ☒ Reasonable level of assurance
- ☐ Limited level of assurance

1.4 Summary Description of the Project

The project activity is a capacity up gradation of geothermal power plant from 3x55MW to 3x60MW which leads to increase in power production of 15MW. The steam required for the energy generation is supplied under Energy Sales Contract (ESC) from Chevron Geothermal Indonesia. The capacity up gradation is done by modifying turbine and gas ejectors. The generated electricity is supplied to the Jawa-Madura-Bali grid (JAMALI grid, Indonesia). The steam from Geo thermal site is utilized for operation of the turbine which is coupled to generator to produce electricity.

The proposed project would generate electricity through steam generated from geothermal resource thereby displacing, electricity generated using existing fossil fuel based power plants or future capacity additions in the country.

The estimated electricity supplied to the grid from the project activity is 213,959 MWh per year¹. The estimated GHG emission reduction is 1,125,224 tCO_{2e}² for the chosen ten year crediting period. The latitude and longitude of the project activity are mentioned below in the table,

Company	Site location	Latitude ³	Longitude
PT. Indonesia Power	Awibengkok-Ratu area, Sukabumi district, west java province, Indonesia	06° 44' 26" S	106° 38' 28" E

The key parameters of the project are given in table 1-4:

Table 1-4: Technical data of the project

Description	Units	Operation condition
No of units	Nos	3
Installed Turbine capacity	MW	3 x 60
Installed Generator Capacity	MW	3 x 55
Rated Generator capacity	kVA	68,750
Power Factor	-	0.8
Over Load of generator	%	20

During the monitoring period 2009-04-01 to 2011-03-31 (both days included) the total emission reduction comes to **261, 713** tCO_{2e}.

The on-site visit was carried out on 2011-11-28 and 2011-11-29. All the members of the Verification team attended the site visit and investigated the operation and monitoring of the PT. Indonesia's Gunung Salak Geothermal power plant.

¹ As per the registered VCS PD

² As per the registered VCS PD

³ <http://www.satsig.net/maps/lat-long-finder.htm>

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

Method and Criteria:

The purpose of a validation is to have an independent third party assess the project design. In particular the project's baseline, the monitoring plan (MP), and the project's compliance with

- The requirements of the VCS Version 3.0;
- The requirements of the approved methodology and validated VCS PD and monitoring plan;
- Relevant rules, including the host country legislation

are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is seen as necessary to provide assurance to stakeholders on the quality of the project and its intended generation of Voluntary Carbon Units (VCUs).

Document Review:

The validation scope is given as a thorough independent and objective assessment of the project design including especially: the correct application of the methodology, the project's baseline study, additionality justification, stakeholder involvement, environmental impacts and monitoring plan, which are included in the validated PD other relevant supporting documents, to ensure that the proposed VCS project activity meets all relevant and applicable VCS version 3.0 criteria.

The information included in the validated PD and the supporting documents were reviewed and assessed against the requirements as set out by the VCS version 3.0.

The validation is based on the information made available to TÜV NORD JI/CDM CP and on the contract conditions. TÜV NORD JI/CDM CP cannot be held liable by any entities for making its validation opinion based on any false or misleading information supplied to it during the course of validation.

The validation is not meant to provide any consulting to the project participants. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

Interviews:

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

Site Inspections:

The on-site visit was carried out on 2011-11-28 and 2011-11-29. Three members of the Verification team attended the site visit and investigated the operation and monitoring of the PT. Indonesia's Gunung Salak Geothermal power plant.

Resolution of Any Material Discrepancy:

Material discrepancies identified in the course of the validation are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is 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 project with certain characteristics have not been met or
- There is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

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 first verification.

CARs CLs and FAR if raised are discussed in the course of this validation/verification is included in the next section 2.2 of this report.

2.2 Validation Findings

2.2.1 Gap Validation

There was no gap validation of the project conducted during this monitoring period. Verification of this project is based on already validated project design document^{/VCS-PD/} dated 2009-07-10, Validation report dated 2009-07-14^{/VAL-R/}, the Validation statement^{/VCS-ST/} and first verification report^{/VER-R/} dated 2009-10-26.

2.3.2 Methodology Deviations

No methodology deviation foreseen during the current monitoring period.

2.3.3 New Project Activity Instances

No new project activity instances are identified or proposed by the project proponent during the current monitoring period.

2.4 Validation Conclusion

The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation against the VCS version 2007.1 standards without any qualifications or limitations. Please refer Validation report dated 2009-07-14^{/VAL-R/}

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Publication of the monitoring report
- Desk review of the Validated PD^{/VCS-PD/}, Monitoring Report^{/MR1/} and Emission reduction calculation spread sheet^{/ER/} submitted by the client and additional supporting documents
- Verification planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft verification reporting
- Resolution of corrective actions (if any)
- Final verification reporting
- Technical review
- Final approval of the verification.

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

Table 3.1: Verification sequence

Topic	Time
Assignment of verification	2011-04-18
On-site visit	2011-11-28 and 2011-11-29
Draft reporting finalized	2011-12-13
Technical review on draft reporting finalized	2012-04-11
Final reporting finalized	2012-05-30
Technical review on final reporting finalized	2012-06-01
Final corrections	2012-06-01

The main verification steps are described below.

3.2 Document Review

The VCS PD^{/VCS-PD/}, Monitoring report^{/MR1/} and supporting background documents related to the project design and baseline were reviewed.

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

The references used in the course of this verification are summarized in section 6.

3.3 Interviews

The verification 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 the VCS.

During verification the verification 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 3-2.

Table 3-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
/IM01/, Projects & Operations Personnel, 1. Ms. Anna Reani 2. Mr. I.C. Lydia 3. Ms. Hadi Suyitro 4. Mr. Iwan Kurniawan 5. Mr. Achmod Ruai 6. Mr. Yus Faisal 7. Mr. Sugimin 8. Mr. Yuansah 9. Mr. Vicky 10. Mr. Rindran 11. Mr. B. Alam	- General aspects of the project - Project design, Commissioning and implementation - Technical equipment and operation of the project - Brief of Project overview, history, technology and project site lay out (by PP) including infrastructures, equipments and monitoring devices - Performance of the project during the reported verification period - Site visit (check metering system, operational log book etc) - Involved personnel and responsibilities - Discussion on FAR raised - Training and practice of the operational personnel - Implementation of the monitoring plan as per the validated PD - Monitoring and measurement equipment - QA/QC Testing and calibration procedures - Monitored data management - Data quality, archiving and reporting procedures - Desk review findings - Data uncertainty and residual risks - GHG calculation - Procedural aspects and selection of simple random sampling by the survey methods - Random Check of non sampled meters (if any)
/IM02/, Consultant, Ms. Alin Pradidina (Project Manager CDM, Southpole Assests, Jakarta)	

A comprehensive list of all interviewed persons is part of section 6 'References'.

3.4 Site Inspections

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. The verification team has carried out an inspection on site^{/IM01 & IM02/} in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore, the on-site assessment was conducted and monitoring data were checked with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

The on-site visit was carried out on 2011-11-28 and 2011-11-29. Three members of the Verification team attended the site visit and investigated the operation and monitoring of the PT. Indonesia's Gunung Salak Geothermal power plant.

On the basis of a competence analysis and individual availabilities, a verification team, consisting of one team leader and 3 additional team members, as well as the Technical Review personnel were appointed.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 3-2.1 below.

Table 3-2.1: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Host country Competence	Team Leading Competence	On-site Visit
☒ Mr. ☐ Ms.	Ma. Paa. Puratchikkanal ⁴	TUV India Pvt Ltd, Bangalore	TL	SA	☒	1.2	☐	☒	☐

⁴Joined TUV NORD until 2012-01-24 due to resignation.

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Host country Competence	Team Leading Competence	On-site Visit
☒ Mr. ☐ Ms.	R. Murali ⁵	TUV India Pvt Ltd, Bangalore	TL ^{A)}	LA	☒	1.2	☐	☒	☒
☒ Mr. ☐ Ms.	Stefan Winter	TN CERT, Essen	TM ^{A)}	TE/SA	☒	1.2.3	☐	☒	☒
☐ Mr. ☒ Ms.	Ellys Simamora	TN CERT, Jakarta	TM ^{A)}	A	☒	-	☒	☐	☒
☐ Mr. ☒ Ms.	Sabine Meyer	TN CERT, Essen	TR ^{B)}	LA	☒	-	☐	☒	-
☒ Mr. ☐ Ms.	Ingo Klein	TN CERT, Essen	TR/FA ^{B)}	SA	☒	1.2.3	☐	☒	-

1) TL: Team Leader; TM: Team Member; TR: Technical review; OT: Observer-Team; OR: Observer-TR; FA: Final approval

2) GHG Auditor Status: A: Assessor; LA: Lead Assessor; SA: Senior Assessor; T: Trainee; TE: Technical Expert

3) GHG auditor status (at least Assessor)

4) As per S01-MU03 or S01-VA070-A2 (such as 1.1, 1.2, ...)

A) Team Member: GHG auditor (at least Assessor status), Technical Expert (incl. Host Country Expert or Verification Expert), not ETE

B) No team member

All team members contributed to the review of documents, the assessment of the project activity and to the preparation of this report under the leadership of the team leader.

Technical Experts contributed to the assessment of special aspects of the project activity, e.g. technical or local auditor for host country aspects.

The following performance records was checked during verification process, monthly energy records, steam generation log records, DG operational records, shut down hour detail records, calibration records of all the monitoring instruments, storage records, training records and basis for emission reduction calculation. All the values mentioned in the emission reduction spread sheet^{/ER/} were based on the reviewed documents. These data values and other information related to project performance including calibration and meter testing details are available in the form of hard copy and records duly archived and maintained as per the quality assurance/quality control procedure specified as a part of monitoring plan given in the validated PD^{/VCS-PD/}.

⁵ Joined TUV NORD until 2012-04-30 due to resignation.

3.5 Resolution of Any Material Discrepancy

Material discrepancies identified in the course of the verification are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is 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 verification of the project with certain characteristics have not been met or
- There is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

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 first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in the next section 4 of this report.

4 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS PD, site visit, interviews and supporting documents as well as the final assessments are summarized. Table 4-1 includes an overview of all raised CARs, CLs and FARs.

Table 4-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
4.1	Project implementation /Remaining issues, including any material discrepancy	0	2	0
4.2	Accuracy of emission reduction calculations	4	1	0
4.3	Quality of evidence to determine emission reductions	0	1	0
4.4	Management and operational system	2	1	1
-	SUM	6	5	1

4.1 Project Implementation Status/ Remaining issues, including any material discrepancy

Description

The project activity is a capacity up gradation of geothermal power plant from 3x55MW to 3x60MW which leads to increase in power production of 15MW. The steam required for the energy generation is

supplied under Energy Sales Contract (ESC) from Chevron Geothermal, Indonesia. The capacity up gradation is done by modifying turbine and gas ejectors. The generated electricity is supplied to the Jawa-Madura-Bali grid (JAMALI grid, Indonesia). The steam recovered from Geo thermal energy is used for producing electricity which is a renewable form of energy.

The project has been registered under "Voluntary Carbon Standards Version 2007.1". All the raised CARs, CLs have been closed successful during validation stage. However during first verification there were 3 FARs highlighted which has to be verified during the second verification period. The Forward Action Request was regarding frequency of NCG analysis, QA/QC of Trips, unrecorded steam flow readings and irregularities in monitored values, calibration frequency of energy meters and other monitoring equipments as per the updated Standard Operation Procedure. FAR 3.1, FAR 3.2 and FAR 3.3 are now converted to CARs and addressed in appropriate sections of this report.

Nevertheless, CL 4.1 and CL 4.2 have been raised.

Related Findings

☐ No CARs, CLs or FARs have been identified in this context

☒ The following finding(s) have been addressed:

Finding:	CL 4.1.1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding Describe the finding in unambiguous style; address the context (e.g. section)	a) In section 2.1 of the MR under Project implementation status, there is inconsistency w.r.t. the applied monitoring period. This section states the MR would end in 2011-04-31. Clarify and revise. b) Several changes has happened during the second monitoring period (For Ex: exchange of electricity meter etc) however the details of such changes and related information's are not mentioned in the MR. Clarify and revise. Ref: Version 01 of the MR		
Corrective Action #1 This section shall be filled by the PP. It shall address the corrective action taken in details.	a) Inconsistency in section 2.1 of the MR has been revised. b) Details of changes happened between 1 April 2009 – 31 March 2011 have been added in section 2.1 of the MR. Documentation (Reference no: 8) referring to the changes are being submitted.		
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.	a) The monitoring period mentioned in section 2.1 of the revised monitoring report is corrected to mention the exact end date as per the second verification period. The date is now corrected to 2011-03-31. It is verified and found to be correct. CL 4.1.a is closed.		

	b) Based on the interview and presentation made by the project proponent representatives during the site visit, the details requested by the DOE w.r.t the change in project implementation status is addressed in the revised MR. However the detailed explanation/reasons for the changes are not presented in the revised monitoring report. In addition, the PP has to clarify the impact of these events or situations occurred during the second verification period which may impact the applicability of the methodology or monitoring plan with regard to the guideline is missing. CL 4.1.b is open. Ref: Version 02 of the MR
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	b) Detail explanation/reasons for all changes happened between 1 April 2009 – 31 March 2011 have been addressed in the revised MR. The changes, which are Unit #1 revenue meter replacement, Unit #1 and Unit #3 Variable Speed Drive (VSD) and Online coupler partial discharge, do not change the project design or monitoring plan as per registered VCS PD because they are all additional activities in related to strengthen operational or maintenance activities in the Gunung Salak geothermal power plant itself. Thus, applicability of methodology, e.g. capacity upgrade activity, is still applicable in the current monitoring period.
DOE Assessment #2 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#3, etc.) shall be added.</i>	b) The revised MR has been reviewed and found to include the detailed explanation and reason for the changes in monitoring equipments and other mechanical parts of the project activity. Thus the DOE confirms that, because of these changes there is no change in the applicability, additionality, baseline and monitoring methodology. Hence CL 4.1.b is closed. Ref: Version 02.1 of the MR
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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:	CL 4.1.2		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	a) For forced outages it has been identified during the onsite audit that unit #3 was tripped due to earthquake however unit #1 and #2 did not trip for the same day. Same occurred also vice versa.		

	Clarification is requested why only one/two unit/s tripped but all three units are place next to each other in series. Clarification requested. b) The regular shutdowns for year 2010 for the points 7, 12, 15, 21, 29, 33 and 35 mentioned in shutdown hour table of the MR could not be crosschecked with supporting documents. c) For the year 2009, the major inspection date mentioned for unit #2 is not matching with the date mentioned in supporting documentation. Clarify and revise accordingly. d) For the year 2010, the simple inspection date for unit #3 is inconsistent with supporting documentation. Clarify and revise accordingly. e) Total shut down times are neither provided in MR nor ER spreadsheet. Ref: Version 01 of the MR																				
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) Difference in forced outage times due to earthquakes because of following reasons: 1) Different ground where each unit erected. Unit #3 is located on unstable and mound ground while Unit #2 is located on slightly unstable location and Unit #1 is located on more compact and stable ground. 2) Different vibration detector sensitivity. Unit #3 has a more sensitive vibration detector compare to the one in Unit #2 and #3 as per confirmation letter received from Ansaldo Energia SpA (Reference document No: 9). 3) Different vibration condition at the time earthquake happened. If one unit has higher vibration during its normal operation, then during earthquake, a possibility of this unit having forced outages due to earthquake is higher compare to the one that has lower vibration. Thus, vibration condition of each unit during normal operation could affect whether the unit is forced to shut down or not. b) Supporting documents are being submitted. Reference documents as below: <table><tr><th>No.</th><th>Unit #</th><th>Date</th><th>Description</th><th>Supporting document</th></tr><tr><td>7</td><td>1</td><td>1 Oct 2010</td><td>Variable Speed Drive (VSD) installation</td><td>Ref. No.: 8</td></tr><tr><td>12</td><td>1</td><td>1 Dec 2010</td><td>Online coupler partial discharge installation</td><td>Ref. No.: 8</td></tr><tr><td>15</td><td>2</td><td>23 Jun 2010</td><td>Generator check</td><td>Ref. No.: 8</td></tr></table>	No.	Unit #	Date	Description	Supporting document	7	1	1 Oct 2010	Variable Speed Drive (VSD) installation	Ref. No.: 8	12	1	1 Dec 2010	Online coupler partial discharge installation	Ref. No.: 8	15	2	23 Jun 2010	Generator check	Ref. No.: 8
No.	Unit #	Date	Description	Supporting document																	
7	1	1 Oct 2010	Variable Speed Drive (VSD) installation	Ref. No.: 8																	
12	1	1 Dec 2010	Online coupler partial discharge installation	Ref. No.: 8																	
15	2	23 Jun 2010	Generator check	Ref. No.: 8																	

	21	3	24 Apr 2010	Condenser cleaning	Ref. No.: 8
	29	3	1 Aug 2010	Variable Speed Drive installation	Ref. No.: 8
	33	3	21 Oct 2010	Variable Speed Drive commissioning	Ref. No.: 8
	35	3	6 Dec 2010	Online coupler partial discharge installation	Ref. No.: 8
c) The date of Major Inspection for Unit #2 has been revised. d) The date of Simple Inspection for Unit #3 has been revised. e) Total shut down times has been provided in the MR and ER spreadsheet.					
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>					
a) Explanation provided by the PP was discussed during the site visit. Due to higher accuracy/sensitivity of the vibration detector of Unit#3, the same was tripped from generating power during earthquake. However due to lower accuracy in sensing the earthquake vibration of Unit #1 and Unit #2, these units were not tripped during the tripping time of Unit#3. This was verified against the shutdown hour details and Ansaldo Energia SpA which is in line with the information provided in the revised monitoring report. Based on the review Ansaldo Energia SpA the DOE identified that Unit#3 can sense the earthquake in axial/radial/vertical direction while the other two Units sense only vertical direction because of earthquake. However the explanation w.r.t the geology and placement of Units are not backed up with evidence. CL 4.1.2.a is open. b) The supporting evidences submitted by the PP is verified and found to mention the exact description/reason for the shutdown hours of respective bullet points under section 2.1. It is verified and found to be correct. CL 4.1.2.b is closed. c) The mistake is rectified in the revised monitoring report. The date of Major Inspection of Unit #2 for the year 2009 is in line with the shut down document and the date mentioned as 2009-07-19. CL 4.1.2.c is closed. d) The mistake is rectified in the revised monitoring report. The date of simple Inspection of Unit #3 for the year 2010 is in line with the shut down document and the date mentioned as 2010-06-05. CL 4.1.2.d is closed. e) Total shutdowns and blackouts for the period from 2009-04-01 to 2011-03-31 are now mentioned in hours under section 2.1 of the revised MR. This tallies with the shutdown hours details of all the					

	units. Evidences regarding the shutdown and blackouts are verified during the site visit. The information provided in the revised monitoring report is correct. CL 4.1.2.e is closed. Ref: Version 02 of the MR
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) Evidence of placement unit #3 as per EIA documentation described that unit #3 is built on unstable ground is being submitted to DOE (reference document no. 15).
DOE Assessment #2 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#3, etc.) shall be added.</i>	The evidence submitted by the PP is reviewed. The explanation provided is accepted by the DOE. CL 4.1.2.a is closed. Ref: Version 02.1 of the MR
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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

Final Assessment

During the verification an on-site visit was carried out. By means of the on-site visit and interview with the PP^{/IM01/&/IM02/} it is checked that the project has been implemented and operated as described in the validated PD^{/VCS-PD/}. During second monitoring period change in energy/revenue meters, installation of Variable speed drive and regular operation and maintenance activities are carried out which are detailed in the monitoring report^{/MR4/}. It is also confirmed that the new meter installed is more robust and having higher recording frequency with accuracy class of 0.2. It is concluded by the DOE that all the above identified installations didn't affect the applicability of the methodology or its monitoring plan. No other change was envisaged in the project activity. These facts have been verified during site visit by interviewing the monitoring personnel's and review of documents.

All FARs raised during the first verification are closed for the current monitoring period. Assessments can be found in CAR 4.2.4, CAR 4.4.1 and CAR 4.4.2. No remaining issues/ discrepancies in previous verification of the project are left. The PD^{/VCS-PD/} and validation report^{/VAL-R/} are found to be OK.

☒ CL 4.1.1 and CL 4.1.2 were raised and closed successfully.

4.2 Completeness of Monitoring/Accuracy of GHG Emission Reduction or Removal Calculations

Description

The proposed project uses CDM approved methodology ACM0002 -“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, Version 07, which is approved under VCS version 3.0.

The project satisfies all criteria of ACM0002, Version 07. The application of monitoring methodology is assessed as correct. The reporting ^{/MR1/, /ER/} is in line with the requirements of the validated monitoring plan as well as with the applied methodology ACM0002 version 07^{/ACM0002/}.

The reporting procedures reflect the requirements of the monitoring plan ^{/VCS-PD/}. The monitoring parameters are recorded as per the monitoring plan.

The monitoring plan^{/VCS-PD/} and Standard Operation Procedure provides detailed information related to the collection and archiving of all relevant data needed to:

- Net electricity generated in MWh
- Electricity imported from the JAMALI grid in MWh
- Average mass fraction of CH₄ in the produced steam (non-dimensional)
- Average mass fraction of CO₂ in the produced steam (non-dimensional)
- Quantity of delivered steam in tonnes
- Amount of diesel fuel used in tonnes or liters

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment is necessary to check the monitoring data with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

Before and during the on-site visit the verification team performed interviews with the project participants to confirm selected information and to resolve issues identified in the document review.

Nevertheless, 4 CARs and one CL have been raised.

Related Findings

☐ No CARs, CLs or FARs have been identified in this context

☒ The following finding(s) have been addressed:

Finding:	CAR 4.2.1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	As per the validated monitoring plan, EGy (i.e., Net electricity delivered to the grid by the project activity) is not sourced from Revenue meter rather it is taken from invoice statement. The current approach of calculating emission reductions during second verification period is not conservative and not in line with the validated monitoring plan. Ref: Version 01 of the MR and version 01 of the ER.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	ER spreadsheet and MR have been revised. EGy (i.e. Net electricity delivered to the grid by the project activity) is sourced from electricity export subtracted by electricity import, which refers to the validated monitoring plan.		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	Net electricity delivered to the grid by the project activity is conservatively calculated in the revised emission reduction spread sheet. The monitoring plan set out in the registered PD for the parameter EGy is in line with the data monitored during the second verification period. The import of electricity from JAMALI grid has been deducted while calculating Net electricity delivered to the grid by the project activity. The same has been verified in the revised emission reduction spread sheet and the revised monitoring report. Ref: Version 02 of the MR and version 02 of the ER. CAR 4.2.1 is closed.		
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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 4.2.2		
Classification	☒ CAR	☐ CL	☐ FAR

Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	a) As per the review of supporting documentation for DG consumptions and operation time, the values mentioned in the MR for Diesel Generator operation with date and operation time are not matching. Please clarify b) The values entered in ER sheet for electricity invoice and electricity delivered is not matching for the month of April 2009 with the supporting evidences reviewed during onsite audit. Ref: Version 01 of the MR and version 01 of the ER.
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) DG consumptions have been carefully checked and the values mentioned have been in line with supporting documents provided by PO. ER and MR have been revised accordingly. b) The values entered in ER sheet for electricity invoice and electricity delivered for the month of April 2009 in Unit #1 has been revised. Both values are now matching to the supporting evidences (Reference document no: 6).
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) DG consumption data is reviewed again and found that the details presented in the MR and ER is still not matching to estimate project emission because of diesel generation operation. CAR 4.2.2.a is open. b) The mistake is rectified in the revised ER and MR. Daily log records submitted by the PP for Unit#1 is reviewed and the generation figure mentioned in the revised ER and MR is in line with the document. CAR 4.2.2.b is closed. Ref: Version 02 of the MR and version 02 of the ER.
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) Diesel generation operation data in the MR and ER calculation has been reviewed and are now matched with documentation of diesel generation operation (hours of diesel genset usage). In addition to that, it was found out that there were some missing start or stop hour of diesel genset or fire fighting warming up activities. To consider those missing data, a fixed maximum 10 minutes value of each warming up as per internal working instruction for diesel genset and diesel fire fighting (reference document no. 15) has been taken into account in the $PEFF_y$ calculation. The MR and ER calculation have been revised accordingly.
DOE Assessment #2 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) The explanation provided is accepted and the 10 minutes gap is adjusted in the blackout period. Now the data presented in the MR and ER is in line with the shutdown hour details of the DG. Hence CAR 4.2.2.a is closed. Ref: Version 02.1 of the MR and version 03 of the ER.

Conclusion <i>Tick the appropriate checkbox</i>	☐ 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
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Finding:	CAR 4.2.3		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	a) Due to delayed calibration of electricity meter as per the MP, maximum accuracy class has been applied to electricity generation. However clarification is requested w.r.t. the way of calculation. Besides please clarify which value has been the base for deduction to calculate the net electricity (i.e., actual value as per reading or invoice value). b) Based on the review of NCG analysis report, for the report dated 2010-07-21 the gas analysis has been done twice. However clarify and ensure that the conservative values have been applied for PE calculation. Ref: Version 01 of the MR and version 01 of the ER.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) The EG_y values have been revised by considering delayed calibration of revenue meter Unit #2. The deduction of actual EG_y values are calculated for months of September until December 2010 and January until March 2011 by considering the revenue meter accuracy, which is 0.2%. EG_y calculation for these specific months of Unit #2 taking into account delayed calibration of revenue meter as following: = (E_{exp} – E_{imp}) x (100% - accuracy) = (E_{exp} – E_{imp}) x (100% - 0.2%) b) NCG analysis dated 21 July 2010 was conducted twice with a different sampling date, which were 19 July 2010 and 20 July 2010. Based on these 2 NCG reports, steam sampled on 20 July 2010 has higher CH₄ and CO₂ weight fraction values, thus the NCG analysis result is utilized in the PE_y calculation for conservativeness (Reference document no: 7).		
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) Applying maximum accuracy class to the net electricity delivered instead of export and import separately is not a conservative approach. CAR 4.2.3.a is open. b) NCG analysis report dated 2010-07-19 and 2010-07-20 are reviewed and the data from 2010-07-20 has been accounted for project emission calculation. The approach followed by the project		

	proponent in the revised ER sheet is more conservative. CAR 4.2.3.b is closed. Ref: Version 02 of the MR and version 02 of the ER.
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) Since MR and ER calculation v2, conservative deduction of EG_{exp} and addition of EG_{imp} in unit #2 BE_y calculation have been incorporated to take into account a delayed revenue meter calibration. However, this conservative approach was not properly explained in the 1st response. As already described in the MR and ER calculation v2, EG_{exp} and EG_{imp} are calculated as follow: $EG_{exp} = EG_{exp} \times (100\% - \text{accuracy of revenue meter})$ $= EG_{exp} \times (100\% - 0.2\%)$ $EG_{imp} = EG_{imp} \times (100\% + \text{accuracy of revenue meter})$ $= EG_{imp} \times (100\% + 0.2\%)$ Therefore, emission reduction is already correctly and conservatively calculated as per UNFCCC "Guideline for assessing compliance with the calibration frequency requirement v.1" whenever revenue meter calibration is delayed.
DOE Assessment #2 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#3, etc.) shall be added.</i>	a) Since the explanation provided in corrective action#1 was misinterpreted and the same has been clarified in the corrective action#2. Thus there is no change in the values, since all the conservative approach is considered during version 02 of the ER. Based on the revised response, CAR 4.2.3.a is closed. Ref: Version 02.1 of the MR and version 03 of the ER.
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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:	FAR to CAR 4.2.4		
Classification	☒ CAR	☐ CL	☐ FAR

Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	During second periodic verification the verifiers have to check whether the NCG analysis is done for every four months and also project emission calculation. Ref: First verification report and version 01 of the MR.												
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The NCG analysis has been scheduled as per VCS PD and SOP of Carbon Credit Monitoring Plan. The Non-Condensable Gases (NCG) sampling and analysis (recording frequency) is planned every four months with all relevant data electronically archived. However, during 2009 there were 2 NCG analysis delayed due to internal procurement difficulties as following: <table border="1" data-bbox="545 705 1349 905"> <thead> <tr> <th colspan="3">NCG Analysis</th> </tr> <tr> <th>Analysis #</th> <th>Planned date</th> <th>Realization date</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>23-Jul-09</td> <td>27-Jul-09</td> </tr> <tr> <td>3</td> <td>23-Nov-09</td> <td>9-Dec-09</td> </tr> </tbody> </table> Therefore, to take into account those 2 NCG analysis delays, CH₄ and CO₂ weight fraction values of months when those delays occurred (July, November and December 2009) are replaced by the highest value of CO₂ and CH₄ weight fraction of each unit within 1 April 2009 – 31 March 2011 monitoring period. This conservative approach has been described in the revised MR and ER calculation.	NCG Analysis			Analysis #	Planned date	Realization date	2	23-Jul-09	27-Jul-09	3	23-Nov-09	9-Dec-09
NCG Analysis													
Analysis #	Planned date	Realization date											
2	23-Jul-09	27-Jul-09											
3	23-Nov-09	9-Dec-09											
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	As evidenced from the second periodic verification, the DOE concludes that the NCG analysis was carried out every four month with few day delays during July 2009 and November 2009. However a conservative approach as per the SOP was adopted to calculate project emission for the delay in NCG analysis. All the evidence and revised documents are verified and found to be valid and correct. CAR 4.2.4 is closed. Ref: Version 02 of the MR and ER sheet and NCG analysis report.												
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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:	CL 4.2.1		
Classification	☐ CAR	☒ CL	☐ FAR

Description of finding Describe the finding in unambiguous style; address the context (e.g. section)	a) For the steam and electricity meters the previous calibration date, current verification calibration detail and due date (validity) of calibration are not presented in the form of DD/MM/YYYY. b) During verification it has been identified that steam meter calibration was delayed by two weeks however ER calculation did not consider the related conservativeness approach. Ref: Version 01 of the MR and ER sheet.
Corrective Action #1 This section shall be filled by the PP. It shall address the corrective action taken in details.	a) The form of date for calibration details of revenue and steam flow meters in the MR has been revised accordingly. b) In order to take into account delays in steam flow calibration period in all units, a higher PE_y is accounted in the revised ER calculation as following formulae: = Steam flow rate x (100% + accuracy of steam flow meter) = Steam flow rate x (100% + 0.25%) This PE_y conservative multiplication affected monthly steam flow data of all units in July 2010 only. This conservative approach has been described in the revised MR and ER calculation.
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.	a) Necessary information w.r.t date of previous calibration and validity has been incorporated in the revised MR. Respective calibration certificate is verified and the information provided in the MR is correct. CL 4.2.1.a is closed. b) The conservative approach followed for the month of July 2010 for all the units which resulted in higher steam production and higher project emission. This is verified in the revised ER sheet and found to be correct. CL 4.2.1.b is closed. Ref: Version 02 of the MR and version 02 ER sheet.
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

Final Assessment

All relevant evidences such as calibration certificate, log records, generation report, invoices, NCG analysis report, and emission reduction spread sheet, shutdown/outages regarding the monitoring were fully checked by the verification team. All evidences are clearly identifiable and assessed to be correct. It could be evidenced that the monitoring system ensures for continuous operation. For the considered monitoring period, all indicators stated in the applicable monitoring methodology ACM0002 (Version 07)

and the registered VCS PD^{VCS-PD/} were correctly monitored and reported. Hence all the value applied for emission reduction calculation is found to be accurate and conservative.

CAR 4.2.1 to CAR 4.2.4 were raised and closed successfully.

☒ CL 4.2.2 is raised was raised and closed successfully.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

Description

It is evident from the monitoring data that the monitoring system ensures for continuous operation, with some TRIP and break down has been found during the monitoring period.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. These were verified during the site visit and found that proper procedures were adopted for data handling.

Nevertheless, two CARs have been raised.

Related Findings

☐ No CARs, CLs or FARs have been identified in this context

☒ The following finding(s) have been addressed:

Finding:	CL 4.3.1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Following issue w.r.t. Section 4.1 of MR have been identified: a) Page 33 mentions that Operating Margin “will be calculated” however it is fixed ex-ante. Clarification requested. b) The values stated under EGy/Conservative for the month of Sept-10 till Mar-11 for unit 2 are inconsistent either with Half-hourly-production or as per invoice information. Clarify if this is based on delayed calibration of corresponding meter. Besides if this is the case the way of calculation considering accuracy should be clarified. Ref: Version 01 of the MR and ER sheet.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) Due to typing error, the word of “will be calculated” in page 33 of the revised MR has been revised to “is fixed ex-ante”, which is in line with the registered VCS PD. b) EG_y from September 2010 to March 2011 for Unit #2 has been revised to take into account revenue meter calibration delay. EG_y is calculated by deducting EG_{exp} and adding EG_{imp} as per following formulae: $EG_{exp} = EG_{exp} \times (100\% - \text{accuracy of revenue meter})$ $= EG_{exp} \times (100\% - 0.2\%)$ $EG_{imp} = EG_{imp} \times (100\% + \text{accuracy of revenue meter})$ $= EG_{imp} \times (100\% + 0.2\%)$ This approach is conservative and is based on the UNFCCC guidelines.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) The mistake is rectified in the revised monitoring report. CL 4.3.1.a is closed. b) The approach followed by the PP is conservatively estimated to calculate the net electricity delivered for the month of September 2010 to March 2011 because of delay in calibration. CL 4.3.1.b is closed. Ref: Version 02 of the MR and version 02 of the ER sheet.
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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

Final Assessment

Proper data management including data acquisition, aggregation and data management system is being followed at the project site.

All records needed for monitoring are archived in line with the requirements of the validated monitoring plan ^{/VCS-PD/}. Updated SOP manual submitted by the PP includes all the emergency preparedness for unrecorded data and major break down. It is evident from the monitoring data that the monitoring system ensures for continuous operation, with some TRIP and break down has been found during the monitoring period.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. These were verified during the site visit and found that proper procedures were adopted for data handling.

The monitoring personnel at site are well trained and follow reproducible routines as was evident

during the site visit. Members of monitoring team were interviewed. Procedure for training and maintenance of critical equipments were discussed during site visit. Day to day operation is supervised by the technically qualified site engineers who have adequate knowledge. They have the responsibility to supervise various technical staff for around the clock who engage in operation and maintenance of project activity. Training records for the monitoring personnel were reviewed during site visit^{/TRA/}. The training would be provided to the concerned personnel as required. Thus, they are competent to carry out the relevant tasks with sufficient accuracy. All necessary monitored and measured raw data were checked during on-site verification (Ref Section 6 of this report).

☒ CL 4.3.1 was raised and closed successfully.

4.4 Management and Operational System

Description:

The allocation of responsibilities is documented in a written form and is followed as described in the SOP and VCS PD. This has been verified. Routines for the archiving of data are defined and documented. Calculations are laid down in the monitoring report and are in line with VCS PD and SOP.

The authority of the project site is given to the Senior Environment Expert, Mrs. Anna Reani. She is responsible for the assessment of all monitoring parameters on yearly basis in a report format and discuss with South Pole if corrections are needed in the monitoring SOP. Mr. Eko Yuniarto, who is the VCS manager responsible for cross checking and also data acquisition like net electricity generation details, export and import of electricity, plant shut down details along with the maintenance of the unit. Mr. Yus Faisal is a VCS coordinator and also operators are responsible for recording readings in the log book. Mr. Yuansah is responsible for the chemical laboratory for NCG calculation mainly for VCS purpose. All these are mentioned in the updated SOP and it is verified and found to be OK.

The details regarding the calibration of the meter are provided as follows:

S.No	Equipment	Description
1	Electricity Revenue Meter Unit #1 (2009-04-01 to 2010-08-10) For EGy and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #1: PT 0806A117-01 Class of Accuracy: 0.2 Date of Calibration: 2008-09-12 Range: 5 A; 57.7 V; 50 Hz
2	Electricity Revenue Meter Unit #1 (2010-08-10 to 2011-03-31)	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #1: MT-1006A500-01

	For EGy and EGimp	Class of Accuracy: 0.2 Date of Calibration: 2010-08-10 Range: 2.5 A; 57-277 V; 50 Hz
3	Electricity Revenue Meter Unit #2 (2009-04-01 to 2011-03-31) For EGy and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #2: PT 0806A118-01 Class of Accuracy: 0.2 Date of Calibration: 2008-09-12 & 2011-04-20 Range: 5 A; 57.7 V; 50 Hz
4	Electricity Revenue Meter Unit #3 (2009-04-01 to 2011-03-31) For EGy and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #3: PT 0806A119-01 Class of Accuracy: 0.2 Date of Calibration: 2008-09-12 & 2009-11-04 Range: 0.05 - 20 A; 57 - 277 V; 50 Hz
5	Steam Flow Meter Unit #1 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: ABB Kent – Taylor Model No.: KDC/SKSTSLSB1620/SR Serial No.: 1592055219 Instrument No.: 1LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25% Date of Calibration: 2008-09-08, 2009-07-13 & 2010-07-26
6	Steam Flow Meter Unit #2 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: Fisher Rosemount Model No.: 3051CD2A02A1AB1H204 Smart Family Serial No.: 01449549 Instrument No.: 2LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC

		Scale: 0 ~ 100 % Accuracy: 0.25% Date of Calibration: 2008-09-08, 2009-07-15 & 2010-07-27
7	Steam Flow Meter Unit #3 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: ABB Kent – Taylor Model No.: 621RC2ULB111121 Remote Seal Serial No.: 95034SR96045 Instrument No.: 3LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25% Date of Calibration: 2008-09-08, 2009-07-14 & 2010-07-28

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the last issuance of VERs for this project activity whichever occurs later.

Related Findings

- ☐ No CARs, CLs or FARs have been identified in this context
- ☒ The following finding(s) have been addressed:

Finding:	CAR 4.4.1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding Describe the finding in unambiguous style; address the context (e.g. section)	During next periodic verification the verifiers have to check the procedures w.r.t QA/QC procedures regarding TRIP, unrecorded steam flow and irregular readings. Ref: First verification report and version 01 of the MR.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The QA/QC procedures regarding TRIP, unrecorded steam flow and irregular readings have been defined in the internal document of Gunung Salak geothermal power plant business unit as per "Prosedur Pemantauan dan Pengukuran" (Reference document no: 10). In addition to that, conservative approach or calculation if such events occurred has been described in the SOP Carbon Credit (Reference document no: 10). Thus, events such as TRIP, unrecorded steam flow and irregular readings have been considered by PPs within the internal procedure and also project documentation. Both procedures are being submitted to DOE.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	During the second verification site visit, the DOE verified the identified FAR and reviewed the procedures for TRIP, unrecorded steam recordings, emergency preparedness, QA/QC for carbon credits etc. Respective documents are reviewed and the DOE concludes that proper management and operational system are implemented at the project site. Ref: Version 02 of the MR. CAR 4.4.1 is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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 4.4.2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	During next periodic verification the verifiers have to check the following procedures as mentioned in the VCS PD, latest updated SOP the requirements are a) Calibration of energy meter once in two years b) Yearly Calibration of other monitoring instrument Ref.: First verification report and version 01 of the MR.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) The periodic calibration of revenue meters, which is once per two years, is described in the previous (January 2003) and current SOP (June 2011) for metering electricity generation. In addition to that, 10 years schedule of revenue meters calibration has also been defined as per both SOP for metering electricity system and monitoring plan of VCS PD. SOPs and calibration schedule of revenue meters are being submitted to DOE (Reference document no: 11).		

	b) The yearly calibration of other monitoring instrument e.g. steam flow meters has been described in the latest updated SOP "Instruksi Kerja Kalibrasi Flow Transmitter". Reference document No. 11 is being submitted.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) During the second verification site visit, the DOE verified the latest SOP which mentions all the details as required by the VCS. The calibration procedures are identified as once in 2 years for energy/revenue meters. b) All other monitoring equipments used in the project activity are calibrated once in a year as per the SOP. If any delay in calibration occurs, the PP follows a conservative approach as per the Guideline of delay in calibration. Hence, the DOE concludes that the raised FAR during first verification shall be closed during the second verification period. Ref: Version 02 of the MR and SOP. CAR 4.4.2 is closed.
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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:	CL 4.4.1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Following issue w.r.t. Section 3.3 have been identified: a) Transparency of persons in charge for VCS activity at the project site is not incorporated in the MR. b) The abbreviations in figure Monitoring equipment are unclear. Clarify. c) Training records have been presented during onsite visit however the information is not mentioned in MR. Clarify and revise accordingly. d) Title page: Specification is requested w.r.t. current number of periodic verification Ref: Version 01 of the MR.		

Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	a) List of persons in charge has been added in revised MR. b) The abbreviations in figure Monitoring Equipment have been clarified. c) Information and list of training conducted from 1 April 2009 to 31 March 2011 have been added in the revised MR. Reference document No. 12 is being submitted. d) Title page with regards to current number of periodic verification has been specified in the revised MR.
DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	a) Revised MR includes the list of persons and in charge under section 3.3. The same is found to be in line with the actual site monitoring. CL 4.4.1.a is closed. b) All the abbreviation in the MR is presented in a transparent manner. The same can be verified and concluded in the revised monitoring report. CL 4.4.1.b is closed. c) Training records covering the second monitoring period is submitted by the PP. Necessary information w.r.t training is included in the revised monitoring report. CL 4.4.1.c is closed. d) Current verification detail is mention in the title page of the monitoring report. CL 4.4.1.d is closed. Ref: Version 02 of the MR.
Conclusion <i>Tick the appropriate checkbox</i>	☐ 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:	FAR 4.4.1		
Classification	☐ CAR	☐ CL	☒ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Standard template for the monitoring of diesel generator operation is not used consistently during the second verification period. The same needs to be checked during the next verification period.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Standard template for the monitoring of diesel generator operation will be used consistently to ensure transparent DG records. The DG recording template is being submitted (reference document no: 13).		

DOE Assessment #1 <i>The assessment shall encompass all open issues. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.</i>	
Conclusion <i>Tick the appropriate checkbox</i>	☒ To be checked during the third periodic verification ☐ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

Final Assessment

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the last issuance of VERs for this project activity whichever occurs later.

All meters undergo calibration regularly and the reports were verified and found to be in accordance with the PPA, SOP and monitoring plan mentioned in the VCS PD. The MR mentions in detail the calibration procedures adopted and meter details including calibration dates and their delays. A conservative approach has been taken to calculate the ER. The monitoring report therefore satisfies the calibration procedure and the calibration frequency.

- ☒ CAR 4.4.1, CAR 4.4.2 and CL 4.4.1 were raised and closed successfully.
 Further FAR 4.4.1 is raised and same needs to be checked during the third verification period.

5 VERIFICATION CONCLUSION

PT. Indonesia Power has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” in Indonesia with regard to the requirements of VCS Version 3.0 Standard.

Reporting Period: From 2009-04-01 to 2011-03-31 (both days included)

In the course of the verification 6 Corrective Action Requests (CARs), 5 Clarification Requests (CLs) were raised and closed successfully. Furthermore 1 FAR is raised which need to be checked during next verification period.

The verification is based on the draft monitoring report, revised monitoring report^{/MR1/}, the monitoring plan as set out in the validated PD^{/VCS-PD/}, the validation report^{/VAL-R/}, emission reduction calculation spreadsheet^{/ER/} and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

In detail the conclusions can be summarized as follows:

- All operations of the project are implemented and installed as planned and described in the validated project description.
- The monitoring plan is in accordance with the applied approved methodology, i.e., ACM 0002, version 07.
- The installed equipment essential for measuring parameters required for calculating emission reductions is calibrated appropriately with some delays.
- The monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 2nd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Year	BE _y	PE _y	LE _y	Emission Reductions ER _y (tCO _{2e} /yr)
2009-04-01 to 2009-12-31	170,011	51,552	0	118,459
2010-01-01 to 2010-12-31	156,722	58,212	0	98,510
2011-01-01 to 2011-03-31	59,627	14,883	0	44,744

Baseline emissions	386, 360	t CO ₂ equivalents
Project emissions	124, 647	t CO ₂ equivalents
Emission reductions	261, 713	t CO₂ equivalents

Bangalore, 2012-06-04



Murali Ramalingam
TUV India Private Limited
Verification Team Leader

Essen, 2012-06-04



TÜV NORD JI/CDM Certification Program
Final Approval

6 REFERENCES:

Table 6-1: Documents provided by the project participant

Reference	Document		
/CAL/	S.No	Equipment	Description
	1	Electricity Revenue Meter Unit #1 (2009-04-01 to 2010-08-10) For EGy and EGimp	Date of Calibration: 2008-09-12
	2	Electricity Revenue Meter Unit #1 (2010-08-10 to 2011-03-31) For EGy and EGimp	Date of Calibration: 2010-08-10
	3	Electricity Revenue Meter Unit #2 (2009-04-01 to 2011-03-31) For EGy and EGimp	Date of Calibration: 2008-09-12 & 2011-04-20
	4	Electricity Revenue Meter Unit #3 (2009-04-01 to 2011-03-31) For EGy and EGimp	Date of Calibration: 2008-09-12 & 2009-11-04
	5	Steam Flow Meter Unit #1 For MS,y	Date of Calibration: 2008-09-08, 2009-07-13 & 2010-07-26
	6	Steam Flow Meter Unit #2 For MS,y	Date of Calibration: 2008-09-08, 2009-07-15 & 2010-07-27

Reference	Document		
	7	Steam Flow Meter Unit #3 For MS,y	Date of Calibration: 2008-09-08, 2009-07-14 & 2010-07-28
/CR1/	Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1346/44/600.4/2006 for Unit#1		
/CR2/	Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1347/44/600.4/2006 for Unit#2		
/CR3/	Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1348/44/600.4/2006 for Unit#3		
/EF/	Emission Factor calculation sheet for JAMALI Grid, Indonesia fixed ex-ante.		
/EIA/#3	Environmental Impact Assessment Unit 3 in year 2009.		
/ER/	- Emission Reductions calculation sheet corresponding to version 01 of the MR - Emission Reductions calculation sheet corresponding to version 02 of the MR - Emission Reductions calculation sheet corresponding to version 02.1 of the MR - Emission Reductions calculation sheet corresponding to version 02.2 of the		

Reference	Document
	MR
/GEN-LOG/	Log book details of the diesel consumption for the crediting period from 2009-04-01 to 2011-03-31.
/INV-ELE/	Invoice copy of the sales of electricity to PT.PLN PERSERO for the crediting period 2009-04-01 to 2011-03-31.
/MR1/	Monitoring report w.r.t "Capacity upgrade of Gunung Salak Geothermal Power Plant project", version 01 dated 2011-11-19
/MR4/	Monitoring report w.r.t "Capacity upgrade of Gunung Salak Geothermal Power Plant project", version 02.3 dated 2012-05-24
/NCG-ANA/	NCG analysis certificate for the period from 2009-04-01 to 2011-03-31 dated 2010-08-03 and 2010-08-05.
/PPA1/	Power Purchase Agreements between PERJANJIAN JUAL BELI TENAGA LISTRIK TAHUN 2003 and PT.INDONESIA POWER for all the three units 1,2&3, Nomor 405.PJ/o63/IP/2003
/PPA2/	Power Purchase Agreements between PERJANJIAN JUAL BELI TENAGA LISTRIK TAHUN 2003 and PT.INDONESIA POWER for all the three units 1,2&3, Nomor 019.PJ/o63/IP/2008.
SOP	- Updated SOP dated 2003-01-23 - Updated SOP dated 2011-06-22
/STEAM-LOG/	Log book details of the steam flow for the crediting period from 2009-04-01 to 2011-03-31.
/TECH-EM/	Technical details of the new installed energy meter for measurement of power.
/THREE-	Three partied SOP for Carbon Credit Monitoring Plan for Capacity Upgrade of

Reference	Document
AGREE/	Gunung Salak Geothermal Power Plant Project, Indonesia dated 2009-10-20.
/TRA/	Training certificate for the period from 2009-04-01 to 2011-03-31.
/VAL-R/	Final validation report w.r.t “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”
/VCS-PD/	Final version (V7) of the VCS PD w.r.t “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”, dated 2009-07-10.
/VER-R/	Final first verification report “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”, dated 2009-10-26.
/WI/ /DGO/ /DFF/	Working Instruction: Diesel Generator Operation dated 2011-08-01 Diesel Fire Fighting Pump Operation dated 2011-08-01

Table 5-2: Background investigation and assessment documents

Reference	Document
/ACM 0002/	Indicative simplified baseline and monitoring methodologies for selected large-scale CDM project activity categories (Version 7)
/ACM 0002/	Tool to calculate the emission factor for an electricity system (Version 01.1)
/IPPC/	2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/EF/	1. Data was obtained from PLN statistics website (Table 23 and Table 24 for all years). Data for power purchased from Independent Power Producers (IPPs) was lumped as a single generation data, except for year 2005 and 2006 2. Data for 2006 includes all power plants including individual IPPs. Data for 2005 is IPP generations data to be used as complimentary information with published data for 2005 contained in Table 23 and Table 24 of PLN statistic website

Reference	Document
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/ISO 14064/	Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/ISO14065/	Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
VCS	Voluntary Carbon Standard Version 3.0
/VDS-PD-T/	VCS PD Template
/VVM/	Validation and Verification Manual (Version as per EB 55)
/EB 52-A 60/	Guidelines for assessing compliance with the calibration frequency requirements

Table 5-3: Websites used

Reference	Link	Organization
/vcs/	www.v-c-s.org	VCS version 2007.1 and VCSA, version 3.0
/unfccc/	http://cdm.unfccc.int	UNFCCC
/satsig/	http://www.satsig.net/maps/lat-long-finder.htm	Satellite Signals

Table 5-4: List of interviewed persons

Reference	Mol ¹		Name	Organization / Function
/IM01/	V	☐ Mr. ☒ Ms	Anna Reani	PT. Indonesia Power (Head Office)
/IM01/	V	☒ Mr. ☐ Ms	Dodi Bakar	PT. Indonesia Power Gunung Salak/ General Manager
/IM01/	V	☒ Mr. ☐ Ms	Hadi Suyitro	PT. Indonesia Power Gunung Salak
/IM01/	V	☐ Mr. ☒ Ms	I.C. Lydia	PT. Indonesia Power (Head Office)
/IM01/	V	☒ Mr. ☐ Ms	B. Alam	PT. Indonesia Power
/IM01/	V	☒ Mr. ☐ Ms	Rrindran	PT. Indonesia Power Gunung Salak
/IM01/	V	☒ Mr. ☐ Ms	Vicky	PT. Indonesia Power Gunung Salak
/IM01/	V	☒ Mr. ☐ Ms	Yuansah	PT. Indonesia Power Gunung Salak

/IM01/	V	☒ Mr. ☐ Ms	Sugimin	PT. Indonesia Power Gunung Salak
/IM01/	V	☒ Mr. ☐ Ms	Iwan Kurniawan	PT. Indonesia Power Kamojang
/IM01/	V	☒ Mr. ☐ Ms	Achmad Rivai	PT. Indonesia Power Gunung Salak
/IM01/	V	☒ Mr. ☐ Ms	Yus Faisal	PT. Indonesia Power Gunung Salak
/IM02/	V	☐ Mr. ☒ Ms.	Alin Pratidina	Project manager CDM, South Pole Carbon Asset Management Indonesia

¹⁾ Means of Interview: (Telephone, E-Mail, Visit)