



VOLUNTARY CARBON STANDARD 2007.1

VERIFICATION REPORT

WAYANG WINDU PHASE 2 GEOTHERMAL POWER PROJECT

**Monitoring Period: 2009-03-04 to 2010-12-01
(include both days)**

Report No: MY-VCS 11/23- 11/272

Date: 2011-08-26

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Name of Verification company:	Date of the issue:
TÜV NORD CERT GmbH	2011-08-26
Report Title:	Approved by:
Wayang Windu Phase 2 Geothermal Power Project	Dr. Jochen Schubert
Client:	Project Title:
Sindicatum Carbon Capital Ltd.	Wayang Windu Phase 2 Geothermal Power Project
Summary:	
Sindicatum Carbon Capotai Ltd., has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project “Wayang Windu Phase 2 Geothermal Power Plant” located at 40km south of Bandung Kecamatan Pangalengan, West Java, Indonesia with regard to the requirements of VCS 2007.1 Standard. The project activity involves installation the construction of 110 MW power plant consisting of 1 unit turbine rated capacity of 117MW and 1 unit generator rated capacity of 116.88MW. The project activity expected to supply annual electricity to the JAMALI grid of Indonesia is approximately 963,000MWh. During the monitored period, the total net electricity exported to the grid is 3,358,209.40MWh. The amount of electricity generated by the existing baseline power plant was 1,657,757.32MWh. Therefore, the net electricity that can claim the emission reductions is 1,700,452.08MWh. The project begins operations and exports its first unit of electricity to the grid was on 2009-03-04. Reporting period: From 2009-03-04 to 2010-12-01 (include both days). Total number of days: 638 In the course of the verification 8 Corrective Action Requests (CARs) and 0 Clarifications (CLs) were raised and closed. There is no Forward Action Request (FARs) raise. The verification is based on the monitoring report, the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant. In detail the conclusions can be summarised as follows: - all operations of the project are implemented and installed as planned and described in the validated project description version 2 and PDD version 3. - the monitoring plan is in accordance with the applied approved methodology i.e ACM0002 Version 09, “Consolidated methodology for grid-connected electricity generation from renewable sources.” - the installed equipment essential for measuring parameters required for calculating emission reductions are calibrated appropriately and according to the frequency as stated in the monitoring plan of the validated PD version 2 and PDD version 3. - the monitoring system is in place and functional. The project has generated GHG emission reductions As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. All the documents checked during on-site visit and verification process will be kept confidential and will not be disclosed at any time other than the Project Proponent consent as required by VCSA TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows: Emission reductions: 1,406,789tCO_{2e}	
Work carried out by:	Number of pages:
Chun Yuen, Cheong (Robert) Chee Yin, Cheong (Nicholas) Beqqal, Samir	38

Abbreviations

BAU	Business as usual
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CO₂	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CP	Certification Program
CL	Clarification Request
DNA	Designated National Authority
EB	CDM Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report
QC/QA	Quality control/Quality assurance
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VCS - PD	VCS - Project Description
VCU	Voluntary Carbon Unit
VVM	Validation and Verification Manual

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1 INTRODUCTION

Sindicatum Carbon Capital Ltd has commissioned the TÜV NORD JI/CDM Certification Program to carry out the verification of the project:

“Wayang Windu Phase 2 Geothermal Power Project”

with regard to the relevant requirements of the Voluntary Carbon Standard 2007.1^{/VCS/}. The verifiers have reviewed the implementation of the monitoring plan (MP) in the validated VCS project for the monitoring period 2009-03-04 to 2010-12-01 (both dates included).

The applied monitoring methodology is ACM0002 Version 09, “Consolidated methodology for grid-connected electricity generation from renewable sources”.

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follows:

- to verify that the project is implemented as described in the registered project design document;
- to assess the implementation of the monitoring plan (MP) content in the registered PDD;
- to assess the project’s compliance with other relevant rules, including the host country Indonesia legislation;
- to confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCU) 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 registered project design document, the monitoring report, emission reduction calculation spread sheet, supporting documents made available to the verifier and information collected through performing interviews 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 VCS Project Description

1.3.1 Project Characteristics

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

Table 1-1: Project Characteristics

Item	Data
Project title	Wayang Windu Phase 2 Geothermal Power Project
Project owner	Star Energy Geothermal (Wayang Windu) Ltd
Any specific project categories	☐ Mega projects ($> 10^6$ t CO _{2eq} / a) ☒ Projects (5,000 to 10^6 t CO _{2eq} / a) ☐ Micro projects (< 5000 t CO _{2eq} / a) ☐ AFOLU project ☐ Grouped project ☐ No specific project category
VCS PD dated	Draft: 2011-05-25 Final: 2011-07-04
Applied Methodology	ACM0002: Version 09: Consolidated methodology for grid-connected electricity generation from renewable sources
Project starting date	2009-03-04
Crediting period	☐ Renewable Crediting Period (7 y) ☒ Fixed Crediting Period (2009-03-04 – 2010-12-01)
Start of crediting period	2009-03-04

1.3.2 Project Location

The details of the project location are given in table 1-2:

Table 1-2: Project Location

Item	Project Scope
Host Country	Indonesia
Region:	West Java
Project location address:	40km south of Bandung Kecamatan Pangalengan,
Latitude:	7° 12' 26.79" S,
Longitude:	107° 37' 44.12" E

1.3.3 Technical Project Description

The project is a geothermal power generation plant developed by Star Energy Geothermal (Wayang Windu) Ltd., to sell electricity to PT Perusahaan Listrik Negara (PLN) and connected to the JAMALI grid. The installed capacity of the project is 110MW consists of 1 unit turbine at rated capacity 117MW and 1 unit generator at rated capacity of 137MVA or 116.88MW. ^{/EI2/EI3/}

The key parameters of the project are given in table 1-3:

Table 1-3a: Technical data of the project ^{/ETI/}

Parameter / Item	Unit	Description
Manufacturer		Fuji Electric Systems Co. Ltd.,
Turbine	Type	Single Casing Condensing Reaction Type
Rated capacity	MW	117
Manufacturer		Fuji Electric Systems Co. Ltd.,
Generator	Type	GTLR1544/63-2
Rated capacity	MVA / MW	137 / 116.88
Rated current	A	5,753
Rated power factor	Cos ϕ	0.85
Rated voltage	kV	13.8

Wayang Windu Unit 1:

Description	Type	Serial No	Accuracy
Main Meter	Power Logic ION 8600	MT-0809A063-01	0.2S
Check Meter	Power Logic ION 8600	PT-0807A249-01	0.2S

Wayang Windu Unit 2:

Description	Type	Serial No	Accuracy
Main Meter	Power Logic ION 8600	MT-0806A388-01	0.2S
Check Meter	Power Logic ION 8600	PT-0805A318-01	0.2S

In addition to these parameters the make, accuracy and class of main and check meters installed in the control room, outage register, maintenance checklists, calibration records, electricity generation and defect registers were checked and verified.

1.3.4 Appointment of team members and technical reviewer

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

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 1-4 below.

Table 1-4: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Scheme competence ³⁾	Technical competence ⁴⁾	Verification competence	Host country Competence	Team Leading competence
☒ Mr. ☐ Ms.	Cheong, Chun Yuen (Robert)	TUV NORD Malaysia	TL	LA	☒	1.2	☒	☒	☒
☒ Mr. ☐ Ms.	Cheong, Chee Yin (Nicholas)	TUV NORD Malaysia	TM ^{A)}	A	☐		☒	☒	☐
☒ Mr. ☐ Ms.	Beqqal, Samir	TUV NORD CERT GmbH	TR ^{B)}	A	☐		☐	☐	☐
☒ Mr. ☐ Ms.	Schubert, Jochen	TUV NORD CERT GmbH	TR ^{B)} FA ^{B)}	SA	☒	1.2	☒	☐	☒

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, ...)

1.4 Level of Assurance

The verification has been planned and organized to achieve a

☒ reasonable level of assurance

☐ limited level of assurance.

2 METHODOLOGY

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 Monitoring Report 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 2.1 below:

Table 2.1: Verification sequence

Topic	Time
Assignment of verification	2011-05-27
On-site visit	2011-06-20 to 2011-06-23
Draft reporting finalised	2011-06-26
Final reporting finalised	2011-08-16
Technical review on final reporting finalised	2011-08-16
Final approval	2011-08-26

The main verification steps are described below.

2.1 Review of Project Documentation

The VCS PD 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 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 5.

2.2 On-Site Assessment

2.2.1 Review of Performance Records

The verification team adopted suitable methodology to ensure that the project is implemented and operated as per the registered PDD. In order to verify that the bbproject is implemented and operated as per the applicable criteria, check on the conditions and specifications described in the registered PDD, site visit to verify the equipment installed, working and operation conditions and accuracy of implemented monitoring methodology. The following items were verified in detail:

- Investigation of whether the turbine and generator along with peripheral supporting equipment such as transformers, etc were installed and worked as planned and presented in the registered PDD
- Operating staff were interviewed and were observed in order to verify allegiance to stated methods of operation and monitoring
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The 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; recording of hourly generation, aggregating of data, and monthly reports were verified.
- Maintenance procedures were verified

The on-site visit was scheduled for 2011-06-20 to 2011-06-23; Site visit was lead by the Team Leader with team member with the requisite technical scope accreditation. During the site visit, the team members were able to check and verify the following records:

- Daily generation report which included details of running hours, total daily generation, auxiliary consumption and cumulative generation and consumption for each month; ^{/D3/D4/}
- Outage register containing details of forced and planned outages, root cause analysis, and corrective actions implemented; ^{/D1/}
- Register containing hourly readings from the control room; ^{/D4/}

- Maintenance check list – mechanical and electrical – daily, weekly, monthly and annually;
- Downtime register

The team also verified the following:

- Turbine name plate details; ^{/EI3/}
- Generator name plate details; ^{/EI2/}
- Main and Check meters, make, type and serial numbers;
- Main control room instrumentation.

2.2.2 Follow-up 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 2-2.

Table 2-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
1. Start Energy Geothermal / Project Owner & Host PP 2. Sindicatum Carbon Capital / Project Consultant and Annex I PP.	• General aspects of the project • Technical equipment and operation • Changes since implementation • Monitoring and measurement equipment • Remaining issues from validation • Calibration procedures • Quality management system • Involved personnel and responsibilities • Training and practice of the operational personnel • Implementation of the monitoring plan • Monitoring data management • Data uncertainty and residual risks • GHG calculation • Procedural aspects of the verification • Maintenance • Environmental aspects • Editorial issues of the Monitoring Report

A comprehensive list of all interviewed persons is part of section 5, Table 5.4: List of interviewed persons.

2.2.3 Collection of Measurements

The verification team has carried out interviews and reviews of records to assess if the collection of measurements is in accordance with the monitoring plan of the validated PD and the relevant VCS criteria. The parameters to be measured and monitored as per the registered PDD are explained in Section D.2 of the MR.

1. Electricity exported to the grid by the project activity
2. Average mass fraction of CO₂ in the produced steam
3. Average mass fraction of CH₄ in the produced steam
4. Quantity of steam produced during the year
5. Electricity supplied by the project activity to the grid (total of net electricity generated by Wayang Windu Unit 1 and Unit 2)
6. Electricity supplied by the existing power generation unit to the grid (net electricity generated by Wayang Windu Unit 1)
7. Net electricity supplied by Wayang Windu Unit 2 to the grid
8. CO₂ emissions from fossil fuel combustion in the operation of the power plant (diesel genset and fire pump) in year
9. Quantity of diesel fuel combusted in power plant operation during the year
10. Weighted average net calorific value of diesel fuel in year
11. Weighted average CO₂ emission factor of diesel fuel in year

Parameter mentioned under 1 above is measured by main meter located at the PLN control room next to the project activity and check meter at the power plant control room. The generated electricity is exported to the JAMALI Grid and this is in accordance with the registered PDD. During the site visit it was confirmed that the details of meters connected at the two generating facilities are as follows:

Wayang Windu Unit 1:

Description	Type	Serial No	Accuracy
Main Meter	Power Logic ION 8600	MT-0809A063-01	0.2S
Check Meter	Power Logic ION 8600	PT-0807A249-01	0.2S

Wayang Windu Unit 2:

Description	Type	Serial No	Accuracy
Main Meter	Power Logic ION 8600	MT-0806A388-01	0.2S
Check Meter	Power Logic ION 8600	PT-0805A318-01	0.2S

2.2.4 Observation of established practices and testing of the accuracy of monitoring equipment

During the on-site visit, the verification team has checked the test methods and practices established for the monitoring instruments whether they are in accordance to local and international requirements and as in the registered PDD.

2.3 Determination of the reductions in GHG emissions

The verification team has reviewed and checked the method for determination of GHG emissions and assessed if they are calculated in a conservative approach and in accordance to the methodology and relevant tools equations.

2.4 Review of additional data from other sources if appropriate

Additional data collected are reviewed and the sources are verified through interviews and review of any websites as stated in the monitoring report.

2.5 Review of monitoring results and verification of the correct application of monitoring methodologies

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.

2.6 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 3 of this report.

3 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 summarised. Table 3-1 includes an overview of all raised CARs, CLs and FARs.

Table 3-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
3.1	Remaining issues, including any material discrepancy	-	-	-
3.2	Project implementation	3	-	-
3.3	Completeness of monitoring	5	-	-
3.4	Accuracy of emission reduction calculations	-	-	-
3.5	Quality of evidence to determine emission reductions	-	-	-
3.6	Management and operational system	-	-	-
	SUM	8	-	-

3.1 Remaining issues, including any material discrepancy, from previous validation

Description

There are no open issues during the validation.

There are no changes in the monitoring plan

Related Findings

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

☐ The following finding(s) have been addressed:

Final Assessment

The DOE team assess that there are no pending issues remaining from the validation and that no such issue has arisen in the interval between validation and this first verification

3.2 Project implementation

Description

During the validation site visit, it was confirmed that the project has been implemented as per design and as described in the registered PDD and VCS PD. The geothermal power project was commissioned in full operation starting on 2009-03-04.

There are no changes in the key equipment since the validation of the project during the monitoring period and it was confirmed that the name plate capacity of the

installed turbine, generator, transformer and such other generating and peripheral equipment were in accordance with the description provided in the registered PDD. The monitoring methodology was in line with the chosen methodology and the equipment and instruments installed for monitoring of the project activity were sufficient to monitor the project activity in line with the requirement as described in the registered PDD.

The verification site visit was conducted on 2011-06-20 to 2011-06-23. During the site visit it was confirmed that there was no alteration or change effected for the generating equipment and / or monitoring instruments and that the project continued to be in line with the description as narrated in the registered PDD and VCS PD.

During the monitoring period covering 2009-03-04 to 2010-12-01 the project activity exported to the JAMALI Grid, Indonesia as follows:

Table 3-2: Electricity Generated

EG ¹	Total Electricity supplied by the project activity to the grid (Unit 1 & 2)	3,358,209.40	MWh
EG _{existing} ²	Monitored	1,657,757.32	MWh
Duration of Monitoring Period	2009-03-04 to 2011-12-01	638	days
EG _{historical,y}	Yearly average of historical electricity delivered by the existing facility to the grid	912,476.00	MWh
EG _{historical,MP}	638/365*912,476	1,594,958.05	MWh
EG _{baseline}	MAX (EG _{historical,MP} , EG _{existing,MP})	1,657,757.32	MWh
EG - EG _{baseline}	Electricity exported to grid for ER calculations	1,700,452.08	MWh

Main meters were installed located at the connection point at the grid line located at the PLN sub-station control building outside the power plant boundary. As per grid connection agreement, main meter was defined as invoice meter. A check meter is installed at the grid connection side to cross checked that the reading is similar as main meter. Both meters accuracy are same. Since the back-up meter is located at the control room of the power plant, the reading from this meter is taken as the electricity exported to the grid to calculate the ER or this period.

However, the verification team found the following:

Related Findings

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

Project implementation	3.2-1
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¹Refer to VER spreadsheet for daily generation data from Wayang Windu Phase 1 and Wayang Windu Phase 2 geothermal power project

²Refer to VER spreadsheet for daily generation data from Wayang Windu Phase 1 geothermal power project

Project implementation	3.2-1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section A.1: The sequence of events for the project implementation and project start dates were not clear.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The following has been added in section A.1: The construction of the project activity started in Jan 2007 (EPC contract was signed on 30 Jan 2007) and the project started its operation and reduced GHG emissions from 4 March 2009 (project start date).		
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>	Section A.1 of revised MR had been updated with the relevant sequence of events for the project implementation information. CAR is CLOSED		
Conclusion <i>Tick the appropriate checkbox</i>	☐ To be checked during the next periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements		

Project implementation	3.2-2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section A.4: The number of units for the turbine and generator are not clear.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The number of units for the turbine and generator has been clarified in section A.4 as follows: List of Main Equipment and Systems: ▪ One unit of 117 MW steam turbine ▪ One unit of 137.5 MVA Main Generator ▪ One unit of 150kV/13.8kV Generator Transformer		
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>	Section A.4 of updated MR includes the technical data of the generation equipment. CAR is CLOSED		

Project implementation	3.2-2
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

Project implementation	3.2-3
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section B.1: During the onsite visit, it was found several incidents for downtime and shutdown that were not indicated in the monitoring report.
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The following has been added in section B.1: During this monitoring period, there are events that affect the outages of the plant, such as earthquake and turbine overhaul. Refer to Annex 1 for further details. List of the WW Unit# 2 Turbine Outages Log has been added to the Annex of the Monitoring Report.
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>	Section B.1 of revised MR had been updated with the incidents and downtime of the project activity in Annex 1. CAR 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

Final Assessment

The verification team has reviewed the parameters in the monitoring report and the parameters are complete and in accordance to the monitoring plan of the registered PDD.

All measured or calculated data are carried out as indicated in the monitoring and reporting procedures developed to manage the project activity except the parameter $FC_{i,j,y}$, for the diesel consumption by the fire pump and standby genset, which was not monitored in accordance to the registered PDD. The flow meters were not installed until 2010-01-15. From 2009-03-04 to 2010-01-31, the usage of diesel was monitored by means of the recorded running hours of the equipment multiplied by the consumption per hour. The PP had provided the explanation of the deviation in Annex 3 of MR. The verification had reviewed the explanation, assessed the records,

equipment specification for the diesel consumption per hour, spreadsheet for the calculation of the diesel consumed taking into consideration for 100% load factor for conservativeness. ^{/C4/C5/}

The verification team conclude that the monitoring of the project activity is complete and carried out in a transparent manner and is implemented as described in the registered PDD.

In the course of the verification, 3 CARs were raised and closed.

3.3 Completeness of monitoring

Description:

The monitoring reporting is in line with the requirements of the validated PD monitoring plan as well as with the applied methodology ACM 0002 Version 09 ^{/ACM2/}.

During this verification the team verified the following parameters with regard to the appropriateness of the applied measurement / determination method, the correctness of the values applied for ER calculation, the accuracy, and applied QA/QC measures.

All the data as per the monitoring plan were cross-checked by the verification team against basic monitored data.

The key monitoring parameters which influence the calculation of the emission reductions are the electricity exported to the JAMALI grid. The electricity is measured with a high accuracy and duly calibrated meters.

No fossil fuels were used in the power generation during the monitoring period

The meter readings are carried out once in a month jointly by PP and representative from PT PLN. The invoice issued by PP is the basis for the commercial billing. All relevant evidences were fully checked by the verification team during and after the site-visit. The accuracy of the main and back-up meters are same as stated in the MR as found during onsite. Other evidences are clearly identifiable and assessed to be correct.

The reporting procedures reflect the requirements of the monitoring plan as stated in the registered PDD, and VCS additional information. All data needed are recorded at least every month, archived and stored appropriately during the stated monitoring period of 2009-03-04 to 2010-12-01 (both days inclusive).

Related Findings

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

Completeness of Monitoring	3.3-1		
Classification	☒ CAR	☐ CL	☐ FAR

Completeness of Monitoring	3.3-1
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: Parameter $M_{s,y}$. According to the registered monitoring plan, the calibration will be conducted at least every 3 years. To ensure accuracy for the measurement, the calibration was carried every six months based on an internal procedure. A calibrator is used to verify and calibrated the respective instrument. The PP is requested to provide following information: 1. The type or model of calibrators used for the various range of the flow meters, pressure and temperature sensors / transmitter. The calibration certification, date of calibration and expiry date of calibration are to be included. 2. Some of the flow meter was out of calibration (as according to the 6 months period). Please provide documents to ensure that the range of the meter is still within the permissible range. 3. The next calibration date.
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	1. Refer to the "Calibrator" tab in the monitoring equipment spreadsheet 2. In accordance to EB52 Report Annex 60, error calculation has to be applied during the affected period between the scheduled date of calibration and the actual date of calibration. Refer to "Error Calculation list.xlsx", "VER - monthly data consolidation.xlsx", and folder "Affected calibration records". 3. Refer to Annex 2 Monitoring Equipments
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>	1. The revised monitoring equipment spreadsheet, "Calibrator Tab" had been updated to include the relevant information of the calibrators type, model and calibration dates. 2. The revised spreadsheet had included the maximum permissible error applied on instruments that had delay in calibration. The errors applied are either the accuracy of the instrument or the variations in the calibration. 3. The instruments calibration details had been included in Annex 2 of revised MR. CAR 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

Completeness of Monitoring	3.3-2
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: According to the registered PDD, the consumption of fuel will be monitored by a flow meter. However, at the beginning of the monitored period, the flow meters for the standby genset and fire pump were not available. The PP is requested to provide a complete demonstration and justification how the fuel consumed was monitored.

Completeness of Monitoring	3.3-2																
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	This has been added in MR annex 3, i.e. The fuel flowmeters for the standby genset and fire pump were only installed and calibrated on 15 Jan 2010. Therefore the diesel consumption between the period of Mar 2009 to Jan 2010 will be calculated based on the running hours recorded from the equipments and the specification of the equipments, i.e. <table><tr><td></td><td>Running Hour (Ltrs/hour)</td><td>Consumption Rate (Ltrs/hour)</td><td>Diesel Consumed (Ltrs)</td></tr><tr><td>Standby genset</td><td>25.7</td><td>149</td><td>3829</td></tr><tr><td>Fire pump</td><td>15.2</td><td>53</td><td>806</td></tr><tr><td colspan="3">Total</td><td>4,635</td></tr></table> Refer to: - “Diesel Consumption and Running Hours Records - 2009.xlsx” - “Emergency Diesel Genset Specs.pdf” - “Fire Pump Specs.pdf”		Running Hour (Ltrs/hour)	Consumption Rate (Ltrs/hour)	Diesel Consumed (Ltrs)	Standby genset	25.7	149	3829	Fire pump	15.2	53	806	Total			4,635
	Running Hour (Ltrs/hour)	Consumption Rate (Ltrs/hour)	Diesel Consumed (Ltrs)														
Standby genset	25.7	149	3829														
Fire pump	15.2	53	806														
Total			4,635														
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>	Annex 3 had been included in revised MR to indicate the diesel consumption by the fire pump and standby genset. However, the following information are not indicated. 1. Annex 3 does not indicate the source of the data input values and insufficient explained how the usage are monitored. 2. Log sheets that indicated when the standby genset and fire pump were in operation. 3. The 100% load factor should be applied for conservativeness. 4. The spreadsheet did not indicate the links where the input values are obtained. 5. What does sheet 1 in spreadsheet represents? CAR is still OPEN																

Completeness of Monitoring	3.3-2
Corrective Action #2 <i>This section shall be filled by the PP. It shall address the corrective action taken in details</i>	1. Annex 3 has been added with the following: The running hour counters at the emergency diesel genset and fire pump were used to get the records of the running hours from March 2009 to January 2010, i.e. - Running hour counter at the emergency diesel genset on 5 Mar 2009 before being tested was 1373.7 and on 28 Jan 2010 after being tested = 1399.4 Therefore = $1399.4 - 1373.7 = 26.9$ hours of running hour for Mar 2009 to Jan 2010 - Running hour counter at the fire pump on 24 Feb 2009 after being tested was 130.5 and on 25 Jan 2010 after being tested = 145.7 Therefore = $145.7 - 130.5 = 15.2$ hours of running hour for Mar 2009 to Jan 2010 The running hour counters at both emergency diesel genset and fire pump were recorded whenever the equipments were being used, i.e. for testing purposes throughout this monitoring period. Consumption rates were based on the specification of the equipments. 2. Refer to Diesel Consumption and Running Hours Records - 2009.xlsx for the log sheets 3. As the equipments have been used only for testing purposes, the load factor is actually lower than 50%. This is evidenced from the records available since the flowmeter was installed in Jan 2010 to date (May 2011) (Refer to "Diesel Quality Check - May 2011.xlsx"). The actual measurements from the flowmeter are consistently lower than the diesel consumption calculation based on the running hour and consumption rate of 50% load factor. Therefore, applying 50% load factor in the calculation is deemed conservative. 4. There were no links in "Diesel Consumption and Running Hours Records - 2009.xlsx" as those are the readings of the running hour counter, multiplied with the consumption rates based on the specification of the equipments 5. Total diesel consumption for both standby genset and fire pump. The sheet has been renamed as "Total diesel consumption" in the file "Diesel Consumption and Running Hours Records - 2009.xlsx"

Completeness of Monitoring	3.3-2
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>	- Annex 3 is revised to explain how the diesel consumption for the fire pump and standby genset are monitored. As explained the running hours are recorded when operational test of the equipment are conducted. There is a running hours meter in each of the equipment that records the operating hours and confirmed during the on-site visit. The diesel consumption rate applied in the calculation is based on the equipment specification for litres/hr. - The spreadsheet submitted shows the log for the equipment operating time and calculations for the diesel consumption. The amount consumed is considered in the PE calculation. - From the measurement of the consumption by the flow meter, the energy balance is lower than the consumption using the rate multiplied by the hour operated. Thus the assumption for the 100% is considered conservative. - The log sheets are submitted to support of the data in the spreadsheet. - The tab has been renamed to avoid confusion. CAR 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

Completeness of Monitoring	3.3-3
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: Parameter $M_{s,y}$ has a repeat MBD- 5 flow meter.
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The repeat of MBD-5 flow meter in section D.2 has been deleted
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>	The repetition of information had been deleted. CAR 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

Completeness of Monitoring	3.3-4		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: Parameter: $FC_{i,j,y}$. The calibration records were not included.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	Section D.2 has been improved with the reference to Annex 2, where the calibration records have been included		
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>	Calibration details for the parameter meter had been updated in Annex 2. CAR 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		

Completeness of Monitoring	3.3-5		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: Parameter EG_y . 1. There is a main and check meter installed for Wayang Windu 1 and Wayang Windu 2 to monitor the electricity generated. The PP is request to clarify and state in the report which meter data is applied in the VERs calculation and why is considered. 2. The next calibration date		

Completeness of Monitoring	3.3-5
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	1. Primary data (data applied to the VERs calculation) is sourced from the check meter (owned by Star Energy). Data from check meter is taken for the primary data instead of the data from main meter (owned by PLN) because the data from the check meter is displayed and recorded continuously at the Wayang Windu's DCS system and can be downloaded at any point of time by Wayang Windu authorized staff. The data from the main meter can only be downloaded on the monthly basis by PLN Staff. The data from the main meter and the check meter are compared on the monthly basis and any differences greater than 4% will be investigated further. During this monitoring period, the difference between the data from main meter and check meter is less than 4% and therefore is considered acceptable. Refer to: "SOP of Metering System.pdf" 2. The next calibration date of both the main meter and check meter are available in Annex 2 of the Monitoring Report
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>	1. The explanation for the data applied in the VERs calculation is acceptable. The verification team had reviewed and cross-checked the data from the DCS which are password protection and only authorised can assessed to down load the data to cross checked with the reading at the meter located at the switchgear control room. The data are compared for the main and check meters and the differences are less than 4%. According to the Metering System SOP, in the event the difference is more than 4% an investigation will be conducted to find out what caused the differences. Therefore, the measurements taken from the check meter is considered appropriate and in line with the SOP. 2. The calibration information had been included in Annex 2 of the revised MR. CAR 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

Final Assessment

The verification team had reviewed the data collected and archived for the determination of the baseline emissions and any project emissions during the crediting period claiming the emission reductions.

All data applied in the calculations have been cross checked to conclude the emission reductions are calculated correctly.

Calibration of meters, instruments and equipment used in the recording of data are verified by reviewing the records to confirm calibration are carried out on or before the expiry date of the certificates. For this period, there are lapsed in the calibration for the steam flow and pressure instruments from the wells. For details of the calibration refer section D.2 and Annex 2 of MR. CAR.3.3-1 was raised and closed.

The electricity export meters to the grid were verified and calibrated according to the metering system once in 5 years by 3rd party laboratory in accordance to the Standard Operating Procedure for Meter System. ^{/P3/}

The energy readings from the main meter are jointly read by the power plant personnel and PT PLN personnel. The main meter is sealed and can only be accessed by the PT PLN officials.

The method in collecting and recording of data are in accordance to procedures developed in managing the project activity. ^{/P3/}

The project emissions parameters are as follows:

1. CO₂ and CH₄ due to the release of non-condensable gases from the steam produced in the geothermal power plant
2. Diesel consumption by the fire pump and standby genset.

The project emissions for the period of monitoring as below table:

Parameter	Period 2009-03-04 to 2010-12-01 (tCO ₂)
CO ₂ and CH ₄ released	107,433.37
Diesel consumption by standby genset and fire pump	28.95
Total for the period	107,462.32
Total for the period (roundup)	107,463

The data taken for project emissions calculation were verified and deemed appropriate. The calculations have applied the correct emission factor values for the CO₂, CH₄ and diesel consumed. ^{/E1/E2/TR/}

There are no leakage occur by the project activity.

For the calculation of baseline emissions, the ex-ante value for JAMALI grid emission factor was applied in accordance to the registered PDD. ^{/PDD/}

It was verified in the course of this verification that the above mentioned method has been correctly and accurately applied in calculating the total emission reductions.

In the course of the verification, 5 CARs were raised and closed.

3.4 Accuracy of emission reduction calculations

Description

Emission reductions due to the project activity are equivalent to the emissions avoided in the baseline by displacing the grid electricity.

No leakage emissions are considered from the project activity since no energy generating equipment is transferred from another activity and / or to the project activity.

Thus, $ER_y = BE_y - PE_y$, where,

ER_y = Emission reductions

BE_y = Baseline emissions, and

PE_y = Project emissions

As per the selected methodology for the project activity, ACM0002, the baseline for the project activity is the kWh produced by the project activity multiplied by an emission coefficient calculated as the Combined Margin (CM) being a combination of the Operating Margin (OM) and Build Margin (BM).

As per the registered PDD, the baseline emission factor has been fixed at 0.891 tCO₂e/MWh on *ex-ante* basis based on data published by Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization and endorsed by Indonesia DNA on 2009-01-19.

The Joint Meter Readings record the total export for Units 1 & 2. For details of the electricity generated refer to Table 3-2 above. The final amount exported after deducting the baseline scenario and historical value will be applied in the baseline emission determination. Hence, $BE_y = (EG - EG_{\text{baseline}}) \times EF_{\text{grid,CM}}$.

Related Findings

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

☐ The following finding(s) have been addressed

Final Assessment

The quality of the documents developed by the project proponent to monitor and determine the emission reductions were easily traceable and reference. Documents archiving and storage are in secured locations.

The verification team had reviewed the data collected and archived for the determination of the baseline emissions and any project emissions during the crediting period claiming the emission reductions.

A sampling method has been applied to cross check on the data applied in the calculations to conclude that the emission reductions are calculated correctly.

All documents reviewed were signed by responsible person in-charge of the project activity.

The method in collecting and recording of data are in accordance to procedures developed in managing the project activity.

3.5 Quality of evidence to determine emission reductions

Description

During the on-site visit, the verification team has reviewed and verified the respective documents that were used to calculate and determine the emission reductions.

The quantum of electricity generated is monitored continuously and recorded on a monthly basis by the authorised representatives of the agency scheduled to buy the power from the project activity. The monthly record is countersigned by the representative of the PP and provides details of power exported, power imported and the net power export.

The electricity meters are calibrated as per the procedure described in the SOP for Metering System and the meters are rendered pilfer proof. The meters installed are of sufficient accuracy; the electricity measurements are made simultaneously by a main and a check meter which provides a continuous comparison and ensures high quality, reliable and accurate data.

The records were easily traceable and referred to a monitored or calculated data or parameter. Details of the documents are listed in Table 5-1

Related Findings

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

Quality of Evidence	3.5-1
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section E.1: The grid combined emission factor is an ex-ante data in accordance to registered monitoring plan. It is not clear why the calculation of the emission factor is included?
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The calculation of the grid emission factor has been deleted from the Monitoring Report.
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>	Section E.1 of revised MR had been improved and the EF calculation had been deleted. CAR 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

Quality of Evidence	3.5-2
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Quality of Evidence	3.5-2		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	Section D.2: Parameters EG_y and $M_{s,y}$ The monthly raw data spreadsheets submitted show the data is from 2009-03-01 to 2011-05-22. The PP is requested to revise the data sheet to indicate the monitored period.		
Corrective Action #1 <i>This section shall be filled by the PP. It shall address the corrective action taken in details.</i>	The data sheet has been revised.		
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>	The revised data sheet had been reviewed and the monitored period had been included. CAR 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		

Final Assessment

The quality of the documents developed by the project proponent to monitor and determine the emission reductions were easily traceable and reference. Documents archiving and storage are in secured locations.

The verification team had reviewed the data collected and archived for the determination of the baseline emissions and any project emissions during the crediting period claiming the emission reductions. /D2/D3/D4/E2/E3/TR/

A sampling method has been applied to cross check on the data applied in the calculations to conclude that the emission reductions are calculated correctly.

All documents reviewed were signed by responsible person in-charge of the project activity.

The method in collecting and recording of data are in accordance to procedures developed in managing the project activity. /P1/P2/P3/P4/P5/P6/

In the course of the verification, 2 CARS were raised and closed.

3.6 Management and operational system

Description

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

Standard operating procedures, gas analysis, steam analysis, instruments maintenance, metering system, plant maintenance, generator, controls and instruments are implemented for proper operating of the plant and wells maintenance. ^{/P1/P2/P3/P4/P5/P6/}

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. ^{/T1/T2/T3/T4/T5/T6/T7/T8/T9/T10/T11/T12/}

Training is provided to the operation personnel as required. The operators are trained by Sumitomo Corporation on the generator, turbine, instrumentation and controls, and steam monitoring in the operation of the geothermal power plant.

Calibration training is provided to qualified personnel to conduct calibration of the flow meters and pressure transmitter. ^{/T4/}

All necessary monitored and measured raw data were checked during on-site verification. Supervisory personnel in charge of each shift are responsible for recording the total electricity generation, electricity export, electricity import, plant shut down or downtime, diesel consumption, down time, wells and steam generation report, etc

Such daily data is aggregated and monthly reports are generated. These are submitted to the Monitoring Officer from Sindicatum for verification and emission reduction calculations. The Plant Superintendent is responsible for the review of the monitored parameters, for correctness, and corrective measures to be initiated in case of minor errors in the monitored data and preparation of a daily summary on project operation and electricity generation

Related Findings

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

☐ The following finding(s) have been addressed:

Final Assessment

All management and operational systems are in place. The roles and responsibilities of the monitoring personnel are clearly mentioned in the MR and also verified during the site visit and found same as described in the PD.

The management and operational system of the project is reviewed in the course of verification

The operational and management structure is established in accordance with the registered PDD and the responsibilities for proper plant operation were clearly defined. The responsibilities are shared as follows

- The Plant Superintendent takes charge of the whole project, any abnormal in monitoring and reporting should be informed to him

- Shift in charge will generate of daily and monthly generation report and monthly exported electricity report and maintaining log sheets
- Operator involves in recording of meter reading for diesel consumed by the fire pump and standby genset.

4 VERIFICATION STATEMENT

Sindicatum has commissioned the TÜV NORD JI / CDM Certification Program to carry out the verification of the Project **“Wayang Windu Phase 2 Geothermal Power Plant”** located at 40km south of Bandung Kecamatan Pangalengan, West Java, Indonesia with regard to the requirements of VCS 2007.1 Standard

The project activity involves installation the construction of 110 MW power plant, consisting of 1 unit turbine rated capacity of 117MW and 1 unit generator rated capacity of 116.88MW. The project activity is expected to supply annual electricity to the JAMALI grid of Indonesia is approximately 963,000MWh. The total net electricity exported to the grid during this monitoring period is 3,358,209.40MWh. During the monitored period, the total net electricity exported to the grid is 3,358,209.40MWh. The amount of electricity generated by the existing baseline power plant was 1,657,757.32MWh. Therefore, the electricity that can claim the emission reductions is 1,700,452.08MWh.

The project begins operations and exports its first unit of electricity to the grid on 2009-03-04.

Reporting period: From 2009-03-04 to 2010-12-01 (Include both days)

Total number of days: 638

In the course of the verification 8 Corrective Action Requests (CARs), 0 Clarifications (CLs) were raised and closed. There is no Forward Action Request (FARs) raise.

The verification is based on the monitoring report, the monitoring plan as set out in the validated PD, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the project participant.

In detail the conclusions can be summarised as follows:

- all operations of the project are implemented and installed as planned and described in the validated PD version 2.0 and PDD version 3
- the monitoring plan is in accordance with the applied approved methodology i.e ACM0002 Version 09, “Consolidated methodology for grid-connected electricity generation from renewable sources.”
- the installed equipment essential for measuring parameters required for calculating emission reductions are calibrated appropriately and according to the frequency as stated in the monitoring plan of the validated PD version 2 and PDD version 3
- the monitoring system is in place and functional. The project has generated GHG emission reductions

As the result of the 1st periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

All the documents checked during on-site visit and verification process will be kept confidential and will not be disclosed at any time other than the Project Proponent consent as required by VCSA

TÜV NORD JI/CDM CP herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows

Emission Reductions Period:	Baseline Emissions (tCO _{2e})	Project Emissions (tCO _{2e})	Leakage (tCO _{2e})	Sum (tCO _{2e})
2009-03-04 to 2010-12-01	1,514,252	107,463	0	1,406,789
TOTAL	1,514,252	107,463	0	1,406,789

Emission reductions 1,406,789t CO_{2e}

Kuala Lumpur, 2011-08-26

Essen, 2011-08-26




Cheong, Chun Yuen (Robert)
TÜV NORD JI/CDM Certification Program
Verification Team Leader

Schubert, Jochen
TÜV NORD JI/CDM Certification Program
Senior Assessor

5 REFERENCES

Table 5-1: Documents provided by the project participant

Reference	Document
MR	Monitoring Report Version 1.0 dated 2011-05-24 Monitoring Report Version 2.0 dated 2011-08-26
Project Implementation	
/A1/	Project Implementation Schedule undated
/A2/	Plant Overview undated Project Layout drawing for WW1 and WW2 dated 2009-07-16 Unit 2 Production wells undated Wells Layout Drawing date missing
/A3/	Well locations- Well Inventory undated
/A4/	Energy Sales Contract Original & Amendment dated 1994 WDA J-0225 Purchase Contract Tubular dated 2005-07-11 WW Joint Operation Contract dated 1994
/A5/	Construction and P&I Drawing for WW1 and WW2 various dates
/A6/	Declaration on the Ownership of the Greenhouse Gas Emission dated 2011-06-27
/A7/	EPC Contract for SAGS and Power Plant dated 1994-12-02
Regulations & Approvals	
/B1/	Certificate to Operate for the Power Plant – English & Indonesia dated 2009-02-18
Equipments & Instruments	
/EI1/	List of auxiliary equipments (WW - EPC exhibits A to D)
/EI2/	Generator Name Plate undated
/EI3/	Turbine Name Plate undated
/EI4/	Emergency Diesel Genset Specification dated 1998-05-05
/EI5/	Fire Pump Specification dated 1999-04-27
/EI6/	WW2-list monitoring devices 12 Aug 2011(equipment list)

Reference	Document
	WW2-list monitoring devices 15 August 2011 (calibrator list)
/E17/	Multivariable Transmitter Yokogawa dated 2010-03
/E18/	Rosemount 2088G dated 2009-04
Generation	
/D1/	Shutdown and Downtime Records
/D3/	Monthly Report 2009 Monthly Report 2010
/D4/	Hourly Generation Report 2009 Hourly Generation Report 2010
ER Calculations	
/E1/	VER Spreadsheet WW2 dated 2011-07-04 with error calculation
/E2/	VER - monthly data consolidation
/E3/	Diesel Consumption and Running Hours Records 2009-03-05 to 2010-01-28
/E4/	Error Calculation list
Calibration	
/C1/	Injection Well Flow FIT984 Calibration Report 04 dated 2009-07-22 Injection well flow FIT984 Calibration Report 04 dated 2009-07-22 Injection well pressure PIT918 Calibration Report 04 dated 2009-06-29 Injection well pressure PIT918_Calibration Report 04_dated 2009-06-29
/C2/	Turbine main steam pressure A2-PIT-0106 Calibration Report 04 dated 2009-10-15 Turbine main steam flow A2-FIT-0106 Calibration Report 03 dated 2009-04-14
/C3/	MBB1 Wellhead Pressure Transmitter PIT2302 Calibration Report 03 dated 2009-04-13 MBB1 Wellhead Pressure Transmitter PIT2302 Calibration Report 04 dated 2009-10-14 MBB1 Wellhead Pressure Transmitter PIT2302 Calibration Report 03 dated 2009-04-13 MBB1 Wellhead Pressure Transmitter PIT2302 Calibration Report 04 dated 2009-10-14
/C4/	MBA5 Wellhead flow FIT2505 Calibration Report 05 dated 2010-01-04

Reference	Document
/IC5/	MBA1 Wellhead Pressure Transmitter PIT2502 Calibration Report 03 dated 2009-04-14 MBA1 Wellhead Pressure Transmitter PIT2502 Calibration Report 04 dated 2009-11-16
/IC6/	MBA2 Wellhead Pressure Transmitter PIT2504 Calibration Report 03 dated 2009-04-14
/IC7/	MBA3 Wellhead Pressure Transmitter PIT2506 Calibration Report 03 dated 2009-04-14
/IC8/	MBA4 Wellhead Pressure Transmitter PIT2508 Calibration Report 03 dated 2009-04-13
/IC9/	MBA5 Wellhead Pressure Transmitter PIT2510 Calibration Report 03 dated 2009-04-14
/IC10/	MBD5 Wellhead Flow FIT501 Calibration Report 04 dated 2009-09-09 MBD5 wellhead Pressure PIT506 Calibration Report 04 dated 2009-09-22
/IC11/	1. Main Meter Unit 1 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2008-10-10 2. Check meter Unit 1 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2009-01-12 3. Check meter Unit1 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2011-01-06
/IC12/	1. Main Meter Unit 2 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2008-10-10 2. Check meter Unit 2 calibration certificate issued by Direktorat Metrologi for calibration conducted on 2008-10-24 3. Check meter Unit 2 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2009-08-24 4. Check meter Unit 2 calibration certificate issued by Laboratorium Kalibrasi for calibration conducted on 2011-01-06
Procedures	
/IP1/	FIT Routine & Venture Inspection Procedures various documents and dates
/IP2/	Utilities Procedures various documents and dates Routine Operation Procedures various documents and dates
/IP3/	Metering System Operation, Maintenance and Calibration dated 2009-04-19, 2009-07
/IP4/	QA/QC Laboratory Analysis & Utilities Procedures various documents and dates
/IP5/	Gas Sampling Procedures various documents and dates

Reference	Document
/P6/	SOPs various documents and dares
Gas Tests Reports	
TR	Gas Analysis for year 2009, 2010 & 2011
/LGA/	Lab Gas Analysis summary
Training	
/T1/	Turbine & Condenser vdated 2008-09-12 & 2008-09-13
/T2/	Steam Above Ground System (SAGS) dated 2008-09-08 to 2009-09-11
/T3/	Control & Instrumentation dated 2008-09-19
/T4/	Calibration various dates
/T5/	AVR dated 2008-12-18
/T6/	Generator & Electrical dated 2008-09-15 and 2008-09-16
/T7/	Gas Removal System and Hot well Pump dated 2008-09-18
/T8/	Monitoring Plan dated 2009-03-24
/T9	Plant Start-up and Shutdown dated 2008-09-20
/T10/	Metering System dated 2008-11-13 2008-11-20 and 2009-01-12
/T11/	Fire Fighting dated 2009-01-08
/T12/	OJT (On-the-Job) various dates
/T13/	Training Plan dated 2008-09-08

Table 5-2: Background investigation and assessment documents

Reference	Document
/ACM2/	ACM0002. Version 9 –Consolidated methodology for grid-connected electricity generation from renewable sources
/HCA/	Host Country approval letter dated 2009-05-08

Reference	Document
/IPCC/	2006 IPCC Guidelines for National Greenhouse Gas Inventories
/MOC/	Modalities of Communication dated 2009-12-07
/PD/	VCS PD version 02 dated 2011-07-04
/PDD/	Registered Project Design Document version 03 dated 2010-12-02
/VCS/	Voluntary Carbon Standard 2007.1
/VR/	Validation Report dated 2010-12-02
/VVM/	Validation and Verification Manual (Version 1.2 ;EB 55)

Table 5-3: Websites used

Reference	Link	Organisation
/cd4cdm/	www.cd4cdm.org	UNEP Riso Centre
/ipcc/	www.ipcc-nggip.iges.or.jp	IPCC publications
/vcs/	www.v-c-s.org	VCSA
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 5-4: List of interviewed persons

Reference	Mol ¹		Name	Organisation / Function
/IM01/	V	☒ Mr. ☐ Ms.	Richard Kotten	Sindicatum Capital Carbon Ltd./ Monitoring Officer
	V	☒ Mr. ☐ Ms.	Stefanus	Sindicatum Capital Carbon Ltd./ Associate
	V	☒ Mr. ☐ Ms	Sven Starckx	Sindicatum Capital Carbon Ltd./ Sr. Technical Advisor
	V	☐ Mr. ☒ Ms	Melanie Tantri	Sindicatum Capital Carbon Ltd./ Senior Associate

Reference	Moi ¹		Name	Organisation / Function
/IM02/	V	☒ Mr. ☐ Ms	Zerry Antro	Star Energy / Plant Superintendent
	V	☐ Mr. ☒ Ms	Dea Putri NF	Star Energy / Production Dispatch
		☒ Mr. ☐ Ms	Anton. P	Star Energy / Production Engineer
		☐ Mr. ☒ Ms	Intan. K	Star Energy / DCS Technician
		☒ Mr. ☐ Ms	Merzani Irmadhiary	Star Energy / Operation Services
		☒ Mr. ☐ Ms	Heribertus Dwiudha	Star Energy / Plant Manager

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