

VERIFICATION REPORT “CAPACITY UPGRADE OF GUNUNG SALAK GEOTHERMAL POWER PLANT PROJECT, INDONESIA”



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Document Prepared By RINA Services S.p.A. (RINA)

Project Title	Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia
Version	2.0Aa
Report ID	2017 IQ MD 36

Report Title	Verification report “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”
Client	South Pole Carbon Asset Management Ltd.
Pages	32
Date of Issue	30-July-2018
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Summary:

RINA Services S.p.A. (RINA), commissioned by South Pole Carbon Asset Management Ltd has verified the greenhouse gas emission reductions reported for the project activity “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project” in Indonesia, VCS project ID 144, for the period 01/04/2016 to 30/06/2017. The verification includes confirming the implementation of the monitoring plan of the registered VCS PD (Project ID 144) and the application of the monitoring methodology as per ACM0002, version 17 dated 13/05/2016. A site visit was conducted to verify the data submitted in the monitoring report.

The project activity comprises of a capacity upgrade of Gunung Salak Geothermal Power Plant from 3 x 55 MW to 3 x 60 MW. The additional installed capacity of 15 MW at Gunung Salak Geothermal power plant generates and supplies an average of 213,959 MWh p.a. of electricity to the connected JAMALI Grid. The project is owned and developed by PT. Indonesia Power, a subsidiary company of PT. PLN (Persero), a state-owned electricity company. The proposed project will increase the utilization of renewable energy sources, in this case geothermal energy, by modifying turbines and steam gas ejectors. Steam for the project is provided by Chevron Geothermal Indonesia under an Energy Sales Contract (ESC) between PT. PLN (Persero) Pertamina, a state-owned oil and gas company, and Unocal Geothermal of Indonesia (Though today, Gunung Salak geothermal fields are owned by Star Energy Geothermal Salak Ltd).

During this verification 01 Clarification Requests (CLs) was identified related to the monitoring, implementation or operations of the proposed VCS project activity (Monitoring Report version 2.0 of 08/09/2017) in relation to all relevant VCS requirements v 3.7 for the project activity and the applied baseline and monitoring methodology; these findings have been discussed in appendix B of this report.

In conclusion, it is RINA’s opinion that the project activity “ Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”, VCS project ID 144, meets all relevant requirements for VCS standard and guidelines and correctly applies the baseline and monitoring methodology ACM0002, version 17.0, “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” of 13/05/2016. The monitoring system is in place and the emission reductions are calculated without material misstatement. Hence, RINA is able to certify that the emission reductions from the project during the monitoring period 01/04/2016 to 30/06/2017 amount to 139,784 tCO₂e.

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1 INTRODUCTION

1.1 Objective

RINA is commissioned by “South Pole Carbon Asset Management Ltd.” to perform an independent verification of its VCS project, “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project” in Indonesia”, already registered under VCS with Project ID.144 for the reported GHG emission reductions for the given monitoring period 01/04/2016 to 30/06/2017. The VCS projects must undergo independent third party verification and certification of emission reductions as the basis for issuance of Voluntary Emission Reductions (VERs/VCUs).

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the project description (PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- 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 scope is:

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

The project is assessed against the requirements of VCS version 3.7 and related rules and guidance. RINA has, based on the recommendations in the latest version of CDM Validation and Verification Manual, and employed a rule-based approach (as criteria) in the verification, focusing on the identification of significant reporting rules and the reliability of project monitoring.

Verification is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

1.3 Level of Assurance

The draft final verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent RINA instructions, with reasonable level of assurance.

The verification team and the technical reviewers consist of the following personnel.

Role	Last Name	First Name	Country
Team Leader, Technical Expert	Menon	Rekha	India
Verifier	Buragohain	Champak	India
Technical reviewer	Carvalho	Thaís	Brazil

1.4 Summary Description of the Project

The project activity comprises of a capacity upgrade of Gunung Salak Geothermal Power Plant from 3 x 55 MW to 3 x 60 MW. The additional installed capacity of 15 MW at Gunung Salak Geothermal power plant generates and supplies an average of 213,959 MWh p.a. of electricity to the connected JAMALI Grid. The project is owned and developed by PT. Indonesia Power, a subsidiary company of PT. PLN (Persero), a state-owned electricity company. The proposed project will increase the utilization of renewable energy sources, in this case geothermal energy, by modifying turbines and steam gas ejectors. Steam for the project is provided by Chevron Geothermal Indonesia under an Energy Sales Contract (ESC) between PT. PLN (Persero) Pertamina, a state-owned oil and gas company, and Unocal Geothermal of Indonesia (Unocal Geothermal Indonesia was acquired by Chevron Geothermal Indonesia Ltd. Though today, Gunung Salak geothermal fields are owned by Star Energy Geothermal Salak Ltd.).

The project site is located in Awibengkok-Ratu area of Gunung Salak Geothermal field surrounded by Halimun Salak national park, which is administratively part of Bogor District and Sukabumi District, West Java Province, Indonesia.

Project Participant(s)	PT. Indonesia Power South Pole Carbon Asset Management Ltd. (as carbon credit buyer)		
Project Title	Capacity Upgrade of Gunung Salak Geothermal Power Plant Project		
Location of the project	The project site is located in Awibengkok--Ratu area of Gunung Salak Geothermal field surrounded by Halimun Salak national park, which is administratively part of Bogor District and Sukabumi District, West Java Province, Indonesia		
Methodology(ies)	ACM0002, version 17.0, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" of 13/05/2016		
Sectoral Scope(s)	01	Technical Area(s)	1.2
Registered PDD	version 2.2 of 14/12/2017 /02/		

Starting date of the crediting period	2nd crediting period:01/04/2016
Project's crediting period	01/04/2016 to 31/03/2026
Project documentation link	VCS database: http://www.vcsprojectdatabase.org/#/project_details/144

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification was conducted using RINA procedures in line with the requirements specified in the VCS Requirements, i.e. VCS Program Guide, VCS Version 3 (v3.7) of 21/06/2017, and VCS Standard, VCS Version 3 (v3.7) of 21/06/2017. The GHG emission reductions are on the basis of the approved Baseline and monitoring methodology “ACM0002”, “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, version 17.0 of 13/05/2016.

The verification consisted of the following three phases

- Document review;
- On-site assessment including Interviews and Site Inspections;
- Resolution of Any Material Discrepancy and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

2.2 Document Review

The monitoring report (MR), version 2.0 of 08/09/2017, version 3.0 of 03/01/2018 and version 4.0 of 23/07/2018 **/01/**, the emission reduction calculations spreadsheet (170908_Gunung Salak_ER calc_ver2_Isa.xlsx) version 01 of 08/09/2017 and ER spread sheets (171101_Gunung Salak_ER calc_ver3_Isa.xlsx), version 02 submitted on 03/01/2018 **/03/**, were assessed as part of the verification. In addition the revised Project Design Document, version 2.2 of 14/12/2017 **/02/** in particular the baseline estimations and the monitoring plan for the project were reviewed.

The following table lists the documentation that was reviewed during the verification

/01/	South Pole Carbon Asset Management Ltd: VCS monitoring report for the project activity “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project”, version 2.0 of 08/09/2017, version 3.0 of 03/01/2018 and version 4.0 of 23/07/2018.
/02/	PT Indonesia Power: VCS project description for project activity “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project in Indonesia, version 2.0 of 28/09/2017 PT Indonesia Power: Revised VCS-PD of version 2.2 of 14/12/2017
/03/	South Pole Carbon Asset Management Ltd: Emission Reduction spread sheet titled (170908_Gunung Salak_ER calc_ver2_Isa.xlsx) version 01 of 08/09/2017 and and ER spread sheets (171101_Gunung Salak_ER calc_ver3_Isa.xlsx), version 02 submitted on 03/01/2018

/04/	VCS: VCS Program Guide, VCS Version 3.7 of 21/06/2017
/05/	VCS: VCS Standard, VCS Version 3.7 of 21/06/2017
/06/	CDM Executive Board: Approved consolidated baseline and monitoring methodology "ACM0002", "Consolidated methodology for grid-connected electricity generation from renewable sources", version 17.0 of 13/05/2016
/07/	VCS: Monitoring report form (MONITORING REPORT: VCS Version 3) , version 03.4 dated 19/10/2016
/08/	RINA Servces SpA: Re validation report 17IQMD37, version 1.1 Aa of 06/11/2017
/09/	PT. PLN (Persero) certification services: Operational licence for unit -1 issued on 05/08/2011 , valid until 04/08/2016 Operational licence for unit -2 issued on 15/08/2016 , valid until 15/08/2021 Operational licence for unit -3 issued on 07/09/2011 , valid until 06/09/2016
/10/	Energy Sales Contract executed among PT PLN (Persero), Perusahaan Pertambangan Minyak dan Gas Bumi Negara, and Unocal Geothermal of Indonesia Ltd. dated 16/11/1994 for steam purchase contract that the Gunung Salak Geothermal Project must be available to supply electricity valid until 30/11/2040
/11/	PT. PLN (Persero) : Monthly Energy generation report issued for the monitoring period from 01/04/2016 to 30/06/2017
/12/	PT. Indonesia Power: Invoice copy of the sales of electricity to PT. PLN (Persero) from 01/04/2016 to 30/06/2017
/13/	Hakit (Indonesian Society of Power Genration Professionals): Training certificates of Mr. Ajib, dated 30/05/2013, Mr. Alexander dated 01/10/2012 and Mr. Lisnandar dated 01/10/2012.
/14/	Provincial Government of West Java; Regional Environmental Control Agency: Approval for supplement environment management plan/environmental monitoring plan for 3*60 MW geothermal power plant dated 23/07/2007
/15/	PT. Geoservices Environmental Laboratories: NCG analysis for period 01/04/2016 to 30/06/2017
/16/	Laboratorium Kalibrasi ,PT. PLN (Persero): Calibration certificates for Energy meters Unit-1 main meter (PT 0806A119-01): dated 03/06/2014 and 29/07/2016 Unit-2 main meter (PT 0806A118-01): dated 03/06/2014 and 29/07/2016 Unit-3 main meter (MT 1006A500-01): dated 03/06/2014 and 29/07/2016 Unit-1 Back up meter (MT-1009A635-01):dated 05/03/2015 Unit-2 Back up meter (PT-0802A471-01):dated 05/03/2015 Unit-3 Back up meter (PT-0802A475-01):dated 05/03/2015
/17/	PT.Indonesia Power: calibration certificates for steam flow meters. Unit-1: dated 13/07/2015 and 13/07/2016 Unit-2: dated 13/07/2015 and 13/07/2016 Unit-3: dated 14/07/2015 and 13/07/2016
/18/	Website: http://database.v-c-s.org/rina-spa VCS: List of sectoral scopes RINA S.p.A is accredited Language: English Retrieved on: 31/08/2017
/19/	PT.Indonesia Power: Log book details of the steam flow for the monitoring period from 01/04/2016 to 30/06/2017
/20/	PT.Suplintama Majusemestra: Calibration certificates for steam flow meters Unit-1: dated 27/12/2016, 30/05/2017

	Unit-2:dated 29/08/2016, 30/05/2017
/21/	PT.Suplintama Majusemesta: Testing and commissioning report for unit -1 dated 27/12/2016 Testing and commissioning report for unit-2 dated 29/08/2016
/22/	Minister of Energy and Mineral Resources-Republic of Indonesia: Grid code of electricity power system of Java-Madura-Bali (Jamali), 03/2007
/23/	Laboratorium Kalibrasi: calibration certificates of back up meters Unit-1, Unite-2 and unit3 is dated 05/03/2015
/24/	PT PLN (PERSERO) : Plant operation worthiness certificate for unit 1 , dated 13/09/2017 and for unit 3, dated 12/10/2017

2.3 Interviews

	Date	Name and Role	Organization	Topic
/a/	31/08/2017	Leonardo Sidabalok- Project Manager	South Pole Carbon Asset Management Ltd.	Monitoring report, emission reduction calculations, records of monitoring parameters, VCS rules, application of methodology etc.
/b/	31/08/2017	Suwipa Rukwongtrakool- Project Manager		
/c/	31/08/2017	Mr. Henrey Octavianus (Senior Operation Supervisor)	PT. Indonesia Power	Technical aspects of the project activity. Operational life, environmental aspects etc.
/d/	31/08/2017	Mrs. Anna (Emission Reduction expert)		Operational details of the project, management structure, legal compliance, health, safety and environmental aspects, data monitoring and recording procedure, safety practices, production controls, internal audits etc.

2.4 Site Inspections

On 31/08/2017, RINA visited the project site in Awibengkong-Ratu area of Gunung Salak Geothermal field Surrounded by Halimun Salak national park, which is administratively part of Bogor District and Sukabumi District, West Java Province of Indonesia to check the technology employed and monitoring arrangement as part of project activity. During the on-site assessment of the project RINA assessed the implementation and operation of the proposed project activity, accessed the installed equipment directly, interviewed key personnel of the plant to confirm the operation information, the commissioning of the units (1, 2 and 3), the GHG Programs undertaken.

2.5 Resolution of Findings

The objective of this phase of the verification is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the project description. To guarantee transparency any findings raised during the verification are incorporated in the Appendix A to this report. A corrective action request (CAR) is raised if one of the following occurs:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The VCS Version 3.7 requirements have not been met.
- There is a risk that the emission reductions cannot be monitored or calculated.

A clarification request (CR) is raised if information is insufficient or not clear enough to determine whether the applicable VCS Version 3.7 requirements have been met.

2.5.1 Forward Action Requests

Based on the review of registered CDM validation report /08/, 1 FAR was raised during the validation (Renewal of crediting period).

FAR 1

During validation the inspection for issuing operational license of unit 1 and unit 3 was pending. Hence, FAR is raised to verify the operational license of two turbines (Unit 1 with serial no: 2118 (60 MW) and unit 3 with serial number: 5626 (60 MW)) during verification.

The operation licence of unit 1 and unite 3 provided by the client /24/ checked and accepted by RINA. FAR 1 is closed.

No FARs raised during this verification.

2.6 Eligibility for Validation Activities

RINA is accredited for validating and verifying GHG emission reduction project activities falling under sectoral scope 01 Energy industries (renewable/non-renewable sources) /18/.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

N/A.

3.2 Methodology Deviations

N/A.

3.3 Project Description Deviations

Deviation of Monitoring Plan for parameter $EG_{facility,y}$ due to applying Guidelines for assessing compliance with the calibration frequency requirements, (CDM VVS, Version 09.0 para 395 (a)). As per validated VCS PD, PP must monitor parameter $EG_{facility,y}$ and SOP for electricity metering scheme, revenue meter calibration should be conducted every 2 years. However, there was a calibration delay for revenue meter of Unit #1, Unit #2, and Unit #3 on 03/06/2016 until 29/07/2016. It is noted that PP has calculated error for the delayed calibration as per Guidelines for assessing compliance with the calibration frequency requirements, (CDM VVS, Version 09.0 para 395 (a)) states that: "Applying the maximum

permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error;”. The same was accepted by RINA.

3.4 Grouped Project

The verification team confirms that the project is not a grouped project and hence this is not applicable to the project activity.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

RINA confirms that the project implementation is in line with the description in registered VCS-PD /02/ by site visit. RINA performed a physical site visit on 31/08/2017 to verify the actual implementation of the project against the description in its registered VCS-PD /02/ and found that all the units 1, 2 and 3 are in operation and the installed capacity of each unit is 60 MW, which is in line with the registered VCS-DD /02/. The capacity of the turbines, generators and DG sets were crosschecked with the nameplates. The model of the electrical generator, steam turbine capacity and the equipment's installed were checked with the technical specification provided by the PP and the same is as per the registered VCS-PD. RINA further checked the operation licences of each unit and noted that the same are valid until August and September 2016, which covers the respective monitoring period /09/. The description in MR /01/ is also consistent with the actual implementation confirmed as above. Therefore RINA confirmed that there is no material discrepancy between the actual project information and the project description.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

According to the methodology ACM0002, version 17.0, the baseline emissions are calculated as follows:

Baseline Emissions:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical}); \text{until } DATE_{BaselineRetrofit}$$

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plants/units to the grid in year y (MWh/yr)

$EG_{\text{historical}}$ = Annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr). This is fixed ex-ante for the entire crediting period.

$\sigma_{\text{historical}}$ = Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr). This is fixed ex-ante for the entire crediting period.

$DATE_{\text{BaselineRetrofit}}$ = Point in time when the existing equipment would need to be replaced in the absence of the project activity (date). This only applies to retrofit or replacement projects

In case $EG_{\text{facility},y} < (EG_{\text{historical}} + \sigma_{\text{historical}})$ in a year y then $EG_{PJ,y} = 0$

$EF_{\text{grid,CM},y}$ is updated and fixed for the entire crediting period to be 0.946 tCO₂/MWh.

Project Emissions:

Project emission applicable for the project activity as per the applied methodology is

$$PE_y = PE_{GP,y}$$

Where,

PE_y = Project emissions in year y (t CO₂e/yr)

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO₂e/yr)

$$PE_{GP,y} = PE_{\text{dry or flash steam},y} + PE_{\text{binary},y}$$

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO₂e/yr)

$PE_{\text{dry or flash steam},y}$ = Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year y (t CO₂e/yr)

$PE_{\text{binary},y}$ = Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year y (t CO₂e/yr)

The project is the operation of flash steam geothermal power plant, so $PE_{\text{binary},y} = 0$

$PE_{\text{dry or flash steam},y} = (w_{\text{steam},\text{CO}_2,y} + w_{\text{steam},\text{CH}_4,y} \times GWP_{\text{CH}_4}) \times M_{\text{steam},y}$

$w_{\text{steam},\text{CO}_2,y}$ = Average mass fraction of CO₂ in the produced steam in year y (t CO₂/t steam)

$w_{\text{steam},\text{CH}_4,y}$ = Average mass fraction of CH₄ in the produced steam in year y (t CH₄/t steam)

GWP_{CH_4} = Global warming potential of CH₄ valid for the relevant commitment period (t CO₂e/t CH₄)

$M_{\text{steam},y}$ = Quantity of steam produced in year y (t steam/yr)

Leakage emissions are zero as per the applied methodology.

The data presented in the monitoring report /01/ and emission reduction worksheet /03/ were assessed by reviewing in detail project documentation, collection of monitored data, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. Sufficient evidences were presented and verified by RINA for the reported emission reductions as listed above.

RINA confirms:

- All the data and parameters were monitored in accordance with the registered PD;
- The data reported in the emission reductions calculation spreadsheet were cross-checked with the raw data and the values reported in the monitoring report were verified against the data presented in the spreadsheet;
- The calculation of emission reductions have been carried out in accordance with the formulae and methods described in the registered PD, the applied methodology and methodological tool;
- Emission factor and default values have been applied in the calculation in accordance with the registered PDD.

Parameters available at the time of validation:

DATA/PARAMETER	Source of data	Reported value for the project period	Assessment/Observation
EF _{OM,y} is the average operating margin CO ₂ emission	Directorate General of Electricity - Ministry	0.786 tCO ₂ /MWh	The verification team has verified the value from the registered VCS-DD/02/ and

factor of power plant connected to the JAMALI electricity grid in 3 recent years available data, calculated using average OM method for each year in which the project generation occurs. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2013, 2014 and 2015 data.	of Energy and Mineral Resources (MEMR), Republic of Indonesia		validation report /08/ and found to be correct and consistent. Hence accepted.
EF _{BM,y} is the build margin CO ₂ emission factor of power plants in the sample group 'm' connected to the JAMALI electricity grid in year 'y'. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2015 data	Directorate General of Electricity - Ministry of Energy and Mineral Resources (MEMR), Republic of Indonesia	0.999 tCO ₂ /MWh	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to be correct and consistent. Hence accepted.
EF _{CM,y} is the combined margin CO ₂ emission factor of power plants connected to the JAMALI	Calculated based on the above mentioned values of EF _{OM,y} and EF _{BM,y}	0.946 tCO ₂ /MWh	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to

electricity grid in year 'y', calculated ex-ante based on the $w_{OM} = 0.25$ and $w_{BM} = 0.75$ for the second and third crediting period			be correct and consistent. Hence accepted.												
$EG_{\text{historical}}$ Average net electricity delivered to the grid before the project activity until $DATE_{\text{BaselineRetrofit}}$	Project Owner-PLN revenue meter (electricity sales)	<table><tr><td></td><td>$EG_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)</td></tr><tr><td>Unit 1</td><td>393,791</td></tr><tr><td>Unit 2</td><td>380,210</td></tr><tr><td>Unit 3</td><td>391,623</td></tr><tr><td>Total</td><td>1,165,624</td></tr></table>		$EG_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)	Unit 1	393,791	Unit 2	380,210	Unit 3	391,623	Total	1,165,624	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to be correct and consistent. Hence accepted.		
	$EG_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)														
Unit 1	393,791														
Unit 2	380,210														
Unit 3	391,623														
Total	1,165,624														
$\sigma_{\text{historical}}$ Standard deviation of average net electricity delivered to the grid before the project activity until $DATE_{\text{BaselineRetrofit}}$	Statistical calculation of standard deviation of $EG_{\text{historical}}$	<table><tr><td></td><td>$\sigma_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)</td></tr><tr><td>Unit 1</td><td>41,556</td></tr><tr><td>Unit 2</td><td>39,743</td></tr><tr><td>Unit 3</td><td>51,982</td></tr><tr><td>Total</td><td>133,281</td></tr></table>		$\sigma_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)	Unit 1	41,556	Unit 2	39,743	Unit 3	51,982	Total	133,281	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to be correct and consistent. Hence accepted.		
	$\sigma_{\text{historical}}$ until $DATE_{\text{BaselineRetrofit}}$ (MWh)														
Unit 1	41,556														
Unit 2	39,743														
Unit 3	51,982														
Total	133,281														
$DATE_{\text{BaselineRetrofit}}$ Point in time when the existing equipment would need to be replaced in the absence of the project activity	Considering the Energy Sales Contract (ESC) for steam purchase is upto 2040 which results a 46 years of technical life of the project from commissioning /10/. Also, as per Geothermal energy	<table><tr><td></td><td>Commissioning Date</td><td>$DATE_{\text{BaselineRetrofit}}$</td></tr><tr><td>Unit 1</td><td>12 March 1994</td><td>12 March 2040</td></tr><tr><td>Unit 2</td><td>12 June 1994</td><td>12 June 2040</td></tr><tr><td>Unit 3</td><td>16 July 1997</td><td>16 July 2043</td></tr></table>		Commissioning Date	$DATE_{\text{BaselineRetrofit}}$	Unit 1	12 March 1994	12 March 2040	Unit 2	12 June 1994	12 June 2040	Unit 3	16 July 1997	16 July 2043	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to be correct and consistent. Hence accepted.
	Commissioning Date	$DATE_{\text{BaselineRetrofit}}$													
Unit 1	12 March 1994	12 March 2040													
Unit 2	12 June 1994	12 June 2040													
Unit 3	16 July 1997	16 July 2043													

	associations the life of geothermal plant is around 30-50 years		
GWP _{CH4} Global warming potential of methane, valid for the relevant commitment period in tCO ₂ /tCH ₄	Default value for the second commitment period = 25 tCO ₂ /tCH ₄ (Updated required for source of global warming potentials from the IPCC's Second Assessment Report to the IPCC's Fourth Assessment Report)	25	The verification team has verified the value from the registered VCS-PD/02/ and validation report /08/ and found to be correct and consistent. Hence accepted.

Data and parameters monitored ex-post:

The following parameters are monitored :

Data/Parameter	M _{Steam,y}		
Data Unit	Tonnes		
Description	Quantity of steam produced during the year 'y'		
Source of data to be used	Project Owner-main steam line flow meter /19/		
Value of monitored parameter for the monitoring period		01/04/2016 to 31/12/2016	01/01/2017 to 30/06/2017
	Unit-1	2,899,654.89	2,033,459.00
	Unit-2	2,799,774.53	2,088,628.60

	<table><tr><td>Unit-3</td><td>2,728,387.30</td><td>1,300,925.50</td></tr><tr><td>Total</td><td>8,427,816.72</td><td>5,423,013.10</td></tr></table>	Unit-3	2,728,387.30	1,300,925.50	Total	8,427,816.72	5,423,013.10
Unit-3	2,728,387.30	1,300,925.50					
Total	8,427,816.72	5,423,013.10					
	RINA verified the quantity of steam from the three units with the hourly log sheets recorded by the PP /19/. The same was found to be consistent with the ER spread sheets /03/.						
Monitoring equipment	Steam flow meter	Se.No	Calibration dates	Calibration entity	Does it cover the MP		
	Unit #1	H400C50109D	13/07/2015 and 13/07/2016	PT. Indonesia Power	Yes /17/		
		Meter no H400C50109D , replaced with 4987429-2 on 27/12/2016. Confirmed the same with commissioning certificate /21/	27/12/2016 30/05/2017	PT.Suplintama Majusemesta	Yes /20/		
	Unit #2	1594052708	13/07/2015 and 13/07/2016	PT. Indonesia Power	Yes /17/		
		Meter no 1594052708, replaced with 4987429-1 on 29/08/2016. Confirmed the same with commissioning certificate /21/	29/08/2016 30/05/2017	PT.Suplintama Majusemesta	Yes /20/		
	Unit #3	D404420109D	14/07/2015 and 13/07/2016	PT. Indonesia Power	Yes /17/		
	Noted that the calibration of steam flow meters was performed by personnel from PT. Indonesia Power. RINA checked the credibility of the peronnel performing such calibration and noted that the three personnel are trained from Hakit (Indonesian Society of Power Genration Professionals) /13/ and the same was accepted by RINA.						

Accuracy of the monitoring equipment	0.25% & 2%																																																																		
Measuring/Reading/Recording frequency	In accordance with registered PD, the parameter is monitored continuously. The readings are recorded hourly and the values are aggregated annually.																																																																		
Calculation method (if applicable)	Specific Steam Consumption (SSC) calculation: $SSC = \frac{\text{Steam flowrate (t steam)}}{\text{Net power output of the plant (MWh)}}$ <table><thead><tr><th colspan="4">01/04/2016 - 31/12/2016</th></tr><tr><th></th><th>Steam flowrate (t steam)</th><th>Net power output of the plant (MWh)</th><th>SSC (t steam/MWh)</th></tr></thead><tbody><tr><td>Unit 1</td><td>2,899,654.89</td><td>352,803.91</td><td>8.219</td></tr><tr><td>Unit 2</td><td>2,799,774.53</td><td>330,173.52</td><td>8.480</td></tr><tr><td>Unit 3</td><td>2,728,387.30</td><td>367,375.88</td><td>7.427</td></tr></tbody></table> <table><thead><tr><th colspan="4">01/01/2017 - 30/06/2017</th></tr><tr><th></th><th>Steam flowrate (t steam)</th><th>Net power output of the plant (MWh)</th><th>SSC (t steam/MWh)</th></tr></thead><tbody><tr><td>Unit 1</td><td>2,033,459.00</td><td>234,906.68</td><td>8.656</td></tr><tr><td>Unit 2</td><td>2,088,628.60</td><td>241,979.23</td><td>8.631</td></tr><tr><td>Unit 3</td><td>1,300,925.50</td><td>172,317.51</td><td>7.550</td></tr></tbody></table> • Steam quantities based on underlying project boundary calculation is SSC times the attributable electricity generation to VCS Project ($EG_{PJ,y}$) <table><thead><tr><th colspan="4">01/04/2016 - 31/12/2016</th></tr><tr><th></th><th>SSC (t steam/MWh)</th><th>Attributable electricity generation to VCS Project ($EG_{PJ,y}$) (MWh)</th><th>Steam quantities based on underlying project boundary (t steam)</th></tr></thead><tbody><tr><td>Unit 1</td><td>8.219</td><td>28,731</td><td>236,329</td></tr><tr><td>Unit 2</td><td>8.480</td><td>35,794</td><td>305,230</td></tr><tr><td>Unit 3</td><td>7.427</td><td>31,378</td><td>231,172</td></tr></tbody></table> <table><thead><tr><th colspan="4">01/01/2017 - 30/06/2017</th></tr></thead></table>			01/04/2016 - 31/12/2016					Steam flowrate (t steam)	Net power output of the plant (MWh)	SSC (t steam/MWh)	Unit 1	2,899,654.89	352,803.91	8.219	Unit 2	2,799,774.53	330,173.52	8.480	Unit 3	2,728,387.30	367,375.88	7.427	01/01/2017 - 30/06/2017					Steam flowrate (t steam)	Net power output of the plant (MWh)	SSC (t steam/MWh)	Unit 1	2,033,459.00	234,906.68	8.656	Unit 2	2,088,628.60	241,979.23	8.631	Unit 3	1,300,925.50	172,317.51	7.550	01/04/2016 - 31/12/2016					SSC (t steam/MWh)	Attributable electricity generation to VCS Project ($EG_{PJ,y}$) (MWh)	Steam quantities based on underlying project boundary (t steam)	Unit 1	8.219	28,731	236,329	Unit 2	8.480	35,794	305,230	Unit 3	7.427	31,378	231,172	01/01/2017 - 30/06/2017			
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	SSC (t steam/MWh)	Attributable electricity generation to VCS Project (EG _{PJ,y}) (MWh)	Steam quantities based on underlying project boundary (t steam)
Unit 1	8.656	17,233	149,272
Unit 2	8.631	32,002	276,342
Unit 3	7.550	11,192	84,418
The calculations were checked with ER spread sheets and the same was found to be acceptable.			
Calibration			
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Meters will be calibrated according to the national standard of Java-Madura-Bali (JAMALI) Grid Code that described calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years /22/, or Standard Operational Procedures by PT. Indonesia Power or other documents which update or replace this national standard (whichever occurs earliest). It is in line with the calibration interval.		

Data/Parameter	$W_{\text{steam}, \text{CO}_2, y}$
Data Unit	t CO ₂ /t steam
Description	Average mass fraction of carbon dioxide in the produced steam (non-dimensional)
Source of data to be used	The Non-Condensable Gases (NCG) data taken from steam Sampling /15/ as prescribed in the Monitoring Methodology ACM0002 version 17.0
Value of monitored parameter for the monitoring period	As mentioned in the MR RINA verified the values provided in the ER sheets with the NCG analysis reports /15/ and the same is found to be consistent. The NCG sampling and analysis is performed every 3 months by Geoservices Ltd as per the methodology requirements ACM0002, version 17 /06/. However, in year 2016 (month of July, October, and November), and year 2017 (month of January until March) for Unit #1 and #2, in year 2016 (month of July, October, and November), and year 2017 (month of January until April) for Unit #3, when there were delays in NCG analysis. The same was accepted by RINA since it doesn't impact the ER calculations.

Monitoring equipment	Gas analysis using Gas Chromotography performed by external laboratory. Non-condensable gases sampling are carried out at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling phase steam only) as prescribed in the Monitoring Methodology ACM0002 version 17 /06/.
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Every 3 months
Calculation method (if applicable)	N/A
Calibration	
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	N/A

Data/Parameter	$W_{\text{steam,CH}_4,y}$
Data Unit	t CO ₄ /t steam
Description	Average mass fraction of methane in the produced steam (non-dimensional)
Source of data to be used	The Non-Condensable Gases (NCG) data taken from steam Sampling as prescribed in the Monitoring Methodology ACM0002 version 17.0
Value of monitored parameter for the monitoring period	As mentioned in the MR RINA verified the values provided in the ER sheets with the NCG analysis reports /15/ and the same is found to be consistent. The NCG sampling and analysis is performed every 3 months by PT. Geoservices as per the methodology requirements ACM0002, version 07 /06/.
Monitoring equipment	Gas analysis using Gas Chromotography performed by external laboratory. Non--condensable gases sampling are carried out at the steam field--power plant interface using ASTM Standard Practice E1675 for Sampling 2--Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling phase steam only) as prescribed in the Monitoring Methodology ACM0002 version 17 /06/.
Accuracy of the monitoring equipment	N/A
Measuring/Reading/Recording frequency	Recorded and reported once in every 3 months.
Calculation method (if applicable)	N/A
Calibration	
Calibration frequency/interval	N/A

Is the calibration interval in line with the monitoring plan of the PD?

Data/Parameter	EG _{facility,y}		
Data Unit	MWh		
Description	Net electricity delivered to the grid by the project activity		
Source of data to be used	Project Owner--PLN revenue meter (electricity sales) /11/		
Value of monitored parameter for the monitoring period	EG _{facility,y} (MWh)		
	01/04/2016 - 31/12/2016		01/01/2017 - 30/06/2017
	Unit 1	352,804	234,907
	Unit 2	330,174	241,979
	Unit 3	364,229	172,305
	Total	1,047,206	649,191
RINA verified the values provided in the ER sheets with the hourly readings recorded in the form of electronic files. This was also checked with the monthly generation readings signed by all parties (PT. Indonesia Power, Chevron Geothermal Salak, PT. PLN (Persero) and Pertamina Geothermal Energy) /11/ and further cross checked with electricity sale invoice /12/. The same was found to be consistent.			

Monitoring equipment	Revenue meter	Se.No	Calibration dates	Calibration entity	Does it cover the MP								
	Unit #1	MT-1009A635-01 (PLN owned back-up meter)	05/03/2015	Laboratorium Kalibrasi (Persero) (accredited govt lab)	Yes /23/								
		PT 0806A119-01 (main meter)	03/06/2014 and 29/07/2016	PT. PLN (Persero)	No /16/								
	Unit #2	PT-0802A471-01 (PLN owned Back up meter)	05/03/2015	PT. PLN (Persero)	Yes /23/								
		PT 0806A118-01 (main meter)	03/06/2014 and 29/07/2016	PT. PLN (Persero)	No /16/								
	Unit #3	PT-0802A475-01 (PLN owned back up meter)	05/03/2015	PT. PLN (Persero)	Yes /23/								
		MT 1006A500-01 (main meter)	03/06/2014 and 29/07/2016	PT. PLN (Persero)	No /16/								
	Noted that there was a calibration delay for revenue meter of Unit #1, Unit #2, and Unit #3 on 03/06/2016 until 29/07/2016. Based on the UNFCCC “CDM validation and verification standard for project activities” v.01.0, where described that a maximum permissible error is considered in BE _y calculation in case of the revenue meter calibration delay as per following formula: EG _{exp} (Electricity exported to the grid) = EG _{exp} x (100% - accuracy of revenue meter) = EG _{exp} x (100% - 0.2%) EG _{imp} (Electricity imported from the grid) = EG _{imp} x (100% + accuracy of revenue meter) = EG _{imp} x (100% + 0.2%) The same was checked against the ER spread sheets and found to be consistent. The following are the revised values.												
	<table><tr><td colspan="2">EG_{facility,y} (MWh)</td></tr><tr><td>01/04/2016 - 31/12/2016</td><td>01/01/2017 - 30/06/2017</td></tr><tr><td>Unit 1</td><td>352,656</td></tr><tr><td></td><td>234,907</td></tr></table>					EG _{facility,y} (MWh)		01/04/2016 - 31/12/2016	01/01/2017 - 30/06/2017	Unit 1	352,656		234,907
	EG _{facility,y} (MWh)												
01/04/2016 - 31/12/2016	01/01/2017 - 30/06/2017												
Unit 1	352,656												
	234,907												

		Unit 2	330,055	241,979
		Unit 3	364,082	172,305
		Total	1,046,793	649,191
		PP has calculated error for the delayed calibration as per Guidelines for assessing compliance with the calibration frequency requirements, (CDM VVS for project activities, Version 01.0 para 369 (a)) states that: “Applying the maximum permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error;”. The same was accepted by RINA.		
Accuracy of the monitoring equipment	0.2			
Measuring/Reading/Recording frequency	Measurement of electricity is continuous , the reading are recorded hourly, daily and reported annually. Also the monthly readings are recorded.			
Calculation method (if applicable)	$EG_{\text{facility}} = EG_{\text{exp}} - EG_{\text{imp}}$ $EG_{\text{PJ},y} = EG_{\text{facility},y} - (EG_{\text{historical}} + \sigma_{\text{historical}}); \text{until DATE}_{\text{BaselineRetrofit}}$ - In case $EG_{\text{facility},y} < (EG_{\text{historical}} + \sigma_{\text{historical}})$ in a year y then $EG_{\text{PJ},y} = 0$			
Calibration				
Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?	Revenue meters are calibrated once per 2 years according to the PPA signed between PT. Indonesia Power and PLN (load dispatcher) and the calibration frequency of PLN-owned back-up meter is every 5 years. This complies with the Minister of Energy and Mineral Resources Regulation No. 3 issued in 2007 (http://portal.djmbp.esdm.go.id/sijh/permen-esdm-03-2007.pdf) regarding Java-Madura-Bali (JAMALI) Grid Code that described calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years /22/			

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

As discussed in the above section the quantity of steam for all the three units is measured by means of calibrated meters. The values were cross checked with the hourly records of log books /19/. Average mass fraction of carbon dioxide and methane in the produced steam (non-dimensional) is checked with NCG analysis reports, recorded every 3 months by accredited third

party lab /15/. Quantity of net electricity generation supplied by the project plant/unit to the grid is measured with the help of revenue meters. Every month representatives from PT. PLN (Persero)'s take the reading of the main meter in the presence of representatives from Chevron and PT. Indonesia Power. The monthly electricity production reports present the net electricity export to grid /11/. Base on the monthly readings invoice is raised by PP /12/. The verification team has cross checked monthly electricity sale invoices against the net export and found to be in order.

During the site visit it was checked that all the monitored data is archived both physically as well as in electronic format. All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. Combined margin CO₂ emission factor for grid connected power generation in year y is taken as 0.946 tCO₂/MWh for the JAMALI Grid, Indonesia has been rightly applied in this monitoring period. The verification team has verified the value with registered VCS-PD and found to be correct and consistent /02/.

4.4 Non-Permanence Risk Analysis

N/A

5 SAFEGUARDS

5.1 No Net Harm

The project does not result to any net harm. This is evident from the EIA approval for the project activity and RKL/RPL (Environment Management Plan and Environment Monitoring Plan) for the additional installed capacity 3 x 5 MW. Appropriate measures has been taken as per letter No. 660.1/1801/I/2007 from the provincial Environmental Agency (*BPLHD*) of West Java to the project owner due capacity upgrade activity. Considering the mitigation controls planned as part of the project activity, EIA process and the contribution made by the project to the sustainable development of the local and national area, the project is expected to have an overall positive impact on the local and global environment.

As per host country requirement, EIA was conducted for the project activity and as per approval received from competent authority /14/ the appropriate measures were taken as part of Environment Management Plan and Environment Monitoring Plan. Considering the mitigation controls planned as part of the project activity, EIA process and the contribution made by the project to the sustainable development of the local and national area, the project is expected to have an overall positive impact on the local and global environment.

5.2 Local Stakeholder Consultation

The stakeholder consultation conducted by PP during registration of the project activity has been outlined in the updated VCS PD. During the site visit, RINA team interacted with stakeholders and no negative comments were received from the stakeholders during the meeting. They did not object to the project activity because the project will not negatively impact the surrounding environment or people.

6 VERIFICATION CONCLUSION

RINA Service Spa (RINA) has performed verification of the emission reductions reported for the project activity "Capacity Upgrade of Gunung Salak Geothermal Power Plant Project" in Indonesia", VCS Registry Project ID 144, for the period 01/04/2016 to 30/06/2017, with regard to

the relevant requirements for VCS activities. The project participants of the “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project” in Indonesia” project are responsible for:

- the preparation of greenhouses gas emissions data and the reported greenhouse gas emission reductions from the project on the basis set out in the monitoring plan contained in the registered project design document version version 2.2 of 14/12/2017
- the development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of greenhouse gas emission reductions of the project.

It is the responsibility of RINA to express an independent verification opinion about the project’s conformity with the requirements of VCS Standard version 3.7 and GHG program applied, on the reported greenhouse gas emission reductions from the project.

Based on documented evidence and corroborated by an on-site assessment RINA can confirm that:

- the project has been implemented and operated as per the registered VCS-PD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS Standard version 3.7 requirements;
- the monitoring is in place as per the applied baseline and monitoring methodology;
- the monitoring plan in the registered VCS-PD is as per the applied baseline and monitoring methodology.

It is RINA’s opinion that the GHG emission reduction stated in the monitoring report version 04 of 23/07/2018 for the “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” for the period 01/04/2016 to 30/06/2017 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology CDM Executive Board: ACM0002, version 17.0, “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” of 13/05/2016 and the monitoring plan contained in the registered VCS-PD.

Hence RINA is able to certify that the emission reduction from the project during the monitoring period 01/04/2016 to 30/06/2017 is amount to.

Verification period: From 01/04/2016 to 30/06/2017

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
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01/04/2016 - 31/12/2016	90,722	5,023	0	85,699
01/01/2017 - 30/06/2017	57,163	3,078	0	54,085
Total	147,885	8,101	0	139,784

APPENDIX A: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH ₄	Methane
CR	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MR	Monitoring Report
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document
PE	Project Emission
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services S.p.A.
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
VER	Voluntary Emission Reductions
VVS	Validation and Verification Standard

APPENDIX B: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUEST

Table 1. FAR from the previous validation

FAR ID	01	Section no.	2.5.1	Date: 02/01/2018
Description of FAR				
During validation the inspection for issuing operational license of unit 1 and unit 3 was pending. Hence, FAR is raised to verify the operational license of two turbines (Unit 1 with serial no: 2118 (60 MW) and unit 3 with serial number: 5626 (60 MW)) during verification				
Project participant response				Date: 03/01/2018
The operational license (Power plant operation worthiness certificate) of two turbines (Unit 1 with serial no: 2118 (60 MW) and unit 3 with serial number: 5626 (60 MW)) have been issued on September 13 th , 2017 and October 12 th , 2017 respectively.				
Documentation provided by project participant				
1. Gunung Salak_Unit #1 Power plant operation worthiness certificate (SLO) 2017.pdf 2. Gunung Salak_Unit #3 Power plant operation worthiness certificate (SLO) 2017.pdf				
DOE assessment				Date: 04/01/2018
Plant operation worthiness certificate issued by PT PLN (PERSERO) for unit 1 , dated 13/09/2017 and for unit 3, dated 12/10/2017 checked and accepted by RINA team. FAR 01 is closed.				

Table 2. CL from this verification

CL ID	01	Section no.	4.2	Date: 02/01/2018
Description of CL				

1. The combine margin grid emission factor values in the MR and ER spread sheets is not consistent with VCS-PD.
2. PP to clarify, if the steam flow meter for unit 2 is replaced in 2016. As per the previous verification report, the meter s.no was 1594052708.
3. It is mentioned that the steam flow meters will be calibrated according to the national standard of Java-Madura-Bali (JAMALI) Grid Code that described calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years, or Standard Operational Procedures by PT. Indonesia Power or other documents which update or replace this national standard (whichever occurs earliest. PP is requested to provide evidences/references for the same.
4. PP to clarify, NCG analysis are carried out every 4 months or 3 months because the MR states both. PP is further requested to clarify on how the Weight fraction of total gas (%) is calculated. This is not transparent from the ER spread sheets.
5. PLN owned back up meter details are not provided.
6. PP is requested to provide the evidence of the calibration frequency for PLN owned back meters and Revenue meters.

Project participant response**Date:** 03/01/2018

1. The combine margin grid emission factor values in the MR and ER spread sheets have been revised to make it consistent with VCS-PD.
2. The steam flowmeter for Unit 2 has been replaced on 29/08/2016. The previous steam flowmeter with s.no 1594052708 and the new one have been added in the revised MR.
3. The national standard of Java-Madura-Bali (JAMALI) Grid Code that described calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years (Section MC 4.0, para MC 4.1.1, page 103) has been provided.
4. MR has been revised for the NCG analysis are carried out every 3 months instead of every 4 months. The weight fraction of total gas (%) based on laboratory analysis result instead of calculation.
5. PLN owned back up meter details have been provided in the revised MR (Table 1. Technical details of monitoring instruments).
6. The evidence of the calibration frequency for PLN owned back-up meters and Revenue meters have been provided.

Documentation provided by project participant

1.	a)	171101_Gunung Salak_ER calc_ver3_Isa.xlsx
	b)	171121_Gunung Salak_Monitoring Report_ver3_Isa.docx
2.	a)	171121_Gunung Salak_Monitoring Report_ver3_Isa.docx
	b)	2015_07_Calibration main steam flow meter #2.pdf
	c)	2016_07_Calibration main steam flow meter #2.pdf
	d)	2016_08_Calibration main steam flow meter #2 (new steam flowmeter).pdf
	e)	2016_08_Commissioning Report Unit #2 (new steam flowmeter).pdf
	f)	2017_05_Calibration main steam flow meter #2 (new steam flowmeter).pdf
3.		2007_Grid Code Jamali_Minister of Energy and Mineral Resources (English).pdf
4.	a)	171121_Gunung Salak_Monitoring Report_ver3_Isa.docx
	b)	160315 GS_NCG analysis_1.pdf
5.		171121_Gunung Salak_Monitoring Report_ver3_Isa.docx
6.	a)	2014_Unit #1_Nett kWh Meter External Calibration Cert.pdf
	b)	2014_Unit #2_Nett kWh Meter External Calibration Cert.pdf
	c)	2014_Unit #3_Nett kWh Meter External Calibration Cert.pdf
	d)	2016_Unit #1_Nett kWh Meter External Calibration Cert.pdf
	e)	2016_Unit #2_Nett kWh Meter External Calibration Cert.pdf
	f)	2016_Unit #3_Nett kWh Meter External Calibration Cert.pdf
	g)	2015_MT-1009A635-01 (0453.21.BTND.058B-15.15) PLTP Salak Unit 1.pdf
	h)	2015_PT-0802A471-01 (0454.21.BTND.058B-15.15) PLTP Salak Unit 2.pdf
	i)	2015_PT-0802A475-01 (0455.21.BTND.058B-15.15) PLTP Salak Unit 3.pdf

DOE assessment	Date: 04/01/2018
1. Revised MR and ER spread sheets checked. Noted that the combined margin values have been made consistent with the PD. 2. It is confirmed that the steam flowmeter for Unit 2 has been replaced on 29/08/2016. The same was confirmed with the testing and commissioning certificate and calibration certificates. 3. The national standard of Java-Madura-Bali (JAMALI) Grid Code checked by RINA and it is confirmed that the calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years. 4. NCG analysis are carried out every 3 months, the same has been revised in the updated PD. It is checked the weight fraction of total gas (%) is taken directly from laboratory analysis and no calculation is involved. 5. Revenue meters are calibrated once per 2 years according to the PPA signed between PT. Indonesia Power and PLN (load dispatcher) and the calibration frequency of PLN-owned back-up meter is every 5 years. This complies with the Minister of Energy and Mineral Resources Regulation No. 3 issued in 2007 (http://portal.djmbp.esdm.go.id/sijh/permen-esdm-03-2007.pdf) regarding Java-Madura-Bali (JAMALI) Grid Code that described calibration period of installed meters in power plants connected to JAMALI Grid is once per 5 years 6. The evidence of the calibration frequency for PLN owned back-up meters and Revenue meters have been provided CL 01 is closed.	



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Rekha Menon

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITRP

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
 Scheme Leader
 Rita Valeroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

RINA Services S.p.A. è accreditato/riconosciuto da
 RINA Services S.p.A. is accredited /recognized by

UNFCCC	quali Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects
VCSA	per condurre la Validazione e la Verifica di Progetti VCS to carry out Validation and Verification of VCS Projects
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS to carry out Validation and Verification of GS Projects
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS to carry out Validation and Verification of SCS Reports
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR to carry out Validation and Verification of ACR projects
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB to carry out Validation and Verification of co-benefit CCB projects



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Champok Buragohain

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITR, Local Expert

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)
1	11/07/2017	Qualification update

Responsabile di schema
 Scheme Leader
 Laura SEVERINO

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

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CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

Si attesta che il sig./sig.ra:
 We declare that Mr/Mrs/Ms:

Thais De Lima Carvalho

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITRP

per le seguenti aree tecniche:
 for the following technical areas:

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation	1
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
 Scheme Leader
 Rita Valoroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

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