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Implementation of Verified Carbon Standard (VCS) Lahendong Unit 5&6 Geothermal Power Plant

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ABSTRACT

Pertamina Geothermal Energy (PGE), a subsidiary of PT. Pertamina (Persero) that has registered for five Clean Development Mechanism (CDM) Projects for Kamojang Unit 5 (30 MW), Karaha Unit 1 (30 MW), Ulubelu Unit 3&4 (110 MW), Lumut Balai Unit 1&2 (110 MW), Lumut Balai Unit 3&4 (110 MW), with total potential emission reduction about 2.058 Million ton CO2e/year. Due to the transition phase from Post Kyoto Protocol-2012 give impact in fluctuation of Certified Emission Reduction (CER) price, PGE attempted to develop and upgrade PGE's CDM Projects. PGE found an opportunity to develop other mechanism for contribution to the Emission Reduction program by involved to the Voluntary market with Verifed Carbon Standard (VCS) scheme. The Verified Carbon Standard (VCS) provides a global program and standard for Green House Gas (GHG) Emission Reduction and removal projects and programs. It uses as its core the requirements set out in ISO 14064-2:2006, ISO 14063:2006 and ISO 14065:2007. The VCS Project shall meet the following principles such as: real, measureable, permanent, independently audited, unique, transparent and conservative. Now PGE has been developing one geothermal projects for VCS scheme in Lahendong Unit 5 and 6 Geothermal Power Plant with potential emission reduction about 181,030 ton CO2e/year. Implementation of VCS program become PGE contribution as a real action for GHG emission reduction, and complies with implementation of reducing GHG emission for 26% reduction as national target until 2020. This paper also has further discussion about implementation of VCS scheme process in PGE, included but not limited to preparation, validation, registration and Monitoring, Reporting & Verification (MRV) plan.

1. INTRODUCTION

The VCS is a private, non-for-profit, non-govermental organization founded to provide quality assurance in the certifications of projects' voluntary carbon emission reduction. The VCS is a greenhouse gas accounting program used by projects around the world to verify and issue carbon credits in voluntary and pre-compliance markets. VCS was developed by business and environmental leaders to enhance the quality assurance-system for carbon credits issued in voluntary markets. Projects use VCS requirements to ensure that carbon credits bought by business and consumers can be trusted and have real environmental benefits. (International Trade Center, 2011). The VCS Program is among the most widely used quality assurance system for accounting for GHG Emission Reductions in the voluntary carbon market. It uses as its core the requirements set out in ISO 14064-2:2006, ISO 14064-3:2006 and ISO 14065:2007. The VCS Program is recognized and trusted to ensure GHG emission which meet following principles such as: reductions real, measureable, permanent, independently audited, unique, transparent and conservative. The scope of the VCS Program includes: the six Kyoto Protocol GHG Emission, Ozone-depleting substances as set out in VCS Documents ODS Requirements, project activities supported by a methodology approved under the VCS Program through the methodology approval process and project activities supported by a methodology approved under a VCS approved by a methodology approved under a VCS approved GHG Program, unless explicitly excluded under the terms of VCS approval (VCS, 2017). Verified emissions reductions are sold to governments, companies, and individuals who voluntarily offset their emissions, claim carbon neutrality, and/or invest in projects in the developing world (Bumpus & Liverman, 2011; Peters-Stanley & Gonzalez,2014). The voluntary carbon market (voluntary market) is the forum for trade of verified emissions reductions and operates in parallel with the compliance market developed under the framework of the UN-created Clean Development Mechanism (CDM)) (Howard., et al, 2015). The voluntary market was established by NGOs and private sector companies in the late 1990s at the same time as the CDM (Bumpus & Liverman, 2011).

2. IMPLEMENTATION OF VCS

Refer to VCS Procedural Documents Version 3.8 for Registration and Issuance Process (VCS, 2017) these are followings step for VCS Validation, Verification and Registration procedures:

2.1 VCS Project Validation and Verification

The project shall be validated and the GHG emission reductions or removals verified as set out in diagram below (**Figure 1**). The documents which has to be submitted include project description, evidence of right of use and other documents as required.

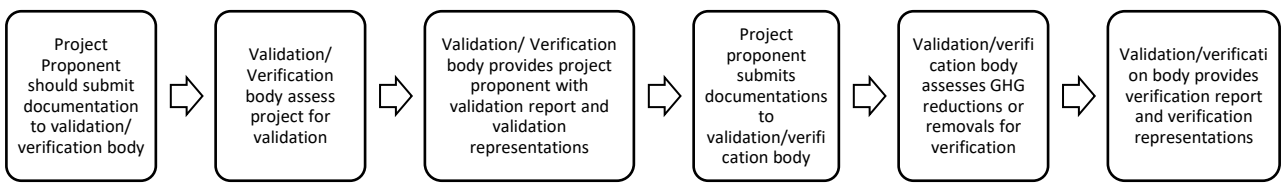

Figure 1: VCS Project Validation and Verification Process

2.2 VCS Project Registration and issuance request

In this step, the project proponent submits project documents to VCS Registry include Project Description, Validation Report, Validation Representation, Registration Representation, Monitoring Report, Verification Report, Verification Representation, Issuance Representation and other documents as required.

2.3 VCS Project Review

The project review is a process consisting of a completeness check (undertaken by the VCS registry administrator), a completeness review (undertaken by the VCSA) and an accuracy review (undertaken by the VCSA, at its discretion) of the project registration, VCU issuance or project crediting period renewal request. The project review process is set out n Diagram below.

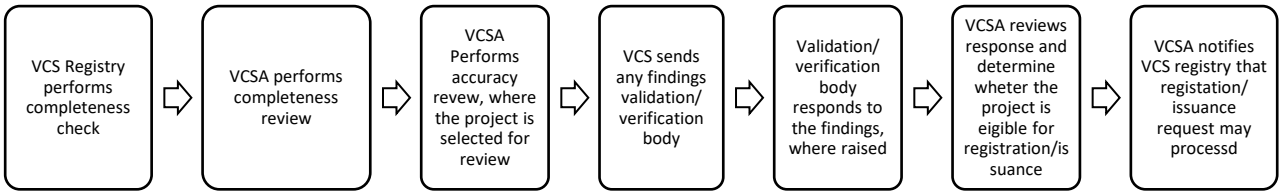

Figure 2: VCS Project Review Process

2.4 VCS Project Periodic VCU (Verified Carbon Unit) Issuance

There may be issuance of VCUs subsequent to the initial issuance of VCUs to the project as set out in Diagram below. Documents for issuance submission are include: Monitoring Report, Verification Report, Verification Representation and Issuance Representation (and other documents as required).

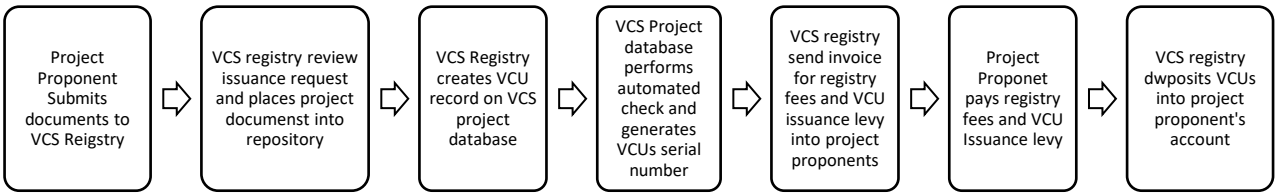

Figure 3: VCS Project Periodic VCU Issuance

3. VCS PROGRAM PT PERTAMINA GEOTHERMAL ENERGY

3.1 Opportunities for PT PGE

Pertamina Geothermal Energy (PGE), a subsidiary of PT. Pertamina (Persero) that has registered for five Clean Development Mechanism (CDM) Projects for Kamojang Unit 5 (30 MW), Karaha Unit 1 (30 MW), Ulubelu Unit 3&4 (110 MW), Lumut Balai Unit 1&2 (110 MW), Lumut Balai Unit 3&4 (110 MW), with total potential emission reduction about 2.058 Million ton CO2e/year. Due to the transition phase from Post Kyoto Protocol-2012 give impact in fluctuation of Certified Emission Reduction (CER) price, its consideration for PGE to develop and upgrade PGE's CDM Projects. PGE found an opportunity to develop other mechanism for contribution to the Emission Reduction program by involved to the Voluntary market with VCS scheme. Implementation of VCS program become PGE's contribution as a real action for GHG emission reduction, and complies with implementation of reducing GHG emission for 26% reduction as national target until 2020.

3.2 Project Description

PT PGE has developed VCS project in Lahendong Unit 5 and 6 Geothermal Power Plant with the net installed capacity of the power plant is 2x20MW. The project activity is located in the Tompaso geothermal field, approximately 50 km south of the capital city of Manado, on the island of Sulawesi in Indonesia. It stretches trough the villages of Sendangan, Pinabetengan, Tompaso and Kanonang (I and II), Tomosewer and Talikuran in the Tompaso and Kawangkoan sub-districts, Minahasa District, North Sulawesi, Indonesia **(Figure 4).** The presence of the project activity enables the export of 315,360 MWh of renewable electricity per year to Sulutgo grid under a power purchase agreement with PT PLN, the state-owned electricity company. The project activity connected by 150 kV transmission line to the Sulutgo grid via the Kawangkoan substation, which is approximately 2 km from the project site. In the absence of the project activity, the demand of electricity in the region would have been met by the operation of existing grid-connected power plants and by the addition of new power generation sources to the Sulutgo Grid. The VCS Lahendong Unit 5&6 start its crediting period from September,15th 2016 for Lahendong Unit-5 and from December, 9th 2016 for Lahendong Unit-6. The average emission reductions in the project activity are estimated to be 181,030 tCO2/year.

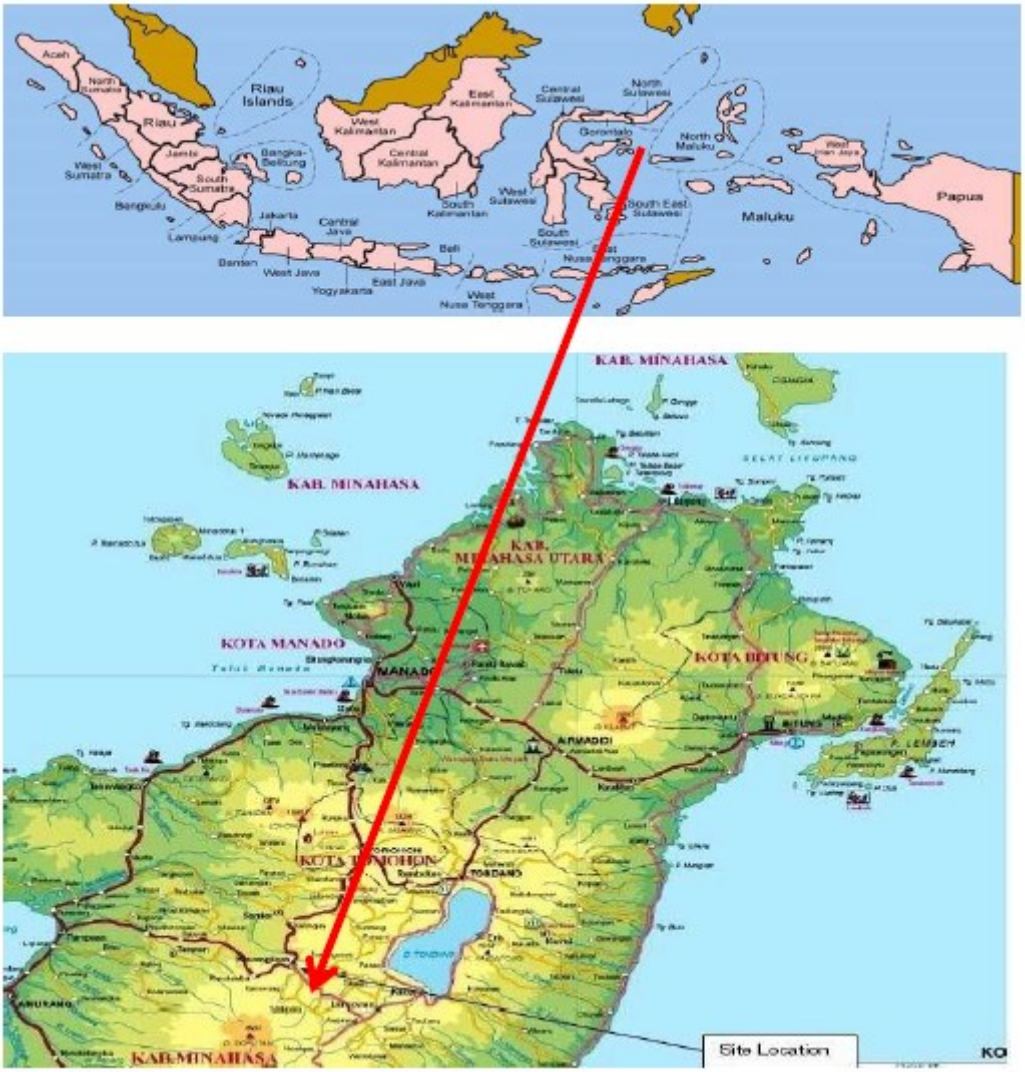

Figure 4: Location of Lahendong Unit 5 and 6 Geothermal Power Plant

The Lahendong Unit 5 and 6 Geothermal Power Plant use single flash condensing steam as its thermal cycle to convert hydrothermal fluids to electricity, where the plant will only utilise the steam fraction of the two phase fluids and the separated brine is injected as shown in the Figure 5. Single flash condensing steam plant is the most common type of geothermal power generation plant in operation today which has been proven worldwide to be environmentally safe and sound.

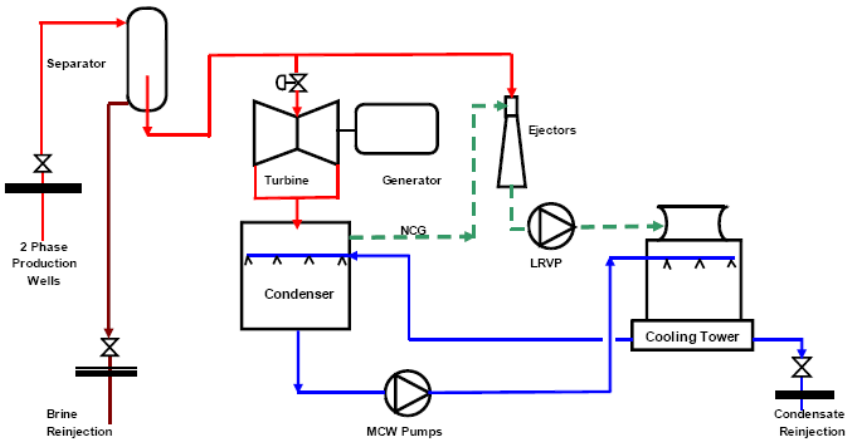

Figure 5 : Single Flash Condensing Steam Plant

3.3 Implementation VCS Project in PT PGE

The VCS Lahendong Unit 5&6 registration process began in March 2018, with initial preparation by prepared the Project Design Document & Monitoring Report Documents (**Tabel 1**). The Project Design Document & Monitoring Report Documents consist of information about project details, application of methodology, Quantification of GHG Emission Reductions and Removals, Data and Parameter Monitored, Safeguard (No Net Harm, Environmental Impact, Local Stakeholder Consultation and Public Comments) and Achieved GHG Emission Reductions and Removals. Afterward, the next procedure is submitted documents for public comment and opened the public comment period for one month. After finished the public comment period, PGE arranged the Validation & Verification site visit by the selected independent DOE (*Designated Operational Entities*). Site visit focused on checked some location related with the VCS Project, such as estimated location for Geothermal Power Plant, well cluster and environmental condition near the Power Plant location. In site visit, DOE interviewed some local residents to get information about impact of the project related to the Sustainability Development. DOE also interviewed local operator and reviewed submitted document related to the VCS Project. After finished the site visit, DOE processed and reviewed the entire submitted document, then DOE gave report for the validation result. The report consists of list of findings in Project Design Documents which needs to be clarified or corrected by the Project Participant. For response the findings, Project Participant gave the clarification or correction statement and submitted the additional supporting document, if necessary. DOE checked the finding responses then requested other clarifications and correction if it's not clear enough to be closed. Validation process will be automatically closed after the DOE issue the Validation Report. For the final process, PGE submitted the documents (Project Description, Validation Report, Monitoring Report, Verification Report,) to the APX Registry for VCS Registration.

Table 1: Timeline of VCS Registration Process for Lahendong Unit 5&6 Project

Project Activity	Project Timeline
Project Design Document & Monitoring Report Preparation	March, 1st – Mei, 31th 2018
Document Submission for Public Comment	June, 1st 2018
Period of Public Comment Process	June, 1st - June, 30th 2018
Validation & Verification Site Visit	July 8 -9th 2018
Response & Clarification Findings from Validation & Verification process	July,10th 2018 – August, 8th 2018
Validation & Verification Report issued	August, 9th 2019
Registration Process	Start from September 2018

3.4 Methodology for Potential Emission Reduction Calculation

The Methodology of this VCS project is using ACM0002 version 18.1 "Large-scale Consolidated Methodology for Grid-Connected Electricity Generation from Renewable Sources" which is applicable for renewable electricity generation plant, in the form of a geothermal power plant which is connected to interconnected power grid (ACM0002, 2018). The potential emission reduction calculated from the deviation of Baseline Emission and Project Emission.

3.4.1 Baseline Emission

The baseline scenario in this project would be the CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due the project activity. For this project calculated as the product of the kWh produced by renewable generation unit, times an emission coefficient (baseline emission factor) calculated as a combined margin (CM), consisting of the combustion of average of the operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" Version 02.2.1 (UNFCCC, 2011)

3.4.2 Project Emission

The project emission estimated come from fugitive emission of CH_4 and CO_2 from non-condensable gases contained in geothermal steam. For geothermal and solar thermal projects, which also use fossil fuel for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions, but fossil fuel combustion in this project activity is envisaged only from the emergency diesel generator system. In line with the explanation of ACM0002 version 18.1 above, the project emissions from fossil fuel combustion in the emergency diesel generator are neglected.

3.5 Benefit of Implementation of VCS

Implementation of VCS Project would effect some benefits for PGE; (1) contribution in supporting Sustainable Development implementation and (2) contribution for GHG emission reduction which complies the "PGE contribution as a real action for GHG emission reduction, and complies with implementation of reducing GHG emission for 26% reduction as national target until 2020. On the other side, the implementation of VCS project is expected to influence the improvement of the CER Price presently to obtain potential revenue. The voluntary market has thus far constituted only a fraction of the total carbon market, and like the CDM, has been affected by the global financial down-turn and suppressed market demand (Boyd et al., 2011). However, whereas the CDM was on the verge of collapse by late 2012 (Moosa et al., 2012), the voluntary market has remained more resilient (Peters-Stanley et al., 2012). This VCS Project now still on going process in regitsration on APX Registry, so the potential revenue could not be predicted by now, but its expected to be increased if it is compared with the CER (Certified Emission Reduction) price.

CONCLUTION

The VCS is a private, non-for-profit, non-govermental organization founded to provide quality assurance in the certifications of projects' voluntary carbon emission reduction. It uses as its core the requirements set out in ISO 14064-2:2006, ISO 14064-3:2006 and ISO 14065:2007. The VCS Program is recognized and trusted to ensure GHG emission which meet following principles such as: reductions real, measureable, permanent, independently audited, unique, transparent and conservative. PT. Pertamina Geothermal Energy (PGE) has already processed for register for VCS Project for Lahendong Unit 5&6 Geothermal Power Plant with potential emission reduction are estimated to be 181,030 tCO2/year. Benefit for VCS implementation for PGE ; (1) contribution in supporting Sustainable Development implementation and (2) contribution for Green House Gas (GHG) emission reduction. Beside that, implementation of VCS is expected to influence the improvement of the CER Price presently to obtain potential revenue.

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