

50 MW SIPANSIHAPORAS HYDRO POWER PLANT, NORTH SUMATRA



Document Prepared By: KBS Certification Services Pvt. Ltd.

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Version	01.1
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Approved By	Kaushal Goyal, Managing Director
Work Carried Out By	Team Leader: Chetan Swaroop Sharma (TA 1.2) Local Expert: Yenni Sembiring Technical Reviewer: Rohit Badaya (TA 1.2)

Summary:

KBS Certification Services Pvt. Ltd. has been contracted by, "South Pole Carbon Asset Management Ltd." to undertake independent validation of the renewable crediting period of the project activity with the title "50 MW Sipansihaporas Hydro Power Plant, North Sumatra" and VCS registry no. 486, with regard to the relevant requirements of VCS Standard Version 3.7.

KBS Certification Services Pvt. Ltd. has performed the validation of the renewable of the crediting period of the project activity with the title "50 MW Sipansihaporas Hydro Power Plant, North Sumatra" and VCS registry no. 486. An independent and objective review of the project document (revised) and the new project baseline along with the other relevant documents is reviewed against the requirement of the VCS Standard v3.7 and "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" Version 03.0.1.

The report is based on the assessment of the revised project document, revised ex-ante emission reduction calculation sheet, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., on site visit, electronic (telephonic or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidances and CDM decisions.

In the course of validation, 03 Corrective Action Requests (CAR) and 00 Clarification Request (CL) have been raised. All the CARs and CLs have been closed out successfully.

Hence, KBS requests the renewable of the crediting period of the project activity (VCS ID. 486) "50 MW Sipansihaporas Hydro Power Plant, North Sumatra".

Abbreviations

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
CM	Combined Margin
CO ₂	Carbon dioxide
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
MP	Monitoring Plan
OM	Operating Margin
PA	Project Activity
PD	Project Description
PP	Project proponent
PPA	Power Purchase Agreement
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

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1 INTRODUCTION

1.1 Objective

South Pole Carbon Asset Management Ltd. has commissioned KBS to perform the validation of request to renew crediting period of the VCS project “50 MW Sipansihaporas Hydro Power Plant, North Sumatra” (Project Id. 486). The assessment was done with regard to the relevant requirements for VCS Version 3.7.

The purpose of validation is to ensure a thorough, independent assessment of registered VCS project activity submitted for renewal of crediting period against the applicable VCS requirements.

In particular, the validity of project's baseline and regulatory surplus are validated in order to confirm the clause no. 3.8.5 of VCS Standard Version 3.7 for the “Renewal of Project Crediting Period”. The validation is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified emission reduction (VER).

1.2 Scope and Criteria

The assessment was performed in accordance with the requirements of Verified Carbon Standard V3.7 and included an assessment, but not limited to, of following:

1. Demonstration of the regulatory surplus, in reference to the additionality of the project, in accordance with section 4.6.3 of the VCS 3.7
2. Validity of the original baseline scenario reviewing the following:
 - a. Evaluation of impact of new relevant national and/or sectoral policies and circumstances on the validity of the baseline scenario.
 - b. Assessment of GHG emissions associated with the original baseline scenario using the latest version of the CDM Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period.
 - c. If original baseline scenario is no longer valid, whether the current baseline scenario is established in accordance with the VCS rules.
 - d. The project description, containing updated information with respect to the baseline, the estimated GHG emission reductions or removals and the monitoring plan, submitted for validation is based upon the latest approved version of the methodology or its replacement.
3. The updated project description is validated in accordance with the current VCS rules (V3.7).

1.3 Level of Assurance

☒ Reasonable level of assurance

☐ Limited level of assurance

1.4 Summary Description of the Project

The project is a new run-off-river hydropower plant in North Sumatra Province in Indonesia with a daily regulating pond. The project is owned and developed by PT. PLN (Persero), a state-owned electricity company.

The key purpose of the project is to utilize the hydrological resources of the Sibuluan River and another three lateral tributaries, thus a renewable source of energy, generating zero emission electricity to be transmitted to the Sumatra grid (hereafter referred to as the grid) through the Sibolga PLN substations. The electricity currently generated by the grid is relatively carbon intensive. It will displace fossil-fuel-based power plants and reduce the associated GHG emissions with fossil-fuel-based power plant in Sumatra grid. Therefore, the project activity is reducing greenhouse gas emissions.

The project uses well-established hydropower generation technology for electricity generation and transmission, and is a run-of-river hydropower project with a total installed capacity of 50 MW (consisting of a 33 MW and a 17 MW turbine). Stringing another circuit of the existing 150 kV single circuit transmission lines, which is being operated in Sibolga substations, connects the project to the grid. The length of the new lines from each power station to the substation is 7.8 km and 0.9 km respectively.

The project consists of a main intake, tributary intakes, a waterway, a power station, hydro mechanical works, generating equipments, transmission line and substations, permanent roads, a base camp and an inflow monitoring system.

The specific technical data of the turbines / generators are listed in Table 1 below:

Table 1 - Technical data of the turbine / generator units (specifications are per unit)

Turbines 1	Brand	MEIDEN
	Model	Francis vertical shaft
	Rated output	34,000 kW
	Rated head	128.4 m
	Rated speed	429 rpm
	Rated flow	28.5 ³ /s
	Serial number	M211071 CR1101

Generators 1	Brand	TOSHIBA
	Model	Francis vertical shaft
	Rated power	39,000 kVA
	Rated voltage	11 kV
	Rated current	2,047 A
	Rated frequency	50 Hertz
	Rated speed	429
	Rated factor	0.85

Turbines 2	Brand	MEIDEN
	Model	Francis vertical shaft
	Rated output	17,600 kW
	Rated head	67 m
	Rated speed	375 rpm
	Rated flow	28.5 ³ /s
	Serial number	M211071 CR2101

Generators 2	Brand	TOSHIBA
	Model	Francis vertical shaft
	Rated power	20,000 kVA
	Rated voltage	11 kV
	Rated current	1,050 A
	Rated frequency	50 Hertz
	Rated speed	375
	Rated factor	0.85

The main technical parameters of the proposed project are shown in table below:

Table 2 - Main technical parameters of the proposed project

Parameter	Capacity	Source
Installed capacity (MW)		Feasibility study page 14/19
Unit 1	33	
Unit 2	17	
Expected annual power generation (effective supply to the grid) (MWh)		Feasibility study page 14/19
Unit 1	142,200	
Unit 2	72,600	
Water head (m)		Feasibility study page 14/19
Unit 1	131.4	
Unit 2	67.6	
Design flow (m ³ /s) unit 1 and unit 2	18.76	Feasibility study page 14/19
Capacity Factor (%)	49%	Calculated based on

Parameter	Capacity	Source
		feasibility study
Transmission loss (%)	1.00%	Feasibility study page 9-3

No changes, comparing to the registered project design, has been observed, as validated above, in the project description.

2 VALIDATION PROCESS

2.1 Method and Criteria

The validation process was carried out in line with the requirements of VCS Version 3. Standard auditing techniques and KBS's CDM Procedures were also applied during the validation. The validation process included the following processes as described in the subsequent sub-sections.

Duration of Validation:

Validation Contract	17/08/2017
On site verification	26/09/2017
Findings raised	30/09/2017
Draft Validation Report	23/10/2017
Final Validation Report	31/10/2017

2.2 Document Review

Desk review was performed of the revised PD /01/ against the registered and validated VCS PD /02/. The validation report /03/ and the previous verification reports /04/ were also reviewed to validate the renewal of crediting period in accordance with the VCS Standard Version 3.7 /05/. In addition, certain supportive documents, relating the project performance (like PPAs /09/, commissioning certificates /13/, Proof of title /15/ and JMRs /14/) were also reviewed.

The list of document reviewed is included in the Appendix 1: 'References'

2.3 Interviews

The site visit for this validation assessment was undertaken by the members of the assessment team. Summary of on-site activities are mentioned below;

Location	Sibolga, Indonesia (Project Site)
Dates	26/09/2017
Key points discussed	Name of persons interviewed, Designation, Organization
Project Document	

Project and Technology Description, Methodology Justification, Validity of Baseline, Monitoring Plan, Project Performance	Augga Pramukti, Health and Safety, PLN Dike Satya L.P, Administration, PLN Radian P.R, Health and Safety, PLN Rachtvatheriandi, Administration, PLN Roy Zona Kaban, Operation, PLN Fajor, Unit Manager, PLN Sipansihaporas Leonardo Sidabalok, Project Manager, South Pole Carbon Asset Management Limited
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2.4 Site Inspections

A site visit is undertaken by members of validation team, involving but not limited to,

- An assessment of the implementation and operation of the VCS project activity as per the revised VCS PD/02/;
- Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the mentioned monitoring plan;
- A cross-check between information provided in the revised PD and data from other sources such as plant log books, inventories, purchase records or similar data sources;
- A check of the monitoring equipments including performance and observations of monitoring practices against the requirements of the registered VCS PD and the selected methodology.

2.5 Resolution of Findings

During the validation of the renewable of the crediting period, the following correction actions (CARs) and clarifications (CLs) have been raised and resolved after satisfactory response from the project participants.

Table 1. CL from this validation

No CL from this validation

CL ID	xx	Section no.	Date: DD/MM/YYYY
Description of CL			
Project participant response			Date: DD/MM/YYYY
Documentation provided by project participant			

DOE assessment	Date: DD/MM/YYYY

Table 2. CAR from this validation

CAR ID	01	Section no.	-	Date: 29/09/2017
Description of CAR				
In the section 2.1 of the VCS PD /01/, PP needs to mention the title and reference of the applied methodology along with the applicable tools.				
Project participant response				Date: 13/10/2017
In the section 2.1 of the VCS PD has been revised to mention the title and reference of the applied methodology along with the applicable tools.				
Documentation provided by project participant				
171013_Sipansihaporas_VCS PD_v2_Isa.docx				
DOE assessment				Date: 18/10/2017
Corrections have been done in the revised VCS PD and found OK. Hence this CAR is closed.				

CAR ID	02	Section no.	-	Date: 29/09/2017
Description of CAR				
In the section 3.1 of the VCS PD /01/, PP needs to mention the calculation of the combined margin emission factor based on the OM and BM. Further the weightage of the OM & BM shall be in line with the "Tool to calculate the emission factor for an electricity system" (Version 05.0) /11/ for the second crediting period.				
Project participant response				Date: 13/10/2017
VCS PD has been revised to mention the calculation of the combined margin emission factor based on the OM and BM. And, further the weightage of the OM & BM has been revised to be in-lined with the "Tool to calculate the emission factor for an electricity system" (Version 05.0) for the second crediting period.				
Documentation provided by project participant				
1. 171013_Sipansihaporas_VCS PD_v2_Isa.docx 2. 171013_300356_Sipansihaporas_ER Calculation_Isa_v3.xlsx				

DOE assessment	Date: 18/10/2017
Corrections have been done in the revised VCS PD and found OK. As per UNFCCC Methodological tool: Tool to calculate the emission factor for an electricity system v05.0, the following default values should be used for wOM and wBM (for all projects except for wind and solar power generation project activities): wOM = 0.5 and wBM = 0.5 for the first crediting period, and wOM = 0.25 and wBM = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool. PP has selected the option “wOM = 0.25 and wBM = 0.75” which is correct for the project activity for the second crediting period. Hence this CAR is closed.	

CAR ID	03	Section no.	-	Date: 29/09/2017
Description of CAR				
In the section 3.2 and 3.3 of the VCS PD /01/, PP needs to justify the project emissions and leakage emissions as per the applied methodology /07/.				
Project participant response				Date: 13/10/2017
In the section 3.2 and 3.3 of the VCS PD has been revised to justify the project emissions and leakage emissions as per the applied methodology				
Documentation provided by project participant				
171013_Sipansihaporas_VCS PD_v2_Isa.docx				
DOE assessment				Date: 18/10/2017
Corrections have been done in the revised VCS PD /01/ and found OK. Hence this CAR is closed.				

Table 3. FAR from this validation

No FAR raised during this validation.

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				

DOE assessment	Date: DD/MM/YYYY

2.5.1 Forward Action Requests

No FAR (Forward Action Request) is raised during this validation of the renewal crediting period.

3 VALIDATION FINDINGS

3.1 Project Details

Same as in the registered VCS PD /02/ except for the information which have been revised and mentioned below.

- **Project crediting period:** 2nd Crediting period, 10 years from 1 April 2016 until 31 March 2026.
- **Project estimated GHG emission reductions or removals:** 1,853,928 emission reductions credits for the 10 year crediting period and 185,392 tCO₂e emission reduction credits per year.

Validation team confirms that the description in the project description is accurate, complete, and provides an understanding of the nature of the project.

3.2 Application of Methodology

3.2.1 Title and Reference

The project uses the VCS board-approved consolidated baseline and monitoring methodology ACM0002 “Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources”, version 17.0, 13 May 2016¹ /07/.

This methodology also refers to the latest approved versions of the approved “Tool to calculate the emission factor for an electricity system”, version 05.0² /11/.

3.2.2 Applicability

In accordance with the para 3.8.5 of the VCS standard V3.7 /05/ and Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period, version 3.0.1 /12/, the VCS PD has been updated using the latest version of the applied

¹ <https://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

methodology i.e. ACM0002 “Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources”, version 17.0. The project meets the applicable criteria of the latest version of the applied methodology ACM0002 “Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources”, version 17.0. Validation team has checked the PP’s justification (In the revised VCS PD /01/) for the applicability criteria of the latest version of the applied methodology and found OK.

3.2.3 Project Boundary

Same as in the registered VCS PD /02/.

3.2.4 Baseline Scenario

The revised VCS PD (version 03, dated 30/10/2017) /01/ applying the latest version of the applied methodology ACM0002 “Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources”, version 17.0, found in line with paragraph 3.8.5 (2) of VCS standard V3.7 /05/.

The baseline scenario for the project activity has been updated in accordance with the paragraph 3.8.5 (2) “Renewal of Project Crediting Period” of VCS Standard: VCS Version 3.7 /05/. The applied methodology ACM0002 version 17.0 /07/, involves the calculation of baseline emissions, emission factor of the grid, which is calculated using the “Tool to calculate the emission factor for an electricity system” /11/. The tool requires the usage of publicly available data for the calculation of grid emission factor. The original PD included old grid emission factor data which have been updated in the revised PD /01/.

The latest of weighted average of the Operating Margin emission factor ($EF_{grid,OMsimple,y}$), Build Margin emission factor ($EF_{grid,BM,y}$), and Combined Margin emission factor ($EF_{grid,CM,y}$) of Sumatera grid of year 2015 already determined and calculated³ according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system”, by the Indonesian government under the Directorate General of Electricity - Ministry of Energy and Mineral Resources (MEMR)⁴ /10/.

Operating Margin emission factor: The Operating Margin emission factors for 2013, 2014 and 2015 are calculated separately and then the three- year average is calculated as a full-generation weighted average of the emission factors. The result of the Operation Margin Emission Factor of Sumatra calculation is 0.676 tCO₂e/MWh.

Built Margin emission factor: Build Margin Emission Factor is calculated to be 0.933 tCO₂e/MWh by dividing total CO₂ emissions by the total annual generation data.

Combined margin (CM) emission factor: The Baseline Emission Factor is calculated as a Combined Margin, based on the Operating Margin (OM) and Build Margin (BM), using the weighted average (preferred option) of the Operating Margin and Build Margin.

³ Based on notification letter number 322/20/DJL.4/2017 dated on February 7th, 2017 from the MEMR.

⁴ Based on notification letter number 1515/03/DLT.3/2017 dated on May 30th, 2017 from the MEMR.

$$EF_{\text{grid,CM},y} = EF_{\text{grid,OM},y} \times w_{\text{OM}} + EF_{\text{grid,BM},y} \times w_{\text{BM}} \quad (4)$$

where:

$EF_{\text{grid,BM},y}$	=	Build margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$EF_{\text{grid,OM},y}$	=	Operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
w_{OM}	=	Weighting of operating margin emissions factor (per cent)
w_{BM}	=	Weighting of build margin emissions factor (per cent)

As per UNFCCC Methodological tool: Tool to calculate the emission factor for an electricity system v05.0, the following default values should be used for w_{OM} and w_{BM} (for all projects except for wind and solar power generation project activities): $w_{\text{OM}} = 0.5$ and $w_{\text{BM}} = 0.5$ for the first crediting period, and $w_{\text{OM}} = 0.25$ and $w_{\text{BM}} = 0.75$ for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

Therefore using the approach above, the ex-ante emission factor ($EF_{\text{grid,CM},y}$) for Sumatra Grid will be:

$$\begin{aligned} EF_{\text{grid,CM},y} &= (EF_{\text{grid,OM},y} \times w_{\text{OM}}) + (EF_{\text{grid,BM},y} \times w_{\text{BM}}) \\ &= (0.676 \times 0.25) + (0.933 \times 0.75) \\ &= 0.869 \text{ tCO}_2/\text{MWh (Fixed ex-ante for the second crediting period)} \end{aligned}$$

Validation team confirms that PP has correctly calculated the combined margin emission factor as per applied methodology /07/ and the tool /11/.

3.2.5 *Additionality*

Referring to the VCS Standard version V3.7 para 3.8.5, the additionality of the project was assessed for the regulatory surplus. The national and sectoral policies applicable to the large scale Hydro projects in Indonesia were reviewed by the assessment team /16/ and the assessment team is in the opinion that the project continues to be voluntary.

3.2.6 *Quantification of GHG Emission Reductions and Removals*

The calculation of emission reduction is being done following the same approach as in the registered VCS PD/02/. The latest applied methodology /07/ too has the same calculation procedures for GHG estimation and hence there has been no change

3.2.7 *Methodology Deviations*

There are no deviations found from the applied methodology (ACM 0002, Version 17.0).

3.2.8 *Monitoring Plan*

The monitoring plan is same as in the registered VCS PD /02/.

The implemented monitoring plan was validated against the requirements of the applied methodology (ACM 0002, Version 17.0) and found in compliance with updated version.

It may be noted, the applied monitoring methodology (ACM 0002, Version 17.0) requires the monitoring of the “Quantity of net electricity generation supplied by the project plant/unit to the grid in year y ($EG_{\text{facility},y}$)”. In the context of the project activity it is represented as the parameter “Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y ($EG_{PJ,y}$)” which is being monitored in the project activity as per the requirements of the applied methodology.

3.3 Non-Permanence Risk Analysis

Not Applicable to the project activity.

4 SAFEGUARDS

4.1 No Net Harm

The project activity has no potential negative environment and social-economic impacts. Assessment team confirms it based on its on-site visit, document review and local & sectoral expertise.

4.2 Environmental Impact

Same as in the registered VCS PD /02/.

4.3 Local Stakeholder Consultation

Same as in the registered VCS PD /02/.

4.4 Public Comments

This is not a new project activity hence this section is not applicable.

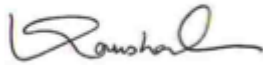
5 VALIDATION CONCLUSION

The project activity “50 MW Sipansihaporas Hydro Power Plant, North Sumatra” VCS Registry no. 486 as described in project document version 03, dated 30/10/2017 meets the requirements of the renewal of the crediting period as stated in the para 3.8.5 of the VCS Standard V3.7 /05/ and Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period, version 3.0.1 /12/. The applied methodology is also the latest (ACM0002, version 17.0/07/) in accordance with the procedure for renewal. The project activity meets all the criteria and the conditions to generate verified emission reductions (VERs) for the requested crediting period i.e. 1 April 2016 until 31 March 2026.

Validation team confirms that project complies with the validation criteria for projects set out in VCS Version 3, and includes any qualifications or limitations. Further the project is likely to achieve estimated GHG emission reduction or removals.

Location: Faridabad

Date: 01/11/2017



Authorized Signatory: Kaushal Goyal

Designation: Managing Director

KBS Certification Services Pvt. Ltd.

APPENDIX 1: REFERENCE DOCUMENTS

S. No	Document Name
/1/	/1.1/ VCS – PD Version 01, dated 25/08/2017
	/1.2/ VCS – PD Version 03, dated 30/10/2017
/2/	Registered VCS PD, version 03 dated 10/11/2009
/3/	Validation Report (Validation report no. 2009 IQ ME 154) dated 24/09/2010
/4/	Previous verification reports
/5/	VCS Standard Version 3.7
/6/	VCS Program Guide Version 3.7
/7/	Approved methodology, ACM0002 “Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources”, version 17.0
/8/	Audit plan sent to the PP for the site inspection.
/9/	Signed Power Purchase Agreement (PPA)
/10/	2015_Sumatera Grid Emission Factor Ex-ante_Ex-post (OM_BM_CM)
/11/	“Tool to calculate the emission factor for an electricity system”, Version 05
/12/	Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period, version 3.0.1
/13/	Commissioning certificates
/14/	Joint meter reading reports
/15/	Proof of Title: The contract agreement
/16/	http://www.irena.org/DocumentDownloads/Publications/IRENA_REmap_Indonesia_report_2017.pdf PLN's Electricity Supply Business Plan (RUPTL PT. PLN (Persero)) year 2017-2026. Decree of Ministry of Energy and Mineral Resources No. 1415 K/20/MEM/2017 dated on 29 March 2017 concerning Ratification of PT. PLN (Persero)'s Electricity Supply Business Plan Year 2017 – 2026. https://djke.sdm.go.id/pdf/RUPTL/RUPTL%20PLN%202017-2026.pdf (accessed, 2017).
/17/	VCS Web site: www.v-c-s.org http://v-c-s.org/program-documents

APPENDIX 2: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Personnel Name:		Chetan Swaroop Sharma	
Qualified to work as:			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☒
Technical Reviewer	☒	Local Expert (India)	☒
Area(s) of Technical Expertise			
Sectoral Scope		Technical Area	
Energy industries (renewable/non-renewable sources)		TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	

	TA 1.2: Energy generation from renewable energy sources
Energy Demand	TA 3.1. Energy demand
Waste handling and disposal	TA 13.1. Solid waste and wastewater TA 13.2. Manure
Approved by (Manager C & T)	Sanjay Kandari
Approval date:	01/05/2017

Personnel Name:		Yenni Sembiring	
Qualified to work as:			
Team Leader	☐	Technical Expert	☐
Validator/Verifier	☐	Financial Expert	☐
Technical Reviewer	☐	Local Expert (Indonesia)	☒
Area(s) of Technical Expertise			
Sectoral Scope	Technical Area		
Not applicable	Not applicable		
Approved by (Manager C & T)	Gagandeep Kakkar		
Approval date:	31/12/2014		

Personnel Name:		Rohit Badaya	
Qualified to work as:			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☒
Technical Reviewer	☒	Local Expert (India)	☒
Area(s) of Technical Expertise			
Sectoral Scope		Technical Area	
Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources		
	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
Energy demand	TA 3.1. Energy Demand		
Waste Handling and Disposal	TA 13.1 Waste Handling and Disposal TA 13.2 Manure		
Approval date:	16/10/2017		