




## Validation report form for GS project activities

## VALIDATION REPORT

<b>Title of the project activity</b>	Papop Biogas and Renewable Energy Project in Thailand
<b>Version number of the validation report</b>	1.1 Aa
<b>Completion date of the validation report</b>	06/10/2017
<b>Version number of PDD to which this report applies</b>	Version 03 of 25/09/2017
<b>Version number of GS Passport to which this report applied</b>	02 of 12/09/2017
<b>Project participant(s)</b>	Papop Renewable Company Limited Swiss Carbon Value Limited
<b>Host Party</b>	Thailand
<b>Estimated annual average GHG emission reductions or net removals in the crediting period (tCO<sub>2</sub>e)</b>	87,990 tCO <sub>2</sub> e
<b>Sectoral scope(s) and selected methodology(ies)</b>	Sectoral Scope: 13 Methodology: ACM00014 'Treatment of wastewater' Version 7
<b>Name of DOE</b>	RINA Services S.p.A (RINA)
<b>Name, position and signature of the approver of the validation report</b>	Laura Severino Unit Manager Sustainability & Climate Change 

## SECTION A. Executive summary

### Purpose and general description of the project

The proposed project activity involves installation of a new Upflow Anaerobic Sludge Blanket (“UASB”) for wastewater treatment and biogas recovery at the Thai San Miguel Liquor (“TSML”) distillery (“TSML distillery”) located in Amphor Tha Muang, Kanchanaburi Province, Thailand. The proposed project activity is being implemented by the Papop Renewable Company Limited (“Papop”) as a builder, operator, transfer scheme, which will be handed over to TSML after a period of 9 years. TSML distillery produces alcohol spirits and as a part of the production process generates large amounts of wastewater, which has high organic matter content. Currently, wastewater is treated in an anaerobic lagoon and the anaerobic conditions lead to the production of biogas that is released directly to the atmosphere. The purpose of the proposed project activity is to use the biogas generated by the UASB for heat generation in the TSML boilers and for electricity generation in a newly installed engine. The electricity generated will be exported to the Thai national electricity grid. The proposed project activity will result in emission reductions from the avoidance of methane emissions from the anaerobic open lagoon, the avoidance of carbon dioxide emissions from the combustion of fuel oil in the TSML boiler and from the displacement of grid sourced electricity which includes fossil fuel based electricity generation. The estimated emission reductions are 87,990 tonnes of CO<sub>2e</sub> per year.

### Location

The project activity is implemented at the Thai San Miguel Liquor (“TSML”) distillery (“TSML distillery”) located in Amphor Tha Muang, Kanchanaburi Province, Thailand. The geographical coordinates are 13°56’32.13” N latitude and 99°40’06.83” E longitude.

### Scope of validation

The scope of the Validation is to have an independent evaluation of a project activity by a DOE against the GS requirements and principles, on the basis of the PDD and GS Passport. Validation is a requirement and it is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of VERs and sustainability development.

### Validation process

Validation is conducted using RINA procedures in line with the GS requirements and principles and applying standard auditing techniques. The validation assessment involved a document review of relevant documentation, the interview and/or on-site visit and the reporting. Validation is not meant to provide any consultancy towards the project participants. However, stated request for clarifications and/or corrective actions may have provided input for improvement of the project design.

### Conclusion

RINA commissioned by Papop Renewable Company Limited is performing the validation of the project activity ‘Papop Biogas and Renewable Energy Project in Thailand’, with regard to the relevant GS requirements and principles for project activities.

In conclusion, it is RINA’s opinion that the project activity “Papop Biogas and Renewable Energy Project in Thailand”, in “Thailand”, as described in the PDD version 03 of 25/09/2017 and GS passport, version 02 of 12/09/2017 meets all relevant requirements for GS activities and all relevant host Party criteria and correctly applies the baseline and monitoring methodology “ACM00014” ‘Treatment of wastewater’, version 07 of 04/11/2016.

## SECTION B. Validation team, technical reviewer and approver

### B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Validation findings

1.	Team Leader Technical & Expert (13.1)	IR	Menon	Rekha	RINA India	√	√	√	√
2.	Validator	IR	Buragohain	Champok	RINA India	√	√	√	√

## B.2. Technical reviewer and approver of the validation report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	De Lima Carvalho	Thais	RINA Brazil
2.	Approver	IR	Severino	Laura	RINA Central Office

## SECTION C. Means of validation

### C.1. Desk review

The PDD version 01 of 29/11/2016, version 02 of 12/09/2017 and version 03 of 25/09/2017 /01/, in particular the applicability of the methodology, the baseline determination, the additionality of the project activity, the starting date, the project eligibility, the monitoring plan, the sustainability indicators, the stakeholder consultation, the environment impact assessment, the emission reductions calculations (874\_TSML\_ex-ante\_ER\_Calculations\_V01\_29112016\_R.xlsx) and revised worksheet (874\_TSML\_ex-ante\_ER\_Calculations\_V02\_12092017) /02/ were assessed as part of the validation. All documents reviewed or referenced during the validation are listed in Appendix 3.

### C.2. On-site inspection

Duration of on-site inspection: 01/12/2016 to 02/12/2016				
No.	Activity performed on-site	Site location	Date	Team member
1.	- Description of the project activity - Baseline and Additionality - Emission reductions calculations - Monitoring plan and monitoring arrangements - GS Sustainable Indicators - Local stakeholder consultation - Environmental and social impacts	TSML distillery at 60/9, Moo 1, Wangkhanai, Subdistrict, Thamuang District, Kanchanaburi Province, Thailand	01/12/2016 & 02/12/2016	Rekha Menon & Champok Buragohain
2.	- Site round to access project boundary, monitoring arrangements etc. - Interview with local stakeholders			

## C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Singh	Santosh Kumar	South Pole Group (Regional Director, SEA)	01/12/2016 & 02/12/2016	Project implementation and operation. Baseline identification, Additionality of the project activity, start date of the project activity, Project boundary. Monitoring plan and monitoring parameters. Preparation of the PDD, GS passport, calculation of the ER etc.	Rekha Menon & Champok Buragohain
2.	Raya	Sirinut	South Pole Group (Project Manager)			
3.	Khunikakorn	Ladaporn Kat	South Pole Group (Project Manager)			
4.	Phengphit	Prasarn	Papop Renewable Company Limited (Maintenance)	02/12/2016	Monitoring plan and monitoring parameters. Management of the meter devices. Technical equipment, calibration and monitoring observation. Information flows for generating, aggregating and reporting the monitoring parameters. Cross-check of information in the monitoring report and data source.	
5.	Saekam	Manop				
6.	Wongju	Narong				
7.	Rattananadhever	Suchai	Papop Renewable Company Limited (Design Engineer)			
8.	Immboon	Charoen	Local farmer, Wangkhanai	02/12/2016	Sustainable development parameters, employment generation, Continuous grievance mechanism, Stakeholder engagement etc.	
9.	Boonchu	Somkate	Assistant, Village head; Wangkhanai			
10.	Aumnhongpoh	Padung	Head Village security, Wangkhanai			

## C.4. Sampling approach

&gt;&gt; N/A

**C.5. Clarification requests, corrective action requests and forward action requests raised**

Areas of validation findings	No. of CR	No. of CAR	No. of FAR
Project design document	-	1	-
Description of project activity	1	-	-
Application of selected baseline and monitoring methodology and selected standardized baseline			
- Applicability of methodology and standardized baseline	-	-	-
- Deviation from methodology	-	-	-
- Clarification on applicability of methodology, tool and/or standardized baseline	-	1	-
- Project boundary	-	1	-
- Establishment and description of baseline scenario	1	-	-
- Project eligibility	1	-	-
- Demonstration of additionality	1	-	-
-Sustainability assessment	-	1	-
- Emission reductions	-	1	-
- Monitoring plan	-	1	-
- Sustainability Monitoring plan	-	1	-
Duration and crediting period	-	-	-
Environmental impacts	1	-	-
Local stakeholder consultation	1	-	-
Pre-feasibility assessment	-	1	-
Others (please specify)	-	-	-
<b>Total</b>	<b>6</b>	<b>8</b>	<b>0</b>

**SECTION D. Validation findings****D.1. Project design document**

<b>Means of validation</b>	The PDD version 01 of 29/11/2016, version 02 of 12/09/2017 and version 03 of 25/09/2017/ <b>01/</b> submitted by Swiss Carbon Value Limited has been the basis for the validation process. Validation is as per GS requirement V2.2 / <b>03/</b> and VVS version 09 / <b>05/</b> .
<b>Findings</b>	CAR 01 was raised as the latest PDD template of UNFCCC was not used by PP to which PP has updated the PDD using the latest PDD template of UNFCCC in consistent with GS requirement version 2.2. Hence, the CAR is closed.
<b>Conclusion</b>	RINA confirms that the latest PDD, version 03 of 25/09/2017 / <b>01/</b> is based on the currently valid PDD template / <b>15/</b> and is completed in as per "Instructions for filling out the project design document form for CDM project activities".

**D.2. GS Passport**

<b>Means of validation</b>	The GS passport version 01 of 16/03/2015 and version 02 of 12/09/2017/ <b>06/</b> submitted by Swiss Carbon Value Limited has been the basis for the validation process. Validation is as per GS requirement V2.2 /03/, Gold Standard Passport template (Annex R to Toolkit version 2.2)
<b>Findings</b>	N/A
<b>Conclusion</b>	RINA confirms that the above Gold Standard Passport is based on the currently valid GS Passport is in accordance with the latest version of the Gold Standard Passport template (Annex R to Toolkit version 2.2).

**D.3. Description of project activity**

<b>Means of validation</b>	The title of the project activity is defined as "Papop Biogas and Renewable Energy Project in Thailand" in the PDD /01/ which is in line with the GS Registry and GS Passport / <b>06/</b> . The proposed project activity involves installation of a new Upflow Anaerobic Sludge
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	Blanket (“UASB”) for wastewater treatment and biogas recovery at the Thai San Miguel Liquor (“TSML”) distillery (“TSML distillery”) located in Amphor Tha Muang, Kanchanaburi Province, Thailand. The proposed project activity is being implemented by the Papop Renewable Company Limited (“Papop”) as a builder, operator, transfer scheme, which will be handed over to TSML after a period of 9 years as verified from project agreement copy /16/. TSML distillery produces alcohol spirits and as a part of the production process generates large amounts of wastewater, which has high organic matter content. Currently, wastewater is treated in an anaerobic lagoon and the anaerobic conditions lead to the production of biogas that is released directly to the atmosphere. The purpose of the proposed project activity is to use the biogas generated by the UASB for heat generation in the TSML boilers and for electricity generation in a newly installed engine. The electricity generated will be exported to the Thai national electricity grid. The proposed project activity will result in emission reductions from the avoidance of methane emissions from the anaerobic open lagoon, the avoidance of carbon dioxide emissions from the combustion of fuel oil in the TSML boiler and from the displacement of grid sourced electricity which includes fossil fuel based electricity generation. The UASB is designed to treat 1,500 m <sup>3</sup> /day of wastewater with a methane generation rate of 0.15 m <sup>3</sup> /kg of COD /16/. Expected biogas generation from the project activity is 30,681.82 m <sup>3</sup> /day as per the project agreement assumptions /16/. Although, as per operational license the plant is approved for biogas production capacity of 43,000 m <sup>3</sup> /day /17/. The produced biogas shall be used in thermal oil boiler of 16 TPH (there are two thermal oil boilers of 16TPH capacity each) as verified during site visit. Any remaining biogas shall be used in two gas engine of 952kWe each for electricity generation and export to grid. The expected operational life of the project is more than 20 years as declared from technology supplier /25/. With methane avoidance and fossil fuel replacement in boiler the estimated emission reductions from the project activity is 87,991 tonnes of CO <sub>2e</sub> per year.
<b>Findings</b>	CR 1 was raised to provide copy of project agreement, technical specifications of project activity and commissioning certificate of the project activity to which PP has provided the same and all details are consistent with information provided in PDD. Hence, response is accepted and CR is closed.
<b>Conclusion</b>	RINA confirms that the description of the proposed project activity, as contained in the PDD sufficiently covers all relevant elements, is accurate and complete and that it provides the reader with a clear understanding of the nature of the proposed GS project activity.

#### D.4. Application of selected baseline and monitoring methodology

##### D.4.1. Applicability of methodology

<b>Means of validation</b>	The proposed project activity applies large scale consolidated methodology ‘ACM0014’ ‘Treatment of wastewater’, version 07.0 /08/ as indicated in the PDD /01/. The following tools are also applied: 1. Project and leakage emissions from anaerobic digesters /09/ 2. Tool for the demonstration and assessment of additionality” (version 07.0.0) /07/
<b>Findings</b>	NA
<b>Conclusion</b>	RINA hereby confirms that the selected baseline and monitoring methodology has been previously approved by the CDM Executive Board, and is applicable to the Project, which complies with all the applicability conditions therein and the selected version is valid at the time of submission of the proposed project activity. It is also confirmed that the methodology is correctly applied by comparing it with the actual text of the applicable version of the methodology.

##### D.4.2. Deviation from methodology

<b>Means of validation</b>	NA
<b>Findings</b>	NA
<b>Conclusion</b>	NA

### D.4.3. Clarification on applicability of methodology, tool and/or standardized baseline

<b>Means of validation</b>	<p>The methodology applied for this project is ACM0014 “Treatment of wastewater” Version 07.0 /08/. The validation team confirmed that the choice and justification of this methodology is correctly defined in Table 1, Section B.2 of PDD /01/.</p> <p>In the baseline scenario of the project activity, the wastewater is directed to open lagoons for treatment that have clearly anaerobic conditions, the solid materials were not separated before directing the wastewater to the open lagoons. This was confirmed during the onsite visit. In the project scenario, the anaerobic digester is installed. Biogas extracted from the digester is flared and used to generate electricity and heat. Therefore, scenario 1 of the applied methodology is applicable. The following is applicable for scenario 1 of the applied methodology:</p> <ol style="list-style-type: none"> <li>1. The open lagoons with maximum depth of more than 2m and this confirmed by reviewing the layout drawing /10/ and site visit observations.</li> <li>2. The residence time of the organic matter in the anaerobic lagoon is approximately 148 days which has been calculated considering wastewater generation rate and volume of anaerobic ponds of baseline system as per layout drawing /26/.</li> <li>3. The project activity does not involved the treatment of solid materials. The project activity treats the wastewater generated by the distillery plant. This confirmed by means of site inspection during the onsite visit.</li> </ol>
<b>Findings</b>	<p>CAR 02 was raised to clarify the residence time of organic matter in the anaerobic lagoon to which PP has provided the calculation based on the volume of existing open lagoons in the absence of project activity and the flow rate of wastewater into the baseline system. The calculation is based on actual operational data and hence accepted the residence time justification. CAR is closed.</p>
<b>Conclusion</b>	<p>RINA hereby confirms that the selected baseline and monitoring methodology is applicable to the Project, which complies with all the applicability conditions therein and the selected version is valid at the time of submission of the proposed project activity. It is also confirmed that all applicable tools are correctly applied for the project activity.</p>

### D.4.4. Project boundary

<b>Means of validation</b>	<p>In line with the approved baseline and monitoring methodology “ACM0014”, “Treatment of wastewater”, version 07 /08/ the spatial extent of the project boundary includes “the site where the wastewater is treated in both the baseline and the project scenario, the sites where the sludge/wastewater is applied to lands, any Thai national grid that supply electricity to the project plant, the anaerobic digesters, the power and heat generation equipment and the flare installed under the project activity’. The project boundary was verified during the site visit.</p> <p>Emissions sources included in the project boundary are shown in the table below:</p>													
		<table border="1"> <thead> <tr> <th data-bbox="786 1406 1027 1442"></th> <th data-bbox="1027 1406 1137 1442">GHGs involved</th> <th data-bbox="1137 1406 1441 1442">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="435 1442 786 1597">Baseline emissions</td> <td data-bbox="786 1442 1137 1597">CH<sub>4</sub></td> <td data-bbox="1137 1442 1441 1597">Emission from the open lagoon wastewater treatment process: Applicable as open lagoon would have been used in the baseline wastewater treatment system.</td> </tr> <tr> <td data-bbox="435 1597 786 1778"></td> <td data-bbox="786 1597 1137 1778">CO<sub>2</sub></td> <td data-bbox="1137 1597 1441 1778">Emissions from grid electricity consumed and fossil fuel used in distillery factory. The project activity displaces equivalent amount of electricity and heat energy.</td> </tr> <tr> <td data-bbox="435 1778 786 2022">Project emissions</td> <td data-bbox="786 1778 1137 2022">CH<sub>4</sub></td> <td data-bbox="1137 1778 1441 2022">Emissions from the anaerobic digester: The project involves an anaerobic digester for wastewater treatment and hence emissions accounted in line with the methodology and the applied tool.</td> </tr> </tbody> </table>		GHGs involved	Description	Baseline emissions	CH <sub>4</sub>	Emission from the open lagoon wastewater treatment process: Applicable as open lagoon would have been used in the baseline wastewater treatment system.		CO <sub>2</sub>	Emissions from grid electricity consumed and fossil fuel used in distillery factory. The project activity displaces equivalent amount of electricity and heat energy.	Project emissions	CH <sub>4</sub>	Emissions from the anaerobic digester: The project involves an anaerobic digester for wastewater treatment and hence emissions accounted in line with the methodology and the applied tool.
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Project emissions	CH <sub>4</sub>	Emissions from the anaerobic digester: The project involves an anaerobic digester for wastewater treatment and hence emissions accounted in line with the methodology and the applied tool.												

			Emissions from flaring: Applicable as the project activity involves the installation of a close flare system. This is accounted as per the applied tool.
		CO <sub>2</sub>	Emissions form on-site electricity use and fossil fuel consumed: Applicable as the wastewater treatment plant shall be grid connected and hence, the project activity shall consume power from the grid. Also in boilers fossil fuel shall be used.
	Leakage	N/A	This project activity applies Scenario 1 of the methodology but does not include the treatment of solid materials in the digester in the project activity. Therefore, leakage emissions are not calculated and this is in line with the requirements of ACM0014 version 07.0 /08/.
<b>Findings</b>	CAR 03 was raised as emission source under project activity from on-site fossil fuel consumption was highlighted as not applicable which has been corrected in the updated PDD. Hence, CAR is closed.		
<b>Conclusion</b>	The project boundary was correctly identified in accordance with the methodology ACM0014 (Version 07). All greenhouse gas emissions occurring within the proposed project activity boundary as a result of the implementation of the proposed project activity have been appropriately addressed in the PDD.		

**D.4.5. Establishment and description of baseline scenario**

<b>Means of validation</b>	The most plausible baseline scenario and additionality demonstration is followed as per procedure described in the methodology /08/, as below:  In line with paragraph 5.2.1 of ACM0014, version 07, the below conditions are applicable for the project activity:	
	<b>Conditions</b>	<b>Justifications</b>
	The existing treatment system is an anaerobic lagoon and the wastewater discharged meets the host country legislation;	The existing treatment system is anaerobic lagoons as confirmed by reviewing the layout drawing /10/ and site visit observations. Further, wastewater is not discharged and treated in open lagoon. This is as per host country Factory Act B.E.2535 (1992) /11/. Also valid factory license of Thai San Miguel Liquor (“TSML”) has been verified /27/.
	There is no regulation in the host country that requires the management of biogas from domestic, industrial and agricultural sites;	The project falls under Factory Act B.E.2535 (1992) /11/. As per the applicable act, it is not mandatory to manage biogas. The valid factory license of Thai San Miguel Liquor (“TSML”) has been verified /27/.
	There is no capacity increase of the wastewater treatment system;	The capacity of the distillery factory is 45,678,900 liter/year as per operation license since the year 2004 when the existing treatment system was in place /27/. The same capacity is in place



	after the project is commissioned and hence capacity of wastewater treatment system is not increased.
No other alternative economic activity is expected to be undertaken on the land of the existing lagoon;	As verified during site visit and discussion with project proponent, the existing lagoon system shall be kept as secondary treatment system and treated wastewater after the UASB shall be released into the lagoons and hence no economic activity shall be taken on the land of existing lagoon system.
If the biogas is used to generate electricity in one or several power plants, the total nameplate capacity is below 5MW	As verified from project agreement copy /16/ and commissioning certificate of biogas system linked to the project activity the total capacity is 1.904 MW /28/. Hence, project meets the required condition.

Since, the project meets the conditions as outlined in paragraph 20 of ACM0014, version 07, ***the baseline scenario for the biogas is assumed to be the atmospheric release of the biogas*** as per paragraph 21 of ACM0014, version 07.

In line with clause 5.2.2.1 of ACM0014, version 07, following steps are applied to identify the most plausible baseline scenario:

**Step 1: Identification of alternative scenarios:**

The project activity is applicable under scenario 1 of the methodology and hence, plausible alternative scenarios were determined for the treatment of wastewater (W in line with the methodology as outlined below:

- W1: The use of open lagoons for the treatment of the wastewater;
- W2: Direct release of wastewater to a nearby water body;
- W3: Aerobic wastewater treatment facilities (i.e. activated sludge or filter bed type treatment);
- W4: Anaerobic digester with methane recovery and flaring;
- W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation;
- W6: Wastewater is directed to land application without dewatering;
- W7: Wastewater is dewatered and directed to land application/used a fuel in energy applications.
- W8: Wastewater is not treated

The project activity involves electricity generation with the recovered biogas and plausible alternatives are:

- E1: Power generation using fossil fuels in a captive power plant;
- E2: Electricity generation in the grid;
- E3: Electricity generation using renewable sources.

In addition, the project activity also involves heat generation with the recovered biogas in boiler and therefore, identified the plausible alternative scenarios in line with the methodology as per below:

- H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant;
- H2: Heat generation using fossil fuels in a boiler;
- H3: Heat generation using renewable sources.

Further, the project activity does not involve treatment of solid material which has been confirmed from the project agreement /16/. Hence, no alternative for treatment of solid materials (SM) are identified.

**Step 2: Eliminate alternatives that are not complying with applicable laws and regulations:**

The following baseline scenarios have been eliminated due to non-compliance with applicable laws and regulations:

W2: Direct release of wastewater to a nearby water body: As per host country regulation, discharge of wastewater effluent from a factory shall be prohibited unless there is any treatment /11/. Therefore, direct release of wastewater to a nearby water body does not comply with local regulations. Thus, RINA considers the elimination of this alternative to be reasonable.

W6: Wastewater is directed to land application without dewatering, W7: Wastewater is dewatered and directed to land application/used a fuel in energy applications and W8: Wastewater is not treated: As explained above, as per host country regulation, discharge of wastewater effluent from a factory shall be prohibited unless there is any treatment /11/. RINA considers the elimination of alternatives (W6, W7 and W8) to be reasonable.

Remaining alternatives of wastewater treatment (W1, W3, W4 and W5) are in compliance of applicable law.

Also, alternatives for electricity generation (E1, E2 and E3) and alternatives for heat generation (H1, H2 and H3) are in compliance of applicable law.

**Step 3: Eliminate alternatives that face prohibitive barriers:**

Under this step, the project proponent has eliminated alternatives that face prohibitive barriers.

The following baseline scenarios have been eliminated due to the **investment barrier**:

W3: Aerobic wastewater treatment facilities:

As per report 'Guideline and criteria for design the wastewater treatment system and water improvement system for Thailand, 2003' by Thailand Pollution Control Department and the Environmental Engineering Association of Thailand /13/ alternative 'aerated lagoon and activated sludge' require higher cost for investment, operating and maintenance. Therefore, this alternative faces investment barrier and eliminated from further consideration.

W4: Anaerobic digester with methane recovery and flaring:

This option requires additional investment. Moreover, does not generate any revenue. Further host country regulation does not mandate to apply this technology. Hence, it is uneconomical for PP to go for this option when the recovered biogas can be used to generate addition revenue via power generation or other applications. Hence, this option is considered not considered as plausible alternative.

W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation:

This is the project activity which involves additional cost and technical resources. This is confirmed from the project agreement copy /16/. Hence, this alternative involves financial barrier and can't be more feasible than alternative W1.

H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant:

As stated in the PDD there is no existing cogeneration plant in the project site. This was checked during the site visit by the validation team. The existing fossil fuel boilers were sufficient to meet the demand of the distillery factory. Further, in RINA's opinion this alternative will not suffice the objective of the project activity that is treatment of wastewater. Hence, only for the heat generation component setting up a cogeneration plant involves additional investment and hence not a credible alternative.

H3: Heat generation using renewable sources:

	<p>The boiler where the biogas shall be used for heat generation was already running on fossil fuel (fuel oil). Retrofitting the boiler for renewable energy sources will only incur additional cost when the biogas is available from the project activity. Again setting up another renewable energy based heat generation (except biogas) will only lead to additional investment. Hence, in RINA's opinion this alternative is not a plausible alternative.</p> <p>The following baseline scenarios have been eliminated due to the <b>technological barrier</b>:</p> <p><b>E1: Power generation using fossil fuels in a captive power plant:</b> Power generation from fossil fuel fired captive plan will required additional investment when grid electricity is readily accessible. Biogas from the project is freely available whereas fossil fuel will need additional investment. Running a captive power plant when the demand is not too high for the distillery plant will further need technical resources to run the plan. Hence, the alternative involves barriers and can be neglected for further assessment.</p> <p><b>E3: Electricity generation using renewable sources</b> The project proponent is not in the business of power generation. Setting up renewable power plant except the project will only require additional cost and technical resources. With the limited area of project there is no economic benefit to set up a power plant based on renewable sources without accessing the feasibility and requirement. Hence, this alternative is not credible for baseline scenario.</p> <p>Hence, remaining alternatives are: In case of wastewater treatment system:     W1: The use of open lagoon for the treatment of the wastewater; For power generation:     E2: Electricity generation in the grid; For heat generation:     H2: Heat generation using fossil fuels in a boiler</p> <p>Therefore, only one alternative remains for the project activity which is described above. In line with paragraph 34 of the applied methodology, step 4 is not required.</p>
<b>Findings</b>	CR 02 was raised to clarify if solid material shall be treated in the project activity to which PP has clarified that no solid material except wastewater coming out of the distillery plant shall be treated as the project is designed to treat the wastewater of the distillery plant. Project agreement copy has been verified in this regard and also discussion with project proponent confirm the same. Hence, CR was closed.
<b>Conclusion</b>	All the assumptions and data used by the project participants are listed in the latest PDD, version 03 of 25/09/2017 <b>/01/</b> , including their references and sources; the approved baseline methodology "ACM0014", version 07.0 of 04/11/2016 <b>/08/</b> has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed GS project activity.

#### D.4.6. Proof of project eligibility

<b>Means of validation</b>	<p>The project type eligibility is assessed as per the GS Toolkit <b>/04/</b> which is explained below:</p> <p><b>Scale of project activity</b> The project activity is a large scale VER project as the emission reduction estimated from the project activity is 87,991 tCO<sub>2e</sub>/year which is higher than 60,000 tCO<sub>2e</sub>/year <b>/02/</b>, which is in accordance with the GS Requirements <b>/04/</b> as defined in the GS Passport <b>/06/</b>.</p> <p><b>Host country or state</b> The host party of the project activity is Thailand who has ratified the Kyoto Protocol on 28/08/2002 and has put in effect on 16/02/2005 <b>/14/</b>. Thailand is not included in the Annex B of the Protocol which defined quantified emissions limitation or reduction commitments for Annex I parties. This also means that an official</p>
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	<p>approval from the relevant local authorities stating than an equivalent amount of allowances will be retired to back-up the GS VERs issued is not required.</p> <p><b>Type of project activity</b></p> <p>Proposed project activity will generate electricity and heat using renewable biogas energy energy and will transfer to the national grid. The project activity fits into the renewable energy supply category, as defined in the GS Toolkit version 2.2 /04/.</p> <p><b>Greenhouse gases</b></p> <p>The greenhouse gases due to project activity are CO<sub>2</sub> and CH<sub>4</sub> which are eligible under Gold Standard /04/.</p> <p><b>Official Development Assistance (ODA)</b></p> <p>The project owner has signed ODA declaration /30/ and included to the GS Passport /06/.</p> <p><b>Project timeframe</b></p> <p>The project activity was not previously announced. The project proponent decided to invest the project activity in considering with carbon credit revenue on 22 August 2008 /16/.</p> <p><b>Other Certification Schemes</b></p> <p>The project is not registered in any other certification scheme to claim carbon credit as verified form UNFCCC, VCS database and discussion with project proponent.</p>
<b>Findings</b>	CAR 04 was raised as explanation of pre-announcement and ODA declaration was not provided in GS passport to which PP has provided the same in revised GS passport in line with GS requirement. In addition, it is clarified that the project is not registered for any other certification to claim emission reductions. Hence, CAR was closed.
<b>Conclusion</b>	RINA confirms that the project the eligibility criteria for GS project as per GS requirement version 2.2.

#### D.4.7. Demonstration of additionality and conservativeness

<b>Means of validation</b>	The project additionality has been assessed as per applied methodology (ACM0014, version 07) /08/ and GS requirements version 2.2 /03/. PP has described in section B.4 of the PDD the identification of baseline scenario demonstrate additionality as per step 5.2.1 of applied methodology. The project activity meets the requirement of paragraph 20 of the applied methodology as described in section D.4.5 of this report and therefore, qualify as deemed automatic additional project as per the applied methodology.
<b>Findings</b>	CR 03 was raised to provide supporting documents and further clarifications as the initial PDD was applying financial additionality; whereas the last PDD has been updated as per latest version of the methodology (ACM0014, version 07) which provides “Simplified procedures to identify the baseline scenario and demonstrate additionality’ under section 5.2 of the methodology. PP has demonstrated the same meeting the requirements of paragraph 20 of the methodology and hence, CR 03 was closed as the project qualifies to be deemed automatic additional.
<b>Conclusion</b>	RINA confirms that conservative approach has been applied in line with the applied methodology to demonstrate additionality which is also as per GS requirement version 2.2 and hence the project is additional.

#### D.4.8. Sustainability assessment

<b>Means of validation</b>	<p><b>Do no harm assessment:</b></p> <p>The risk of the project that could have harmful impacts has been assessed under “Do no harm assessment” section in GS Passport/06/. The “Do no harm assessment” is based on the UNDP (United Nations Development Program) safeguarding principles. All the safeguarding principles are assessed in terms of risk, and the explanations and references are provided for each principle to justify the evaluation of the degree of risk.</p> <p><b>Human Rights</b></p> <p>All safeguarding principle listed under “Human Rights” are scored low risk and not applicable. The host country has ratified the relevant international human rights</p>
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treaties /18/. The project is located in Karnchanaburi Province where the surrounding is agricultural land. None of any cultural property is closed to the project area. The project does not cause human right violation. No indigenous people would be affected by the project activity. There was no resettlement of local people due to the project activity. The same was confirmed during interviews with stakeholders.

#### **Labour Standards**

All safeguarding principles listed under “Labour Standards” are scored low. Host county (Thailand) has enforced Labour Relations Act B.E.2518 in line with the principles of international labour organization for safeguarding fundamental rights at work of labour /19/. The law entitles the employees to form labour unions or indulge in collective bargaining or other activities necessary to claim their rights and benefits. The constitution of the Kingdom of Thailand prohibit forced or compulsory labour /20/. The labour protection act in the host country prohibit child labour /21/. The project activity complies above laws and hence justification is accepted.

#### **Environmental Protection**

All safeguarding principles listed under “Environmental Protection” are scored low risk and not applicable. The effluent discharge is as per the effluent discharge regulation as per the notification issued by ministry of Industry under the factories act 1992 /22/. The project activity is not located in an area, which is legally protected, officially proposed for protection, identified by authoritative sources for their high conservation value, or recognized as protected by traditional local communities as confirmed during the site visit. The project has received all relevant clearances /17/.

#### **Anti-Corruption**

The anti-corruption safeguarding principles are scored low. The project does not involve and is not in complicit in corruption. Thailand is a party to United Nation Convention against Corruption /23/.

#### **Sustainable Development Matrix:**

The GS indicators of sustainable development are defined as per the Annex I of the GS Toolkit /04/. The indicators are connected to the localized Millennium Development Goals as per the Annex I of the GS Toolkit /04/. The baseline situation and the future target are described for each parameter. The justification for choice of the parameters was provided in the GS Passport. The justification is based on objective sources such as “IEE Report” /24/. The defined GS indicators in the SD matrix which are in line with the Annex I of the GS Toolkit /04/ are given below including their scores.

#### **Air Quality (+)**

*Parameter:* Amount of avoided SO<sub>x</sub> and NO<sub>x</sub> and odour emissions.

Due to avoidance of fossil fuel combustion, these emissions will be reduced in parallel to reduced CO<sub>2</sub>. In addition, the project involves replacement of open anaerobic lagoon with an enclosed biogas digester; the project significantly contributes to an improvement of odour emissions. Therefore, parameter is scored positive and will be monitored.

#### **Water Quality (+)**

*Parameter:* COD of the wastewater at the outlet of digester system

The quality of the treated wastewater will be significantly improved with the implementation of the biogas system. The parameter is scored positive and will be monitored.

#### **Water quality (+) and quantity (0)**

The amount of wastewater treated will be utilized for irrigation purpose and reused within the factory. Since, there is no significant impact, therefore, this parameter is

scored as zero and will not be monitored. For quality of water, the wastewater will be treated and hence post treatment the project will improve the quality and hence the parameter is kept positive and shall be monitored.

#### **Soil condition (0)**

*Parameter:* Soil contamination, soil erosion

Under the project activity, the wastewater is treated in UASB and then stored in open lagoons which meets the requirement of local laws. The project additionality does not result to soil contamination or erosion compared to baseline scenario. Hence, the parameter is scored neutral and will not be monitored.

#### **Other Pollutants (0)**

*Parameter:* Noise level.

The noise level during the implementation of the project activity is under the national standard. Although there is some noise due to the operation of gensets, the same is mitigated by planting more trees as per the mitigation plan. The noise level post project implementation was monitored by third party and found under permissible limit /30/. Hence, conservatively, the parameter is scored neutral and will not be monitored.

#### **Biodiversity (0)**

*Parameter:* Threatened plants and animals.

The project is located in existing distillery plant and the site doesn't have any threatened plant and animal species as confirmed from the IEE report /24/. Thus, the parameter is scored neutral and will not be monitored.

#### **Quality of Employment (+)**

*Parameter:* Training of staff.

There will be on the job vocational training for those who does not have specific operation experience. All the workers will benefit from trainings on health and safety issues. The parameter is scored positive and will be monitored.

#### **Livelihood of the Poor (0)**

*Parameter:* poverty alleviation.

Income generation by employees associated with project activity will have direct impacts to their livelihood. However, not significantly affect the whole communities around the project, thus it will not significantly improves the livelihood of the poor in general. Therefore, neutral scoring is justified.

#### **Access to Affordable and Clean Energy Services (0)**

*Parameter:* Change in energy use.

The project results in reducing fossil fuel consumption switching to biogas. However, the project's contribution to overall economy of the region/country is very small in terms of change in energy use. Hence, conservatively neutral score is given for this parameter and will not be monitored.

#### **Human and institutional capacity (0)**

*Parameter:* Education and Gender equality

The project provides training for any new employees so it does not affect the education of the local population in general. In addition, the project will recruit new employees in accordance to their qualifications; therefore it does not affect the livelihood and education for women in particular. Therefore, neutral scoring for this parameter is justified.

	<p><b>Quantitative Employment and Income Generation (+)</b></p> <p><i>Parameter:</i> Number of employment and income generation.</p> <p>The project creates additional jobs and income for the new employees. The parameter is scored positive and will be monitored.</p> <p><b>Balance of Payments and Investment (0)</b></p> <p><i>Parameter:</i> Net foreign savings</p> <p>The project activities lead to reduction in fossil fuel consumption for electricity generation. The fossil fuel consumption for electricity generation in Thailand normally is imported. However, the project seems to have an impact on net foreign currency savings, but it is small at the wide-economy level. Therefore, neutral scoring for this parameter is justified.</p> <p><b>Technology Transfer and Technological Self-reliance (0)</b></p> <p><i>Parameter:</i> Training/or workshops for employees:</p> <p>With this project, employees will be trained on the operation of the biogas plant, emergency preparedness and operation of the power generation system. The parameters are already scored positive under quality of employment and hence kept neutral here which is justified.</p> <p>All of the indicators have been scored positive or neutral in comparison with the baseline situation. None of the indicators has been scored negative. The project contributes positive to “environment” and “economic and social development”.</p> <p>It is RINA’s opinion that the project complies with the sustainability assessment requirements defined in the GS Toolkit version 2.2 of 01/06/2012 /04/.</p>
<b>Findings</b>	CAR 05 was raised to provide credible reference against the justifications of safeguarding principles to which PP has provided sources and further explanation based on which the scoring has been done. DOE, cross checked the sources and justification based on sectoral expertise and confirm to be correct. Hence, CAR was closed.
<b>Conclusion</b>	RINA confirms that conservative approach has been applied by PP to demonstrate sustainable development matrix of the project activity which is in line with GS requirement version 2.2.

#### D.4.9. Emission reductions

<b>Means of validation</b>	<p>The emission reduction <math>ER_y</math> by the proposed project activity during the crediting period is the difference between baseline emissions (<math>BE_y</math>), project emission (<math>PE_y</math>) and emissions due to leakage (<math>L_y</math>) as follows:</p> $ER_y = BE_y - PE_y - LE_y$ <p><b>Baseline emissions:</b></p> <p>As per ACM0014 Version 07, the baseline emissions are calculated in three components, (i) baseline missions from anaerobic treatment of the wastewater (<math>BE_{CH_4}</math>), (ii) baseline emissions from generation and consumption of electricity (<math>BE_{EL,y}</math>) and (iii) baseline emissions from heat generation (<math>BE_{HG,y}</math>). The calculation is as follows:</p> $BE_y = BE_{CH_4,y} + BE_{EL,y} + BE_{HG,y}$ <p><b>Step 1: Calculation of baseline emissions from anaerobic treatment of the wastewater (<math>BE_{CH_4,y}</math>):</b></p> <p>In line with the methodology, project proponent shall use minimum value between methane produced after implementation of the project activity (<math>Q_{CH_4,y}</math>) and methane conversion factor method (<math>BE_{CH_4,MCF,y}</math>) for the estimation of methane emissions</p>
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from open lagoons.

$$BE_{CH_4,y} = \min \{ Q_{CH_4,y} ; BE_{CH_4,MCF,y} \}$$

#### Methane produced ( $BE_{CH_4,y}$ ):

In line with applied methodology ACM0014, version 07, step 1 of tool 'Project and leakage emissions from anaerobic digesters' /09/ is applied for quantification of  $BE_{CH_4,y}$ . Being large scale project activity, option 1 of the tool is applied as below:

Option 1: Procedure using monitored data:

'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' to be used for measuring  $Q_{CH_4,y}$ . When applying the tool, the following shall be applied:

- The gaseous stream to which the tool is applied is the biogas collected from the digester;
- $CH_4$  is the greenhouse gas  $i$  for which the mass flow should be determined; and
- The flow of the gaseous stream should be measured on an hourly basis or a smaller time interval; and then accumulated for the year  $y$ .

The project proponent choose the measurement option A on a dry basis as per table 2 (measurement options) of the tool. The mass flow of methane ( $F_{CH_4,t}$ ) shall be determined following below equation:

$$F_{CH_4,t} = V_{t,db} * V_{CH_4,t,db} * \rho_{CH_4,t}$$

Where:

$F_{CH_4,t}$  Mass flow of greenhouse gas  $CH_4$  in the gaseous stream in time interval  $t$  (kg/h)

$V_{t,db}$  Volumetric flow of  $CH_4$  in time interval  $t$  on a dry basis (Nm<sup>3</sup>/h)

$V_{CH_4,t,db}$  Volumetric fraction of the greenhouse gas  $CH_4$  in the gaseous stream in time interval  $t$  on a dry basis (m<sup>3</sup>  $CH_4$ /m<sup>3</sup> dry gas).

$\rho_{CH_4,t}$  Density of greenhouse gas  $CH_4$  in the gaseous stream in minute  $m$  (0.716 kg/m<sup>3</sup>) at reference conditions.

#### Methane Conversion factor method ( $BE_{CH_4,MCF,y}$ ):

$$BE_{CH_4,MCF,y} = GWP_{CH_4} \times MCF_{BL,y} \times B_o \times COD_{BL,y}$$

The quantity of baseline chemical oxygen demand ( $COD_{BL,y}$ ) that would be treated in open lagoons is equal to the chemical oxygen demand ( $COD_{PJ,y}$ ) of the project activity (unless there would have been effluent from the lagoons) is determined using equation 4 of ACM0014 version 07 /08/ and as follows:

$$COD_{BL,y} = \rho \left( 1 - \frac{COD_{out,x}}{COD_{in,x}} \right) \times COD_{PJ,y}$$

Considering one year historical data, discount factor for historical information ( $\rho$ ) is considered as 1 in line with the methodology /08/.  $COD$  of the effluent in the period  $x$  ( $COD_{out,x}$ ) is considered as 1251 ton/month and  $COD$  directed to the open lagoons ( $COD_{in,x}$ ) (scenario 1 for this project activity) is taken as 3998 ton/month as per one year historical data.

As per equation 5 of the methodology /08/, Quantity of chemical oxygen demand that is treated in the anaerobic digester in the project activity ( $COD_{PJ,y}$ ) in year  $y$  (tCOD/yr) is determined as follows:

$$COD_{PJ,y} = \sum_{m=1}^{12} F_{PJ,dig,m} \times COD_{dig,m}$$

Quantity of wastewater that is treated in the anaerobic digester in the project activity



( $F_{PJ,dig,m}$ ) in month  $m$  ( $m^3$ /month) shall be monitored *ex-post* and *ex-ante* the design capacity ( $31,250 m^3$ /month) has been considered in line with the project agreement /16/.

Chemical oxygen demand in the wastewater that is treated in the anaerobic digester ( $COD_{dig,m}$ ) in the project activity in month  $m$  shall be monitored *ex-post*, and for *ex-ante*  $0.1279 \text{ ton}/m^3$  has been considered as per the historical data.

Average baseline methane conversion factor (fraction) in year  $y$ , representing the fraction of ( $COD_{PJ,y} \times B_0$ ) that would be degraded to  $CH_4$  in the absence of the project activity ( $MCF_{BL,y}$ ) is determined as per equation 6 of the methodology /08/ and as follows:

$$MCF_{BL,y} = f_d \times f_{T,y} \times 0.89$$

Since the depth of the baseline lagoon is 3 m as per drawings of open lagoon /10/, the Factor expressing the influence of the depth of the lagoon ( $f_d$ ) is taken as 70% in line with the methodology /08/.

Factor expressing the influence of the temperature on the methane generation in year  $y$  ( $f_{T,y}$ ) shall be calculated following equation 12 of the methodology as follows:

$$f_{T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{availablem}}{\sum_{m=1}^{12} COD_{BL,m}}$$

Factor expressing the influence of the temperature on the methane generation in month  $m$  ( $f_{T,m}$ ) shall be estimated *ex-post* based on monitoring average temperature at the project site ( $T_{2,m}$ ) in month  $m$  (K) following the equation 11 of the methodology as below:

$$f_{T,m} = \begin{cases} 0 & \text{if } T_{2,m} < 278K \\ e^{\left(\frac{E \cdot (T_{2,m} - T_1)}{R \cdot T_1 \cdot T_{2,m}}\right)} & \text{if } 278K \leq T_{2,m} \leq 302.5K \\ 0.95 & \text{if } T_{2,m} > 302.5K \end{cases}$$

Where, activation energy constant (E) as 15,175 cal/mol,  $T_1$  as 303.16 K (273.16 K + 30 K) and ideal gas constant (R) as 1.987 cal/K mol) considered as default in line with the methodology /08/.

After the implementation of the project activity, quantity of methane produced in the digester ( $Q_{CH_4,y}$ ) shall be estimated following latest version of the tool "Project and leakage emissions from anaerobic digesters" and following the same option A of the 'tool to determine the mass flow of a greenhouse gas in a gaseous stream' equation 5 with monitored parameters

### Step 2: Baseline emissions from generation of electricity/or consumption of electricity:

In line with applied methodology the baseline emissions from the generation and/or consumption of electricity are calculated as follows:

$$BE_{EL,y} = (EC_{BL} \cdot EF_{BL,EL,y}) + (EG_{PJ,y} \cdot EF_{PJ,EL,y})$$

Annual quantity of electricity that would be consumed in the absence of the project activity for the treatment of the wastewater (Scenario 1) (MWh/yr) is considered zero on a conservative side.

Net quantity of electricity generated in year  $y$  with biogas ( $EG_{PJ,y}$ ) from the new anaerobic biodigester (MWh/yr) shall be monitored ex-post. Ex-ante,  $EG_{PJ,y}$  is estimated considering potential power generation from the biogas gen-set (1904 kWh), generator efficiency and annual operating days. Baseline emission factor for electricity generated by the project activity in year  $y$  ( $tCO_2/MWh$ ) is fixed ex-ante to be 0.5897  $tCO_2/MWh$  /31/.

**Step 3: Baseline emissions from the generation of heat:**

The project activity involves heat generation utilizing the recovered biogas in boiler. In line with the methodology, baseline emissions from heat generation is calculated as:

$$BE_{HG,y} = \frac{HG_{PJ,y} \times EF_{CO_2,FF,boiler}}{\eta_{BL,boiler}}$$

Net quantity of heat generated in year  $y$  with biogas from the new anaerobic digester (GJ) shall be monitored ex-post. Ex-ante estimation consider historical (1 year) fuel consumption /32/, density of fuel oil 0.8kg/l /35/ and calorific value of fuel oil /35/. Accordingly,  $HG_{PJ,y}$  is estimated to be 139 TJ/year. The efficiency of boiler ( $\eta_{BL,boiler}$ ) considered 85% default as per Tool to determine the baseline efficiency of thermal or electric energy generation systems /33/.  $CO_2$  emission factor of the fossil fuel type used in the boiler for heat generation in the absence of the project activity ( $tCO_2/GJ$ ) is as per IPCC default value 0.0774 /34/. Accordingly,  $BE_{HG,y}$  is estimated to be 9,126  $tCO_2e$ .

**Project Emissions:**

Sources of project emissions have been identified and they are in accordance with the adopted methodology /07/.

Total estimated project emissions as per ACM0014 version 07.0 are the sum of the below calculated in line with the tool 'Project and leakage emissions from anaerobic digesters':-

- i) Project emissions associated with the anaerobic digester ( $PE_{CH_4,y}$ );
- ii) Project emissions from flaring of biogas ( $PE_{flare,y}$ ); and
- iii)  $CO_2$  emissions from consumption of electricity ( $PE_{EC,y}$ ) and/or fossil fuels ( $PE_{FC,y}$ )

**Project emissions from physical leakage of methane from the anaerobic digester ( $PE_{CH_4,y}$ ):**

In line with the tool 'Project and leakage emissions from anaerobic digesters'.  $PE_{CH_4,y}$  is calculated as:

$$PE_{AD,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH_4,y} + PE_{flare,y}$$

Following steps are followed in line with the tool:

**Step 1: Determination of the quantity of methane produced in the digester ( $Q_{CH_4,y}$ ):** Following option 1 monitored data shall be used as per "tool to determine the mass flow of a greenhouse gas in a gaseous stream". For ex-ante estimation, quantity of biogas produced is considered as per project proposal /16/ and amounts to 9,204,545.45  $m^3$ .

**Step 2: Determination of project emissions from electricity consumption ( $PE_{EC,y}$ ):** The consumption of electricity in the anaerobic digester shall be sourced from the biogas generator and hence  $PE_{EC,y}$  is considered zero in line with the tool. In the event project consumes grid electricity the same shall be monitored and project emissions shall be calculated as per "Tool to calculated baseline, project and/or leakage emission from electricity consumption",

**Step 3: Determination of project emissions from fossil fuel consumption ( $PE_{FC,y}$ ):** In case, fossil fuel is consumed, project emissions shall be calculated as below:

$$PE_{FC,y} = FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y} \quad (1)$$

Fossil fuel consumption shall be monitored ex-post, and for ex-ante estimation zero consumption is considered and hence  $PE_{FC,y}$  is zero.

**Step 4: Determination of project emissions of methane from the anaerobic digester ( $PE_{CH_4,y}$ ):** Project emissions of methane from the anaerobic digester include emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester. These emissions are calculated using a default emission factor ( $EF_{CH_4,default}$ ), as follows:

$$PE_{CH_4,y} = Q_{CH_4,y} \times EF_{CH_4,default} \times GWP_{CH_4}$$

Quantity of biogas generation shall be monitored ex-post. For ex-ante estimation, it is estimated considering potential biogas generation and methane fraction as per project proposal /16/. Accordingly,  $PE_{CH_4,y}$  is calculated to be 4,530.94 tCO<sub>2</sub>.

**Step 5: Determination of project emissions from flaring of biogas ( $PE_{flare,y}$ ):**

Enclosed flare is installed for flaring. It is verified from flare specification that the enclosure height is 7.19 m, while its diameter is 950 mm /45/. Therefore it meets the specification as per flare tool /02/. In line with tool "project emissions from flaring"  $PE_{flare,y}$  is determined as below:

$$F_{CH_4,RG,m} = V_{m,db} \times v_{CH_4,m,db} \times \rho_{CH_4,m}$$

In line with the tool, the project participant chooses the option A: apply a default value for flare efficiency. The flare efficiency for the minute m ( $\eta_{flare,m}$ ) is 90% when the following two conditions are met to demonstrate that the flare is operating:

- (1) The temperature of the flare ( $T_{RG,m}$ ) and the flow rate of the residual gas to the flare ( $F_{RG,m}$ ) is within the manufacturer's specification for the flare ( $SPEC_{flare}$ ) in minute m: and
- (2) The flame is detected in minute m ( $F_{lare,m}$ )

The flare efficiency in the minute m shall be adjusted, as a conservative approach, by subtracting 0.1 from the efficiency. Therefore, The flare efficiency for the minute m ( $\eta_{flare,m}$ ) of 80% will be applied. If the above condition is not complied,  $\eta_{flare,m}$  is 0% shall be applied.

Ex-post the biogas flow to flare shall be monitored. Ex-ante the same is considered zero.

#### Leakage Emissions:

In line with the methodology leakage emissions are discussed as per tool 'Project and leakage emissions from anaerobic digesters' /36/. Option 2 of the tool (equation no. 7) shall be used as follows:

$$LE_{AD} = LE_{storage} = F_{ww,CH_4,default} \times Q_{CH_4,y} \times GWP_{CH_4}$$

Quantity of methane produced ( $Q_{CH_4,y}$ ) shall be monitored ex-post. Ex-ante the same is estimated considering quantity of biogas generation (9,204,545 m<sup>3</sup>), methane percentage (55%) as per project proposal /16/.  $F_{ww,CH_4,default}$  (Default factor representing the remaining methane production capacity of liquid digestate (fraction)) is 0.150 as per the tool /36/ and GWP of methane is 25 as per UNFCCC /37/. Therefore,  $LE_{storage}$  is estimated to be 13,593 tCO<sub>2</sub>.

Therefore, emission reductions estimated ex-ante to be:

$$\begin{aligned} E_{Ry} &= BE_y - PE_y - LE_y \\ &= 106,114 - 4,531 - 13,593 \\ &= 87,990 \text{ tCO}_2 \end{aligned}$$

Findings

N/A



	depth of the lagoon on methane generation ( $f_d$ )			lagoon is determined to be more than 2m. This is verified from the lay out diagram /10/, /26/.
7	Grid emission factor in the year $y$ ( $EF_{grid,y}$ )	tCO <sub>2</sub> /MWh	0.5897	Country specific grid emission factor is considered as per publicly available report for Thailand /31/ and which is in line with grid emission factor tool /38/.
8	CO <sub>2</sub> emission factor of the fossil fuel (HFO); $EF_{CO_2,FF,boiler}$	tCO <sub>2</sub> /GJ	0.0774	IPCC default value /34/.
9	Efficiency of the boiler ( $\eta_{BL,boiler}$ )	%	85%	Default value as per Tool to determine the baseline efficiency of thermal or electric energy generation systems /33/.
10	Global warming potential for CH <sub>4</sub> ( $GWP_{CH_4}$ )	Default value	25	Default value as per UNFCCC /37/.
11	N <sub>2</sub> O emission factor for nitrogen from sludge applied to land ( $EF_{N_2O,LA,sludge}$ )	t N <sub>2</sub> O/t N	0.016	Default value in line with the methodology /08/.
12	Methane conversion factor for the application of sludge to lands ( $MCF_{sludge,LA}$ )	Default value	0.05	Default value in line with the methodology /08/.
13	Global warming potential for N <sub>2</sub> O ( $GWP_{N_2O}$ )	Default value	298	Default value as per UNFCCC /37/.
14	Factor representing the remaining CH <sub>4</sub> production capacity of liquid digestate ( $F_{ww,CH_4,default}$ )	Fraction	0.15	Default value in line with the methodology /08/.
15	Low heating value ( $LHV_{CH_4}$ )	MJ/kg	50.4	IPCC default value /34/.
16	Fraction of biogas that leaks from the digester ( $EF_{CH_4,default}$ )	m <sup>3</sup> biogas leaked / m <sup>3</sup> biogas produced	0.05	The project participant selects the default leak factor of 0.05 m <sup>3</sup> biogas leaked per m <sup>3</sup> of biogas produced. The methodology /08/ has been checked and this is found to be acceptable.
17	Universal ideal	Pa.m <sup>3</sup> /kmol.K	8,314	Default in line with the

	gases constant (Ru)			tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /40/.
18	Molecular mass of greenhouse gas <i>i</i> (CH <sub>4</sub> )	kg/kmol	16.04	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /40/.
19	Total pressure at normal conditions (P <sub>n</sub> )	Pa	101,325	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /40/.
20	Temperature at normal conditions (T <sub>n</sub> )	K	273.15	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /40/.
21	Manufacturer's flare specifications for temperature and flow rate (SPEC <sub>flare</sub> )	Temperature - °C Flow rate or heat flux – kg/h or m3/h	Flow rate: Minimum 500 maximum 750 Temperature : Min= 800 deg C Max= 1000 dec C	Verified from specifications provided by manufacturer /45/

**Parameters Monitored ex-post:**

The ex-post parameters that are mentioned in the methodology are included in the PDD and are provided in compliance with the methodology, and they will be monitored during the crediting period:

	Parameter	Description/Assessment
1	Quantity of wastewater that is treated in the anaerobic digester; F <sub>PJ,dig,m</sub> (m <sup>3</sup> /month)	Monitored continuously using a flow meter. Measurements will be recorded in the SCADA system. The measurements will be aggregated to give monthly values and reported quarterly. The flow meter will undergo maintenance / calibration in accordance with the manufacturer's specifications.
2	Chemical oxygen demand in the wastewater that is treated in the anaerobic digester; COD <sub>dig,m</sub> (tCOD/m <sup>3</sup> )	This is monitored on a daily basis. Average values will be calculated and reported quarterly.
3	Average temperature at the project site in month <i>m</i> ; T <sub>2,m</sub> (K)	Monitored continuously and recorded monthly. The project proponent has clarified that average temperature at the project site obtained from weather statistics will be converted to Kelvin. This is deemed acceptable.
4	Net quantity of electricity generated in year <i>y</i> with biogas from the new	This is monitored continuously measured using the energy meter installed in the project activity. The meter will be under the

	anaerobic ( $EG_{P,J,y}$ )	control of PEA and hence all QA/QC to be adopted as per PEA regulations. Data will be recorded monthly.
5	Amount of electricity in the year y that is consumed at the project site for the project activity; $EC_{P,J,y}$ (MWh/yr)	Continuous monitoring using an electric meter with monthly recording and aggregated annually. The meter will be under the control of PEA and hence all QA/QC to be adopted as per PEA regulations.
6	Net quantity of heat generated in year y by the biogas from proposed project activity combusted in the TSML boilers ( $HG_{P,J,y}$ )	The value will be calculated based on the amount of biogas combusted in the boiler, the monitored methane content in the biogas, the net calorific value of methane and the rated efficiency of the TSML boiler. The parameter based on which the calculation will be done is recorded daily.
7	Total amount of biogas collected at the outlet of the digester tanks, Volumetric flow of the gaseous stream $V_{biogas,y}$ (m <sup>3</sup> /yr)	Monitored continuously using a gas flow meter and measurements will be recorded quarterly. The meters will undergo maintenance/calibration as per the manufacturer's specifications.
8	Concentration of methane in the biogas in the outlet of digester; $W_{CH_4,biogas,y}$ (Kg CH <sub>4</sub> /m <sup>3</sup> )	Monitored continuously using a gas analyzer and recorded monthly. The meters will undergo maintenance/calibration as per the manufacturer's specifications or at least annually.
9	Volumetric flow of the residual gas on dry basis at normal conditions in the minute m; $V_{RG,m}$ (Nm <sup>3</sup> )	Measured continuously on dry basis using flow meter. The values will be averaged every minute. The flow meter will be calibrated as per manufacturer's specifications but at least once every three years.
10	Temperature in the exhaust gas in the flare; $T_{flare}$ (°C)	Monitored continuously using a thermocouple. Recorded when the flare is in operation. Thermocouple will be subject to calibration or replacement as per manufacturer's specification.
11	Volumetric fraction of component <i>methane</i> in the residual gas on a dry basis in minute m; $V_{CH_4,RG,m}$	Measured using continuous gas analyser. The value will be averaged on a minute basis. The gas analyser will be periodically calibrated according to manufacturer's specifications/recommendation or at least annually.
12	Flame detection of flare in the minute m; $Flamem$ (Flame on or Flame off)	Measured using a fixed installation optical flame detector, monitored once per minute. Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations.
13	Quantity of fossil fuel type k combusted in the thermal oil boiler; $FC_{k,y}$	Monitored continuously using a flow meter. The records will be kept as and when fossil fuel is used in the project activity. Purchase records to be used for cross checking.
14	CO <sub>2</sub> emission factor of fossil fuel type k combusted in the boiler; $EF_{CO_2,k,y}$ (tCO <sub>2</sub> /TJ)	National value (if available) or most recent IPCC values.
15	Net calorific value of fossil fuel type k combusted in the boiler; $NCV_{k,y}$ (GJ/tonne)	National value (if available) or most recent IPCC values.
16	Average technical	Publicly available sources preferably

	transmission and distribution losses for providing electricity to the project activity (electricity import); $TDL_{i,y}$ (%)	Ministry of Energy, Thailand
17	Quantity of sludge applied to land in year; $S_{LA,y}$ (m <sup>3</sup> /month)	Continuously monitored in weigh bridge and aggregated monthly.
<p><b>Management system and quality assurance:</b></p> <p>The project participant plans to implement an automated monitoring system. Data related to the project will be recorded at the frequency specified in the monitoring plan and stored in electronic or paper form as appropriate. These records will be kept during the crediting period and an additional 2 years after the end of crediting period. Calibration and maintenance of monitoring equipment will also be done as defined in monitoring plan. Therefore, it is concluded that data management and QA/QC procedures are sufficient to ensure that the emission reductions from the project can be reported ex-post and verified.</p> <p>The operational and management structure implemented by PP is summarized below:</p> <ul style="list-style-type: none"> <li>• The process operator/technician will collect all monitoring data as per required frequency.</li> <li>• Each process head to receive the data and review the data to ensure quality control measures. This shall be supported by external consultancy firm and forward to the plant manager.</li> <li>• The plant manager shall approve all monitoring data.</li> </ul>		
<b>Findings</b>	CAR 07 was raised as calibration frequency of some monitoring parameters were not defined along with clarification for monitoring parameter of COD and continuous grievance mechanism. PP has revised the PDD and GS passport incorporating all necessary changes as per applicable requirements. Hence, response was accepted and CAR was closed.	
<b>Conclusion</b>	RINA confirms that the monitoring plan mentioned in the PDD is in accordance with the requirements mentioned in the monitoring methodology and the local regulatory requirements, as well the monitoring arrangements described in the monitoring plan are feasible within the project design. RINA is of the opinion that the monitoring plan will give opportunity for real measurement of achieved emissions reductions for 2 years after the crediting period.	

#### D.4.11. Sustainability Monitoring plan

<b>Means of validation</b>		<b>Parameter</b>	<b>Description/Assessment</b>
	/1/	Air quality	The level of SO <sub>x</sub> and NO <sub>x</sub> values shall be monitored as a result of biogas usage in boilers by third party annually. The target is to maintain the level as per national standard.
	/2/	Water Quality	COD of the wastewater at the outlet of digester system will be measured using colorimetric method in the on-site laboratory to ensure lower COD content than entering the wastewater into UASB, which will be monitored daily.
	/3/	Quantitative employment and income generation	The parameter will monitored and reported once in a year by showing the HR records of the no. employees and income of employees.
	/4/	Quality of employment	The parameter shall be monitored considering trainings given to project staff to enhance quality of employment by project proponent during each monitoring period.



<b>Findings</b>	CAR 08 was raised to clarify for GS indicator GS2 and GS4 and for indicators 'Access to affordable and clean energy services', 'quality of employment' and air quality' which PP has further clarified in the GS passport and the details found correct as per the actual scenario. Hence, CAR is closed.
<b>Conclusion</b>	RINA confirms that sustainability monitoring plan and indicators included in the GS passport confirm to the sustainable development matrix outlined in the GS passport and conforms to GS requirement version 2.2.

#### D.5. Duration and crediting period

<b>Means of validation</b>	PP has chosen renewable crediting period (7 year period that can be renewed twice, for a total of 21 years) as per section V.a.1 of GS requirement v2.2 /03/. Being a retroactive project, the project is eligible for retroactive crediting for realised emission reductions prior to Gold Standard registration of a maximum period of two years as per section V.a.2.3 of GS requirement v2.2 /03/.
<b>Findings</b>	NA
<b>Conclusion</b>	RINA confirms that that duration and crediting period considered for the project activity meets the requirement as outlined section 'V' of GS requirement version 2.2.

#### D.6. Environmental impacts

<b>Means of validation</b>	Environmental impact assessment is not required as per the Thailand regulations for the project activity /41/. An Initial Environmental Evaluation (IEE) has been done for the project activity /24/. As per the IEE no significant environmental and social impacts have been identified throughout the project.
<b>Findings</b>	CR 04 was raised to provide the copy of the IEE report and explain the impacts in the PDD to which PP has provided the impacts as per IEE in the PDD. DOE found the reporting of impacts are as per the IEE which are insignificant. Hence, CR was closed.
<b>Conclusion</b>	RINA confirms that the project does not result any negative environmental and social impact and meets the sustainable development criteria as defined by GS requirements.

#### D.7. Local stakeholder consultation

<b>Means of validation</b>	<p>The project being retroactive registration initial local stakeholder consultation is not required as per GS requirement /03/. However, PP conducted initial local stakeholder consultation process on 10/07/2009 which was explained in PDD. PP has provided compiled stakeholder report which includes detailed stakeholder consultation process, list of attendees, comments raised and addressed by PP /42/. No negative comment found as per the report /42/. The validation team interviewed some local stakeholders during site visit who confirmed the stakeholder meeting and no negative comment raised by them. As per GS requirement, PP has conducted a stakeholder feedback round and project related documents were made available from 16/01/2017 to 16/03/2017 at project site, South Pole Carbon Asset Management Ltd. website, Papop Renewable Ltd. Website and GS website and invited relevant stakeholders via personal invitation, postal invitation and e-mail /06/. Stakeholder invitation tracking is presented in the GS passport. Two feedback received from two stakeholders which has been presented in the passport. Feedbacks were incorporated by PP satisfactorily.</p> <p>Continuous input / grievance mechanism: PP has made provision to record and address any input/grievance received for the project at the project site. A registry is maintained to record the input/grievance received related to the project and how the comment is addressed. In addition, Contact person name, address and telephone number was provided to all stakeholders during feedback round so as to provide any comment. Therefore, the project proponent has made a systematic approach for receiving continuous input / grievance related to the project. The arrangement of continuous input / grievance mechanism was checked during site visit and confirm to be satisfactorily meeting GS requirements.</p>
<b>Findings</b>	CR 05 was raised to provide local stakeholder details with feedback received to which PP has transparently provided the stakeholder feedback round details with photographs in the GS passport. Hence, response is accepted and CR is closed.

<b>Conclusion</b>	RINA confirms that the stakeholder consultation process held for the project activity meets the requirement of GS requirement version 2.2.
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#### D.8. Pre-feasibility assessment

<b>Means of validation</b>	The project being retroactive registration, PP has opted fast track option for pre-feasibility assessment as per Annex P of GS version 2.2 /43/. DOE having required criteria as per Annex P of GS version 2.2 accepted the fast track pre-feasibility assessment. PP has submitted relevant documents to GS under the project ID GS3992. The validation team shared the validation workplan to GS before the site visit. No comment received from GS as part of feedback from GS on fast track pre-feasibility assessment. Further, PP has signed a MoU with GS on 08/12/2016 as part of fast-tracking the project activity /44/. Hence the pre-feasibility assessment as per GS requirement is met.
<b>Findings</b>	CAR 09 was raised to provide pre-feasibility assessment details in GS passport to which PP has provided the details in passport along with the MoU signed with GS. Hence, response is accepted and CAR was closed.
<b>Conclusion</b>	RINA confirms that the pre-feasibility assessment conform to GS requirement version 2.2.

#### SECTION E. Internal quality control

The draft final validation report before being submitted to the client will be subjected to an independent technical review to confirm that all validation activities has been completed according to the pertinent RINA's procedures. The technical review will be performed by a technical reviewer(s) qualified in accordance with the RINA's qualification procedure.

#### SECTION F. Validation opinion

RINA Services Spa (RINA) has performed validation of the project activity "Papop Biogas and Renewable Energy Project in Thailand" in Thailand, with regard to the relevant requirements for GS VER activities.

The review of the project design document and the subsequent follow-up interviews have provided RINA with sufficient evidence to determine the fulfillment of the stated criteria.

The project correctly applies the approved baseline and monitoring methodology "ACM0014", "Treatment of wastewater", version 7 of 04/11/2016.

The biogas recovered from waste water is sent for flaring, power generation and heat generation, which results in reduction of CO<sub>2</sub> and CH<sub>4</sub> emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the "Papop Biogas and Renewable Energy Project in Thailand" are estimated to be on average 87,990 tCO<sub>2e</sub> per year over the selected 7 years renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project's emission reductions and of the sustainable development indicators. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is RINA's opinion that the project participants are able to implement the monitoring plan.

In conclusion, it is RINA's opinion that the project activity "Papop Biogas and Renewable Energy Project in Thailand" in Thailand, as described in the PDD, version 03 of 25/09/2017, Gold Standard Passport version 02 of 12/09/2017 meets all relevant UNFCCC requirements for the GS VER and all relevant host Party criteria and correctly applies the baseline and monitoring methodology "ACM0014", "Treatment of wastewater", version 7 of 04/11/2016.

## Appendix 1. Abbreviations

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CDM-PCP	Clean Development Mechanism Project Cycle Procedure
CDM-PS	Clean Development Mechanism Project Standard
CDM-VVS	Clean Development Mechanism Validation and Verification Standard
CH <sub>4</sub>	Methane
CR	Clarification Request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GS	Gold Standard
GWP	Global Warming Potential
IEE	Initial Environmental Examination
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
LSC	Local Stakeholder Consultation
MoU	Memorandum of Understanding
MoV	Means of Verification
MP	Monitoring Plan
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.
SD	Sustainability Development
SMP	Sustainability Monitoring Plan
SS(s)	Sectoral Scope(s)
UNFCCC	United Nations Framework Convention on Climate Change
VER	Voluntary Emission Reduction

## Appendix 2. Competence of team members and technical reviewers



### 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 SECTORIAL 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 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.

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/ricosciuto da  
RINA Services S.p.A. is accredited /recognized by

UNFCCC	quale Entità Operativa Designate (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

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Page 1 of 1



**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.

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/consociato da  
 RINA Services S.p.A. is accredited /recognized by

UNFCCC	quale Entity Operative Designate (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

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Page 1 of 1



**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.

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

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

UNFCCC	quale 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
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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

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### Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Swiss Carbon Value Limited	PDD for project activity "Papop Biogas and Renewable Energy Project in Thailand" in Thailand	Version 01 of 29/11/2016, version 02 of 12/09/2017 and version 03 of 25/09/2017	PP
2	UNFCCC	Methodological tool "Project emissions from flaring"	Version 02 of 20/07/2012	Others
3	The Gold Standard	Gold Standard Requirements	version 2.2 of 01/06/2012	Others
4	The Gold Standard	Gold Standard Toolkit	version 2.2 of 01/06/2012	Others
5	CDM Executive Board	Clean Development Mechanism validation and verification standard for project activities	Version 01, 03/03/2017	Others
6	Swiss Carbon Value Limited	GS passport for the project activity "Papop Biogas and Renewable Energy Project in Thailand"	Version 01 of 16/03/2015 and version 02 of 12/09/2017	PP
7	UNFCCC	Tool for the demonstration and assessment of additionality	Version 07	Others
8	UNFCCC	ACM0014 'Large-scale Consolidated Methodology: Treatment of wastewater'	Version 07 of 04/11/2016	Others
9	UNFCCC	Project and leakage emissions from anaerobic digesters	Version 01	Others
10	Papop Renewable Company Limited	Drawing of open lagoons	TS-WP-03	PP
11	Department of Industrial Works, Ministry of Industry, Thailand	Factory Act, B.E. 2535 (1992)	<a href="https://www.jetro.go.jp/ext_images/thailand/e_activity/pdf/minreg2.pdf">https://www.jetro.go.jp/ext_images/thailand/e_activity/pdf/minreg2.pdf</a>	Others
12	Ministry of Industry, Thailand	Industrial effluent standards	Ministerial notification No.2 B.E.2539	Others
13	Thailand Pollution Control Department	Guideline and criteria for design the wastewater treatment system and water improvement system	<a href="http://www.pcd.go.th/count/waterdl.cfm?FileName=1_CoP_All.pdf">www.pcd.go.th/count/waterdl.cfm?FileName=1_CoP_All.pdf</a>	Others
14	UNFCCC	Kyoto Protocol, status of ratification	<a href="http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php">http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php</a>	Others
15	UNFCCC	Project Design Document Form for CDM Project Activities (CDM-PDD-FORM), version 10.1 and Attachment "Instructions for filling out the project design document form for CDM project activities" dated 22/07/2016	version 10.1 of 28/06/2017	Others
16	Thai San Miguel Liquor Company Limited and Papop Renewable Company Limited	Agreement between Thai San Miguel Liquor Company Limited and Papop Renewable Company Limited for construction, commission and operation of wastewater anaerobic treatment and biogas capture at its distillery plant (Thai San Miguel Liquor Company Limited)	Agreement dated 22 August 2008	PP

17	Department of Industrial Work	Operational license issued to Papop Renewable Co. Ltd. for biogas production	Operational license valid until 01/01/2019	PP
18	University of Minnesota	Thailand: International ratification on Human Rights Treaties	<a href="http://www1.umn.edu/humanrts/research/ratification-thailand.html">http://www1.umn.edu/humanrts/research/ratification-thailand.html</a>	Others
19	Ministry of Labour	Labour Relations Act B.E.2518	DLPW.No. 45/2547 dated 14/02/1975	Others
20	Kingdom of Thailand	Constitution of the Kingdom of Thailand	<a href="http://www.krisdika.go.th/wps/wcm/connect/d230f08040ee034ca306af7292cbe309/CONSTITUTION+OF+THE+KINGDOM+OF+THAILAND+%28B.E.+2560+%282017%29%29.pdf?MOD=AJPERES&amp;CACHEID=d230f08040ee034ca306af7292cbe309">http://www.krisdika.go.th/wps/wcm/connect/d230f08040ee034ca306af7292cbe309/CONSTITUTION+OF+THE+KINGDOM+OF+THAILAND+%28B.E.+2560+%282017%29%29.pdf?MOD=AJPERES&amp;CACHEID=d230f08040ee034ca306af7292cbe309</a>	Others
21	Ministry of Labour	Labour protection Act B.E.2541	<a href="http://www.mol.go.th/sites/default/files/images/jpg/01.pdf">http://www.mol.go.th/sites/default/files/images/jpg/01.pdf</a>	Others
22	Ministry of Industry	Notification of Ministry of Industry on Industrial Effluent standard 1992		Others
23	United Nations Office on Drugs and Crime	United Nations Convention against Corruption Signature and Ratification Status as of 12 December 2016	<a href="https://www.unodc.org/unodc/en/treaties/CAC/signatories.html">https://www.unodc.org/unodc/en/treaties/CAC/signatories.html</a>	Others
24	Advance Energy Plus Co., Ltd.	Initial Environmental Examination report	IEE Report dated April 2010	Others
25	Papop Co. Ltd.	Commissioning certificate of biogas and wastewater treatment system	Dated 01/05/2010	Others
26	Gamma Engineering Co. Ltd.	Lay out plan of anaerobic pond	Layout drawing dated 14/07/2007	PP
27	Ministry of Industry	Plant operational license issued to TSML	License dated valid until 01/01/2022	PP
28	Guascor	Commissioning certificate of 1.904 MW (Serial no. 330595 and serial no. 330594) biogas fired generator	Commissioning report dated 21/05/2010	PP
29	Papop Renewable Co. Ltd.	ODA declaration as per GS requirement	ODA declaration dated 15/09/2017	PP
30	Vcare Environment Services Co. Ltd.	Ambient noise monitoring report	Monitoring report dated 04/07/2016	PP
31	Bureau of Analysis and Evaluation	Study of greenhouse gas emissions from the power generation of Thailand in 2014	<a href="http://tver.tgo.or.th/2015/file/download/Grid_Emission_Factor_124.pdf">http://tver.tgo.or.th/2015/file/download/Grid_Emission_Factor_124.pdf</a>	Others
32	Thai San Miguel Liquor Company Limited	Amount of HFO consumed in boilers from February 2008 to November 2008	Log book records	PP
33	UNFCCC	Tool: Determining the baseline efficiency of thermal or electric energy generation systems	Version 02 of 27/11/2015	Others
34	IPCC	2006 IPCC Guidelines for National Greenhouse Gas Inventories	Volume 2: Energy	Others
35	The Shell Company of Thailand Limited	Certificate of quality and analysis (Fuel oil)	Dated 29/11/2008	PP
36	UNFCCC	Tool: Project and leakage emissions from anaerobic digesters	Version 01, Annex 32, EB 66	Others
37	CDM Executive Board	Standard for the application of the global warming potentials to clean development mechanism project	version 1, Annex 3 of EB 69 dated 13/09/2012	Others



		activities and programme of activities for the second commitment period of the Kyoto Protocol		
38	UNFCCC	Tool to calculate the emission factor for an electricity system	Version 05 of 27/11/2015	Others
39	DEDE, Ministry of Energy	Electric Power In Thailand – 2011	Annual report	PP
40	UNFCCC	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	Version 03 of 27/11/2015	Others
41	Notification of Natural Resources and Environment Ministry	The regulation of types and specifications of projects or business that require an environment impact assessment (EIA) including the principles, procedures, practices and guidelines for making an EIA report	Enhancement and Conservation of Natural Environmental Quality Act of 1992", Part 4, Section 46-51	PP
42	Advance Energy Plus Co., Ltd.	Local stakeholder consultation meeting held on 10/07/2009	Report dated August 2009	PP
43	Gold Standard Foundation	Fast track option for retroactive projects	Annex P of GS version 2.2	Others
44	MoU between GS foundation and Swiss carbon Value Ltd.	MoU between GS foundation and Swiss carbon for fast-tracking for GS v2.2 retroactive project activity "Papop Biogas and renewable energy project in Thailand"	MoU dated 08/12/2016	PP
45	BKE Combustion Controls Co. Ltd.	Flare specification	Dated 31/07/2009	PP

## Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CR from this validation

<b>CR ID</b>	01	<b>Section no.</b>	D.3	<b>Date:</b> 05/01/2017
<b>Description of CR</b>				
PP is requested to provide the following documents:				
1. The agreement copy between TSML and Papop				
2. Technical specification of the project technology				
3. Operational license of the project plant				
4. Commissioning certificate of the project activity including the gas engine				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The following documents are submitted to DOE:</i>				
1. <i>The agreement between TSML and Papop as Att-2.1</i>				
2. <i>Technical specification of the project technology</i>				
2.1 <i>Technical specification of biogas system is based on information in the BOT agreement as Att-2.1.</i>				
2.2 <i>Technical specification of gas engine as Att-2.2</i>				
2.3 <i>Technical specification of boiler as Att-2.3</i>				
3. <i>Operational license of the biogas system as Att-2.4 and the power production as Att-2.5</i>				
4. <i>Commissioning certificate of the biogas system and the gas engine as Att-3.2 and 3.4, respectively.</i>				
<b>Documentation provided by project participant</b>				
<i>As stated above</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
The requested documents are provided by PP and details are found consistent with actual scenario and reported details in PDD and GS passport. Hence, response is accepted and CR is closed.				

<b>CR ID</b>	02	<b>Section no.</b>	D.4.5	<b>Date:</b> 05/01/2017
<b>Description of CR</b>				
PP is requested to provide documentary evidence that no solid material shall be treated in the project activity.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The UASB system generates very small of amount of solid material. The evidence as Att – 3.2 COD biogas system</i>				
<b>Documentation provided by project participant</b>				
<i>As stated above</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
As per commissioning certificate, the project generates very small amount of solid material. In addition, the system treats only wastewater coming out of the distillery factory and no other solid material is treated as discussed with project proponent. Hence, response is accepted and CR is closed.				

<b>CR ID</b>	03	<b>Section no.</b>	D.4.7	<b>Date:</b> 05/01/2017
<b>Description of CR</b>				
PP is requested to clarify the followings with documentary evidence wherever necessary:				
<ol style="list-style-type: none"> <li>1. Evidence for investment decision date</li> <li>2. Evidence of project start date</li> <li>3. Operational lifetime of the project technology</li> <li>4. Evidence for input values considered for IRR analysis (Project cost, O &amp; M cost, benchmark calculation etc.)</li> <li>5. PDD mention expected electricity exported to grid is 11,206 MWh; whereas the emission reduction shows electricity generation is 10,802 MWh/year. Please clarify.</li> <li>6. Please provide the source of considering average wholesale tariff rate of biogas electricity.</li> <li>7. Also provided the copy of agreement based on which selling price of biogas electricity to TSML factory is considered.</li> <li>8. Provided the study report considered for common practice analysis showing list of distillery plants in the host country.</li> </ol>				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The following documents are submitted to DOE.</i>				
<ol style="list-style-type: none"> <li>1. <i>Evidence for investment decision date is referred to the agreement between TSML and Papop Renewable on 22/08/2008 as Att-2.1.</i></li> <li>2. <i>Evidence of project start date is based on the first payment to a construction company (Jintima) as Att-2.6.</i></li> <li>3. <i>The operation lifetime of the project technology is confirmed by Papop Co.,Ltd as a technology provider. This evidence as Att-3.2 Commissioning certificate of biogas system.</i></li> <li>4. <i>The project is applied ACM0014 - version 07. The assessment of additionality has been justified as per paragraph 20 of ACM0014. The input value of IRR analysis is not required. The section B.5 of PDD is revised in complied with the methodology applied.</i></li> <li>5. <i>The expected electricity exported to grid is calculated as 10,802 MWh/year. It is determined based on the maximum generation out put of power generator deducted by the auxiliary consumption of the biogas system. This exported value will be also applied in the ex-ante emission reduction sheet.</i></li> <li>6. <i>The project is applied ACM0014 - version 07. The assessment of additionality has been justified as per paragraph 20 of ACM0014. The source of wholesale tariff rate is not required. The section B.5 of PDD is revised in complied with the methodology applied.</i></li> <li>7. <i>The selling price is based on the terms described in the agreement between TSML and Papop Renewable as Att-2.1.</i></li> <li>8. <i>The project is applied ACM0014 - version 07. The assessment of additionality has been justified as per paragraph 20 of ACM0014. The study report considered for common practice analysis is not required. The section B.5 of PDD is revised in complied with the methodology applied.</i></li> </ol>				
<b>Documentation provided by project participant</b>				
<i>Revised PDD</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
It is described transparently in the PDD and DOE is also of the opinion that the project meets the simplified procedure to identify baseline and demonstrate additionality as per the applied methodology ACM0014, version 07. Hence, investment analysis has been removed from the project design for additionality argument. The project is deemed automatic additional. Response is accepted and CR is closed.				

<b>CR ID</b>	04	<b>Section no.</b>	D.6	<b>Date:</b> 05/01/2017
<b>Description of CR</b>				

Kindly provide the IEE report and explain the parameters which are monitored as per regulation requirement. Provide copies of approval received for the project activity from competent authorities.	
<b>Project participant response</b>	<b>Date:</b> 12/09/2017
The IEE report is as Att-2.9. The translation in English has been provided in the section 9 – environmental mitigation measures.	
<b>Documentation provided by project participant</b>	
<i>As stated above.</i>	
<b>DOE assessment</b>	<b>Date:</b> 19/09/2017
IEE copy with English translation has been provided. The project does not result any adverse environmental impact. Also as per host country regulation, no environmental impact is necessary to carry out for the project activity. PP has submitted all project approval copies which confirm the project activity as per applicable regulations. Hence, response is accepted and CR is closed.	

<b>CR ID</b>	05	<b>Section no.</b>	D.7	<b>Date:</b> 05/01/2017
<b>Description of CR</b>				
Provide copies of local stakeholder held for the project activity. Also the details of feedback				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
The minute of local stakeholder consultation and its details as Att-2.10.				
<b>Documentation provided by project participant</b>				
<i>As stated above.</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
Stakeholder consultation process and the feedback round has been transparently described in the GS passport. Relevant copies of photographs are pasted in GS passport as evidence. It was confirmed during interview with stakeholders that no negative comment has been raised from stakeholders. Hence, response is accepted and CR is closed.				

Table 2. CAR from this validation

<b>CAR ID</b>	01	<b>Section no.</b>	D.1	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
As per GS requirement V2.2 the latest version of UNFCCC PDD template shall be used which is available the time of first submission of the project activities to The Gold Standard Foundation. The latest template available at UNFCCC website is not used and provide details of initial submission date to GS. The title of the methodology indicated in page 1 of the PDD is not correct.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
The PDD has been revised into the latest version of UNFCCC PDD template. Also, the title of methodology mentioned in page 1 has been corrected as the PDD version 02, 12/09/2017.				
<b>Documentation provided by project participant</b>				
<i>Revised PDD</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has revised the PDD using latest UNFCCC large scale PDD template. DOE checked the same from UNFCCC website and confirm to be correct. This meets the GS requirement version 2.2. Response is accepted and CAR is closed.				

<b>CAR ID</b>	02	<b>Section no.</b>	D.4.3	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
Kindly provide details how the residence time of organic matter in the anaerobic lagoon is estimated to be 177 days as described in the PDD.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The residence time of organic matter in the anaerobic lagoon is estimated to be 148 days. The information is corrected in the revised PDD. The residence time is considered from the volume of existing open lagoons (as Att-2.11) in the absence of project activity and the flow rate of wastewater into the baseline system. This estimation has been provided in the revised ER calculation sheet.</i>				
<b>Documentation provided by project participant</b>				
<i>As stated above.</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has calculated the residence time as per baseline lagoon design capacity and flow rate of wastewater. The calculation is based on actual baseline scenario and hence accepted by the validation team. Response is accepted and CAR is closed.				

<b>CAR ID</b>	03	<b>Section no.</b>	D.4.4	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
Under project boundary section (B.3) of PDD emission source under project activity from on-site fossil fuel consumption is highlighted as not applicable which is not correct as under the project activity fuel oil shall be used in boilers.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The existing boilers consume fossil fuel for thermal generation. The emission source from this activity is included in the revised PDD.</i>				
<b>Documentation provided by project participant</b>				
<i>Revised PDD</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has revised the baseline emission sources in the updated PDD and included as source of emission from on-site fossil fuel consumption. The revised details are found correct as per actual project scenario and hence CAR is closed.				

<b>CAR ID</b>	04	<b>Section no.</b>	D.4.6	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
The explanation on Pre-announcement is not provided in GS passport. Also, ODA declaration is not included in GS passport. Please also clarify if the project was registered under other certification scheme.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The explanation on Pre-announcement is included in the revised GS passport. Moreover, the ODA declaration is be included in the GS passport. The project was not registered under other certification scheme before.</i>				
<b>Documentation provided by project participant</b>				
<i>Revised GS passport</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
Revised GS passport includes details of pre-announcement and ODA declaration. It is also clarified and cross checked by DOE that the project is not registered in any other certification scheme for claiming emission reductions. Hence, CAR is closed.				

<b>CAR ID</b>	05	<b>Section no.</b>	D.4.8	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
Kindly provide credible reference for justification of assessment of safeguarding principles. Under sustainable development matrix while air quality is improved due to the project activity the same is scored zero. Reason for the same is requested to explain. PP is requested to provide source based on which the scoring on sustainability matrix has been done.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<i>The references for justification of assessment of safeguarding principles are provided as Att-2.12. According to SD Matrix, preliminary scoring of air quality indicator has been corrected to positive due to the project will contribute positive impact to air quality by reducing fossil fuel consumption in the existing boilers. In addition, exporting power to national grid will also reduce CO2 emission from power generation based fossil fuel in the system as well. The monitoring parameter of air quality is included in the sustainability monitoring plan.</i>				
<i>The references mentioned in the SD matrix are based on the information described in the IEE report (as Att-2.9). The relevant sources to scoring on sustainable development matrix are based on following documents or evidences.</i>				
1. <i>Air quality – emission certificate from supplier as Att-2.13. The certificate shows that the emission from gas engine is lower than the national standards.</i>				
2. <i>Water quality – COD removal efficiency by the project is based on the information on BOT agreement as Att-2.1. The COD of wastewater treated by the project will be improved and lower than the baseline scenario.</i>				
3. <i>Quantitative employment and income generation – organization chart of biogas system as Att-2.14. The average salary of employee in the project is referred to Att-3.6.</i>				
<b>Documentation provided by project participant</b>				
<i>As stated above</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has done necessary corrections related to safeguarding principles and provided credible sources of justification. For all indicators under sustainable development matrix, PP has provided reasonable justification with supporting evidence wherever applicable. DOE found the corrections are in line with applicable GS rules and national/international laws. Hence, response is accepted and CAR is closed.				

<b>CAR ID</b>	06	<b>Section no.</b>	D.4.9	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
<ul style="list-style-type: none"> <li>a) PP is requested to provide the project agreement copy based on which the input values under assumption (ER sheet) has been taken.</li> <li>b) Kindly provide documentary evidence for biogas generation, removal efficiency, methane percentage in biogas, biogas utilization in boiler and genset.</li> <li>c) Kindly provide the reference for calculation of CH<sub>4</sub> requirement in Genset and efficiency of getssets.</li> <li>d) For efficiency of boiler, kindly clarify why the boiler is considered as new boiler? Also the latest tool is not referred.</li> <li>e) GWP of methane is not updated in reference to commitment period.</li> <li>f) Provide source for considering EFCO<sub>2</sub> grid as 0.5897 tCO<sub>2</sub>/MWh</li> </ul>				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<p><i>The following documents and evidences are submitted to DOE;</i></p> <ul style="list-style-type: none"> <li>a. <i>The agreement between TSML and Papop as Att-2.1.</i></li> <li>b. <i>The technical details are based on following information;</i> <ul style="list-style-type: none"> <li>1. <i>The amount of biogas generation is based on the methane generation rate of 0.15 m<sup>3</sup> CH<sub>4</sub>/kg COD delivered and the total COD loading estimated in the project agreement as Att-2.1.</i></li> <li>2. <i>The amount of biogas sent to boiler system is based on the minimum methane supply of 14,000 Nm<sup>3</sup>/day. This is mentioned in the project agreement as Att-2.1. However, the amount of biogas sent to boiler is compared between the data calculating from project agreement and the required heating value from HFO consumption in the baseline and the specification of fuel oil as Att-2.15.</i></li> <li>3. <i>The amount of biogas sent to generator is based on the calculation of deduction of biogas sent to boiler system from the overall biogas generation.</i></li> </ul> </li> <li>c. <i>The reference for calculation of CH<sub>4</sub> requirement in gensets and efficiency of gensets is based on Att-2.2.</i></li> <li>d. <i>The efficiency of boiler has been revised to 85% because the existing boiler is considered as an old oil fired boiler. The latest tool (version 02) is applied with the project.</i></li> <li>e. <i>The GWP of methane has been revised the update value of 25 in the revised ER calculation sheet and PDD.</i></li> <li>f. <i>The source of grid emission factor is based on a study on Thailand Grid Emission Factor 2014 as Att-2.16.</i></li> </ul>				
<b>Documentation provided by project participant</b>				
<i>Revised PDD and as stated above.</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has provided all relevant supporting documents as requested and updated PDD wherever necessary. The details as per actual records, PDD and emission reduction calculation is found consistent and hence accepted by validation team. CAR is closed.				

<b>CAR ID</b>	07	<b>Section no.</b>	D.4.10	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
<ul style="list-style-type: none"> <li>a) The calibration frequency of flow meters and energy meters used in the project activity monitoring is not provided.</li> <li>b) Kindly describe whether the COD measurement procedure being followed in Papop lab conform to national or international standards.</li> <li>c) For monitoring methane content of biogas the methodology requirement is 90/10 confidence/precision level whereas the PDD mention 95% confidence level.</li> <li>d) For continuous input/grievance mechanism the procedure discussed in GS passport is not transparently explained as the procedure being followed at site.</li> </ul>				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<ul style="list-style-type: none"> <li>a. <i>The calibration frequency of flow meters and energy meters are included in the monitoring plan of the revised PDD.</i></li> <li>b. <i>The COD analysis procure applied in the project is colorimetric method which is international standard. The procedure of COD analysis is Att-2.17.</i></li> <li>c. <i>The requirement of 90/10-confidence/precision level for monitoring parameter of methane content in biogas is included in the revised PDD.</i></li> <li>d. <i>The grievance mechanism procedure in the GS passport is revised as per the available procedure at the site as Att-2.18.</i></li> </ul>				
<b>Documentation provided by project participant</b>				
<i>As stated above</i>				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017

PP has done necessary corrections and provided supporting documents wherever necessary. Details are found consistent with actual scenario and hence accepted. In summary CAR is closed.

<b>CAR ID</b>	08	<b>Section no.</b>	D.4.11	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
Monitoring indicator under GS-2 and GS-4 are same although chosen parameter and way of monitoring is different. Please clarify. Access to affordable and clean energy services, quality of employment and air quality needs to monitor under sustainable monitoring plan.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<p><i>The monitoring GS-3 and GS-4 are under the same indicator as “quantitative employment and income generation” but their chosen parameters are different. The chosen parameter of GS-3 is number of people employed by the project. While, the chosen parameter of GS-4 is income of employee in the project. Those chosen parameters have different ways of monitoring. That is the reason why the chosen parameter will be monitored separately.</i></p> <p><i>The impact on the indicator of access to affordable and clean energy services is scored as neutral since there is no change in energy used caused by the project. In addition, scoring of quality of employment indicator is neutral as its benefit is not significant enough. Therefore, those naturalized indicators are not required to monitor as per the section 2.4.2 of GS toolkit. While, the indicator of air quality are non-neutral scored. Their indicator monitoring as GS-1 is included in the revised GS passport.</i></p>				
<b>Documentation provided by project participant</b>				
Revised GS passport				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
PP has revised the GS passport and updated the monitoring parameters for which positive scoring has been done. Monitoring plan found reasonable to meet the target of each monitoring parameter and hence response is accepted and CAR is closed.				

<b>CAR ID</b>	09	<b>Section no.</b>	D.8	<b>Date:</b> 05/01/2017
<b>Description of CAR</b>				
Kindly provide details of pre-feasibility assessment as per GS rule.				
<b>Project participant response</b>				<b>Date:</b> 12/09/2017
<p><i>The project is applying under the retroactive project cycle of GS version 2.2. The project proponent chooses to apply the fast-track process according to MoU signed on 08/12/2016 as Att-2.19. The DOE work plan was shared along with PDD and GS passport at the initial stage of the project cycle and GS provided feedback that time itself.</i></p>				
<b>Documentation provided by project participant</b>				
Revised GS passport.				
<b>DOE assessment</b>				<b>Date:</b> 19/09/2017
The project being retroactive registration, PP has opted fast track option for pre-feasibility assessment as per Annex P of GS version 2.2. DOE having required criteria as per Annex P of GS version 2.2 accepted the fast track pre-feasibility assessment. PP has submitted relevant documents to GS under the project ID GS3992. The validation team shared the validation workplan to GS before the site visit. No comment received from GS as part of feedback from GS on fast track pre-feasibility assessment. Further, PP has signed a MoU with GS on 08/12/2016 as part of fast-tracking the project activity. Hence the pre-feasibility assessment as per GS requirement is met. CAR is closed.				

**Table 3. FAR from this validation**

<b>FAR ID</b>	xx	<b>Section no.</b>		<b>Date:</b> DD/MM/YYYY
<b>Description of FAR</b>				
<b>Project participant response</b>				<b>Date:</b> DD/MM/YYYY
<b>Documentation provided by project participant</b>				
<b>DOE assessment</b>				<b>Date:</b> DD/MM/YYYY

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
01.0	10/06/2016	Initial publication.