Monitoring Report

Version 02

Date 22/12/2017

UPOIC Wastewater Treatment for Energy Generation, Krabi

UNFCCC Reference No: CDM4322

GS Reference No: GS659

GS CER Verification (GS-CDM)
Monitoring Period: 06/05/2014 to 31/07/2014

Actual GHG Emission Reductions: 9,746 tCO_2e

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1. CDM project description and monitored parameters

United Palm Oil Industry Public Company Limited (UPOIC) has a crude palm oil mill located in Krabi Province, Thailand at approximately 814 km south of Bangkok. The mill produces Crude Palm Oil (CPO) from the Fresh Fruit Bunches (FFB) at capacity of 175,200 tonnes FFB /year, 300 days per year of operation. From the production processes, there is high organic content wastewater called Palm Oil Mill Effluent (POME) generated at approximately 0.59 m3/ton FFB[1]. This POME has Chemical Oxygen Demand (COD) of 60,000-80,000 mg/L, which is currently treated in an open lagoon system using anaerobic, facultative and polishing ponds, with a depth greater than 2 meters, without aeration. Methane is formed during the anaerobic conditions in the ponds and emitted directly to the atmosphere.

The purpose of 'UPOIC Wastewater Treatment for Energy Generation, Krabi' is to shift from traditional wastewater treatment in opened anaerobic ponds with uncontrolled release of methane to the atmosphere to a closed digester system with biogas capture using Completely Stirred Tank Reactors (CSTR) to extract and capture the methane gas from the high organic laden waste water. The captured gas will be produced electricity, which will be utilized in the palm oil factory. Surplus electricity will be fed into the national grid. Hence, the ultimate purpose of the project activity is to reduce greenhouse gases (GHGs) emissions to the atmosphere, produce electricity, and contribute to an environmentally and socially sustainable development of wastewater treatment at UPOIC.

Further background information on the project activity can be found in the Project Design Document (PDD) and associated documents, which have been registered on 18 October 2011, and available on the UNFCCC website: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1293726368.8/view

More details about the project description and all the monitored parameters as mentioned in the registered PDD of the project activity have been described in the CDM monitoring report version 05 dated 26/06/2015. The monitoring data under GS scheme are conducted as per the GS passport version v05, 06/10/2016. This is the first monitoring period considered between 06/05/2014 – 31/07/2014.

Relevant dates for the project activity related to Gold Standard

Date	Event
30/04/2009	LoA Issuance from the host country approval (Thai DNA)
26/10/2009	Completed commissioning of biogas system
21/12/2009	Completed commission of gas engines
18/10/2011	Registered as a CDM project at UNFCCC
06/05 – 31/07/2014	First Monitoring period under Gold Standard
23/07/2014	LoA issuance from Annex I Country
06/05/2016	Registered as a Gold Standard project

[1] 10-day measuring data at UPOIC, Krabi, June-July 2009

2. Gold Standard Monitoring Parameters

<table>
<tr><td colspan="2">GS parameter – No.</td><td>1</td></tr>
<tr><td colspan="2">Indicator</td><td>Water quality</td></tr>
<tr><td colspan="2">Mitigation measure</td><td>None</td></tr>
<tr><td colspan="2">Chosen parameter</td><td>COD of the wastewater at the outlet of digester system</td></tr>
<tr><td colspan="2">Current situation of parameter</td><td>Refer to the baseline situation</td></tr>
<tr><td colspan="2">Future target for parameter</td><td>There is no as such future target for this parameter but to make sure that the COD entering open lagoons in the project is lower than COD entering the open lagoons in the baseline scenario.</td></tr>
<tr><td rowspan="3">Way of monitoring</td><td>How</td><td>COD_{out} from the CSTR system is measured using colorimetric method in the on-site laboratory.</td></tr>
<tr><td>When</td><td>Please refer to the details in the monitoring section in the PDD.</td></tr>
<tr><td>By who</td><td>Internal laboratory</td></tr>
<tr><td colspan="2">Monitored value and frequency</td><td>Monitoring value:
<table>
<tr><th rowspan="2">Monitoring period</th><th>*$COD_{ww,untreated,y}$ (cooling)</th><th>$COD_{ww,treated,PJ,k,y}$</th></tr>
<tr><td>($tonn/m^3$)</td><td>($tonn/m^3$)</td></tr>
<tr><td>06/05/2014 – 31/07/2014</td><td>0.0735</td><td>0.0046</td></tr>
</table>
Frequency: Daily basis

Note: As a result of monitoring parameters, COD entering open lagoon in the project ($COD_{ww,treated,PJ,y}$) is lower than COD entering the open lagoon in the baseline scenario ($COD_{ww,untreated,y}$).</td></tr>
</table>

GS parameter – No.	2
Indicator	Quantitative employment and income generation
Mitigation measure	n/a
Chosen parameter	Number of people employed in the project activity
Current situation of parameter	Refer to the baseline situation For quantitative employment: There was no employment in the absence of project activity. In the project scenario; the employment will be only five permanent job positions. In case, there is an expansion capacity, the more employment will be required.

<table>
<tr><td colspan="2"></td><td>For income generation:
The average monthly income in 2009 at Krabi province was 6,098 THB/capita.</td></tr>
<tr><td colspan="2">Future target for parameter</td><td>There is no target as such but the project activity will offer better income compared to the current situation.</td></tr>
<tr><td rowspan="3">Way of monitoring</td><td>How</td><td>The HR records are the basis on monitoring number of people employed by the project activity.</td></tr>
<tr><td>When</td><td>Once a year</td></tr>
<tr><td>By who</td><td>Project owner</td></tr>
<tr><td colspan="2">Monitored value and frequency</td><td>The monitoring value:

<table><tr><th>Monitoring period</th><th>Quantitative of employments</th><th>Average income generation*</th></tr><tr><td>06/05/2014 – 31/07/2014</td><td>8 people</td><td>> 6,098 THB/capita</td></tr></table>
Note: The average monthly income generated by the project is higher than baseline scenario (6,098 THB/capita) during the monitoring period. The actual value of number of employees and income generation are provided as attachments submitted to the verification team.</td></tr>
</table>

<table>
<tr><td colspan="2">GS parameter – No.</td><td>3</td></tr>
<tr><td colspan="2">Indicator</td><td>Technology transfer and self-reliance</td></tr>
<tr><td colspan="2">Mitigation measure</td><td>None</td></tr>
<tr><td colspan="2">Chosen parameter</td><td>Training recording in relation to occupational safety and health</td></tr>
<tr><td colspan="2">Current situation of parameter</td><td>Refer to the baseline situation.</td></tr>
<tr><td colspan="2">Future target for parameter</td><td>There is no target as such but the project activity will offer better income compared to the current situation.</td></tr>
<tr><td rowspan="3">Way of monitoring</td><td>How</td><td>The training records for all employees in the project will be kept and made available to the DOE during verification.</td></tr>
<tr><td>When</td><td>Once for each monitoring period</td></tr>
<tr><td>By who</td><td>The project owner</td></tr>
<tr><td colspan="2">Monitored value and frequency</td><td>Monitoring period: 06/05/2014 to 31/07/2014
The training program of biogas system operation was provided to the staff annually. The training evidence was recorded. The training topics which are relevant to this indicator are summarized as following;
Biogas safety
Energy Management
Operation and maintenance of biogas system</td></tr>
</table>

	• Safety in biogas system and evacuation plan • Work safety within indoor area • Occupational safety and health Frequency: Once for each monitoring period