

TEMPLATE

MONITORING REPORT

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VERSION **v. 1.1**

RELATED SUPPORT - **TEMPLATE GUIDE Monitoring Report v. 1.1**

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KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	3514
Title of the project (s) covered by monitoring report	Nam Pha Gnai Hydropower Project
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	2.3
Version number of the monitoring report	3.0
Completion date of the monitoring report	11/01/2024
Date of project design certification	18/03/2016
Date of Last Annual Report	28/12/2022
Monitoring period number	2 nd monitoring period
Duration of this monitoring period	01/01/2021 to 31/08/2023 (First and last days included)
Project Representative	Nam Pha Gnai Hydropower Co., Ltd. Swiss Carbon Assets Limited.
Host Country	Lao PDR
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	ACM0002 Grid-connected electricity generation from renewable sources, Version 16.0
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 13: Climate Action (mandatory)	Emissions Reductions	209,218	VERs
SDG 7: Ensure access to affordable, reliable, sustainable and modern energy	Clean energy generated ensuring the access to electricity for local household	373,966.033	MWh
SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all	Employment opportunities have been provided for qualified people and provided trainings for employee	17 local people have been employed for this project in 2021, 2022 and 2023 vintage. / 3 training sessions have been held for the staff in 2021, 2022 and 2023.	

Table 2 – Product Vintages

Start Dates	End Dates	Amount Achieved		
		SDG 13 VERs	SDG 7 EG _{facility,y} /MWh	SDG 8 Employment generation
01/01/2021	31/12/2021	80,791	144,410.402	17
01/01/2022	31/12/2022	75,423	134,813.543	17
01/01/2023	31/08/2023	53,004	94,742.088	17

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

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Nam Pha Gnai Hydropower Project (hereafter referred to as the “the project”) is located in Xaysomboun District, Vientiane Province, Lao PDR, developed by Nam Pha Gnai Hydropower Project Co., Ltd.

The project is a run-of-the-river hydropower station, at the downstream of the planned Nam Ngum 3 station. For the upstream Nam Ngum 3 hydropower project (hereinafter referred to as “NN3 project”), the installed capacity is 440MW, which has not yet put into operation. The installed capacity of the project is 19.2MW (7.4MW+7.4MW+4.4MW), the estimated power supplied to the power grid will be 130GWh (before the operation of NN3) and 86GWh (after the operation of NN3).

The purpose of the report is to calculate the emission reductions generated by Nam Pha Gnai Hydropower Project during the second monitoring period (01/01/2021 to 31/08/2023), and to serve as basis for the verification and issuance of corresponding VERs.

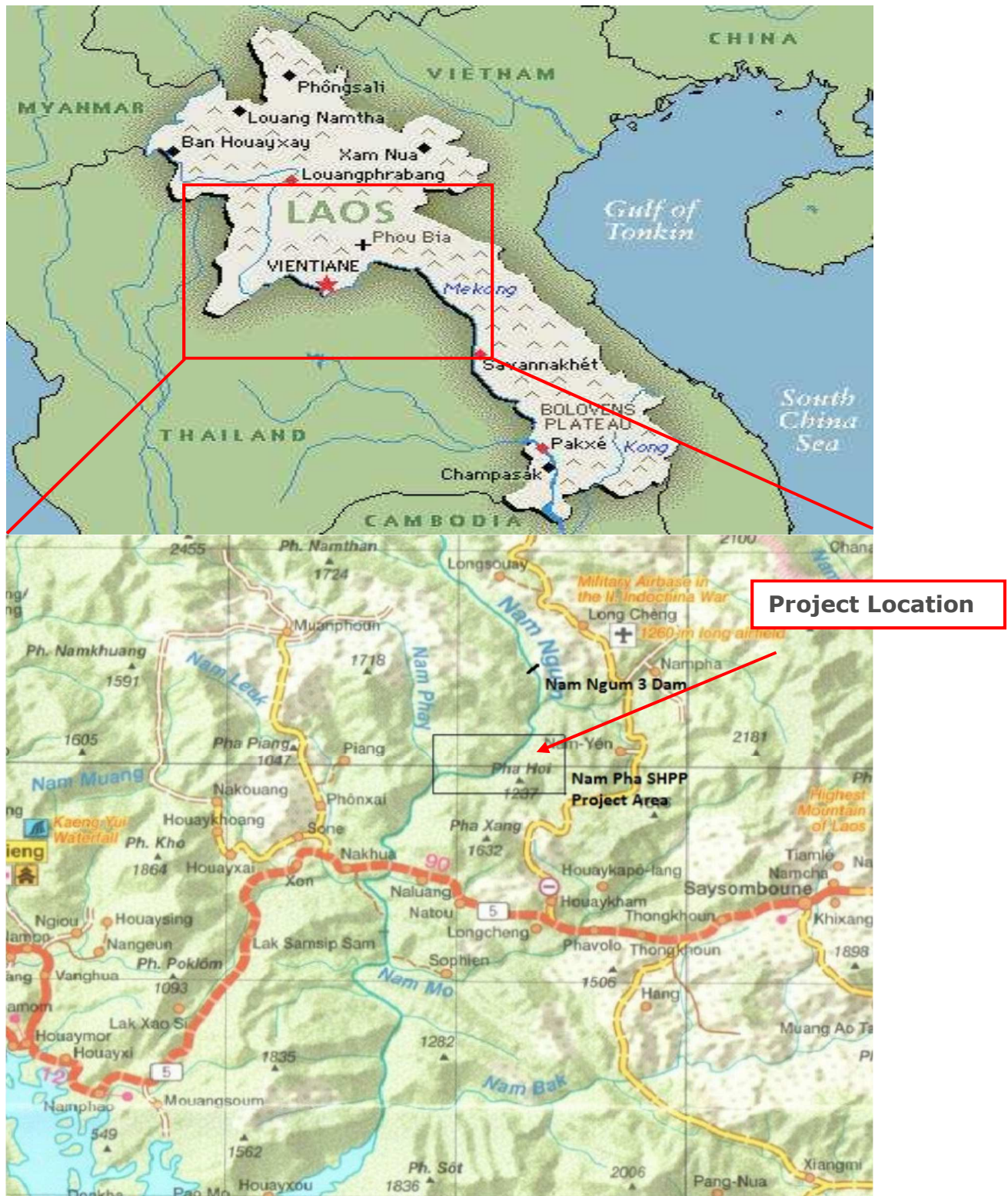
Following the Lao PDR’s electrification policy, the electricity supply falls in short compared to the increased electricity demand. The project has constantly contributed clean energy to the Lao Power Grid. For the Lao Power Grid is connected with the power grid in Thailand, power supplied to the regional grid consisting of Thailand Power Grid and the Lao Power Grid, the power supplied by the project not only meet domestic electricity demand, but also increase the net power export to Thailand and decrease the net power import from Thailand, where the power grid is dominated by thermal power plants. The baseline scenario of the project is continuation of the present situation, i.e. electricity supplied from the power grid. Before the operation of NN3, the reduction in carbon dioxide emissions is estimated to be 72,735 tonnes per year. After the operation of NN3, the reduction in carbon dioxide emissions is estimated to be 48,117 tonnes per year. Total GHG emission reductions achieved in this monitoring period are 209,218 tCO₂e.

A.2. Location of project

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The Project site is located at located in Xaysomboun District, Vientiane Province, Lao PDR. The approximate coordinate of the project site (Weir) is: 19.009331°N, 102.872314°E.

Figure A.1 Show the location of the project:



A.3. Reference of applied methodology

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The baseline methodology applied to the project include:

ACM0002 "Grid-connected electricity generation from renewable sources" (Version 16.0, EB 81)

For more information, please refer to:

<https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQOFQQH4SBK>

This methodology draws upon the following tools:

"Tool to calculate the emission factor for an electricity system" (version 04.0, EB 75)

For more information, please refer to:

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf/history_view

A.4. Crediting period of project

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The first crediting period of project is from 01/09/2019 to 31/08/2026, a total of seven years.

The start time of the first crediting period has been changed from 01/01/2016 to 01/09/2019 in design change memo and have been approved by GS.

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

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The project was commissioned, the actual implementation is in compliance with the registered PDD. Table below indicate the main events for the project:

Table B.1-1 Timeline of the project

Events	Date
Starting date of the project (Civil work agreement was signed)	29/10/2014
Commercial Operation Date	01/09/2019
CDM Registration Date	31/12/2015
Request for GS Registration	05/02/2016
GS Registration Date	18/03/2016
First Crediting Period	01/09/2019~31/08/2026
1st Monitoring Period	01/09/2019~31/12/2020
CDM CERs issued	30/12/2021 ¹
GS CERs issued	20/07/2022 ²

The total install capacity of the project is 19.2 MW. The construction of the project includes fixed weir, a sand trap, intake, headrace canal, headrace tunnel, forebay, penstock, a tailrace and powerhouse with 3 units of turbines (7.4MW+7.4MW+4.4MW). Refer to the following table for the main equipment's parameters.

Table B.1-2 Technologies applied in the project

	Unit	Value	
Turbines:			
Type	-	Horizontal Francis Turbine	
Installed Capacity	MW	7.4	4.4
Number	-	2	1
Water head	m	117.85	117.85
Rotation Speed	rpm	750	1,000
Contractor	-	Voith Hydro Private Limited	
Generators:			
Type	-	Horizontal Synchronous Generator (Cylindrical Rotor Type)	
Model	-	SH11 S900	SSA 710
Installed Capacity	MW	7.4	4.4
Number	-	2	1
Voltage	kV	6.3	6.3
Frequency	HZ	50	50
Power Factor	-	0.85	0.85
Contractor	-	Voith Hydro Private Limited	

¹ <https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1451527911.4/iProcess/CTI1632980160.03/view>

² <https://registry.goldstandard.org/projects/details/611>

During this monitoring period, according to the operational data, the emission reductions over the monitoring period are 209,218 tCO₂e. No serious malfunction happened and the plant was under a normal operation as expected in this monitoring period.

B.1.1 Forward Action Requests

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Forward Action Requests # 1: In-line with "Guidance for Site Visit rule Deviations", following the first site visit within the first two years after the start date of crediting period, verifiers shall conduct a site visit once every three years after that first two year period. In case of deviation from this requirement, the project developer can only request Issuance for the latest three years prior to verification site visit date for which monitoring data can be verified. The remaining years/months of the crediting period will be foregone without any extension.

- Considering that the Covid-19 situation has been alleviated, the site visit of the 2nd monitoring period of this project was conducted on September 22, 2023.

Forward Action Requests # 2: In-line with GS4GG Principles and Requirements, VVB and PP shall consider the following rules after the Transition is finalized:

5.1.39: Transparent, annual update reports need to be provided for Projects that have achieved the Project Design Certification stage or have successfully transitioned to Gold Standard for the Global Goals. An annual report shall be submitted for each monitoring year by end of next calendar year for which verification is not completed². If a verification is in progress but not completed, then an Annual Report is still required by the end of calendar year.

5.1.50: Transitioning projects, maintaining their existing crediting cycle shall undergo Performance Certification no later than the first two years after project implementation or design certification, whichever is later, and once every three years after that, unless the Verifier provides a convincing case for less frequent visits as part of the Verification Report.

- 5.1.39: The annual report of the project activity for year 2023 is expected to be submitted in December 2024.
- 5.1.50: The project has transited from GS version 2.2 to GS4GG, and the transition annex has been approved on 07/02/2022. The site visit of the 2nd monitoring period of this project was held on September 22, 2023.

B.2. Post-Design Certification changes

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B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

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Not applicable

B.2.2. Corrections

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Not applicable

B.2.3. Changes to start date of crediting period

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The start date of the crediting period has been changed from 01/01/2016 to 01/09/2019. The change to the start date of the crediting period has been approved by the Board and affects the start of first monitoring period, i.e. the changed start date is the start of first monitoring period.

The change to the start date of the crediting period has been approved by CDM EB on 15/06/2021 (PRC ref No. PRC-10241-001)

Refer to: <https://cdm.unfccc.int/PRCContainer/DB/prcp409040175/view>.

The change to the start date of the crediting period has been approved by GS registry on 27/10/2021.

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

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Not applicable

B.2.5. Changes to project design of approved project

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Not applicable

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

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1. Monitoring organization

The monitoring process has been carried out and responsibility by the project owner. A monitoring panel has been established by the plant managers to be in charge of monitoring the data and information relating to the calculation of emission reductions with the cooperation of the Technical and Financial Department. A GS manager was assigned full charge the monitoring works. The operation and management structure are shown below:

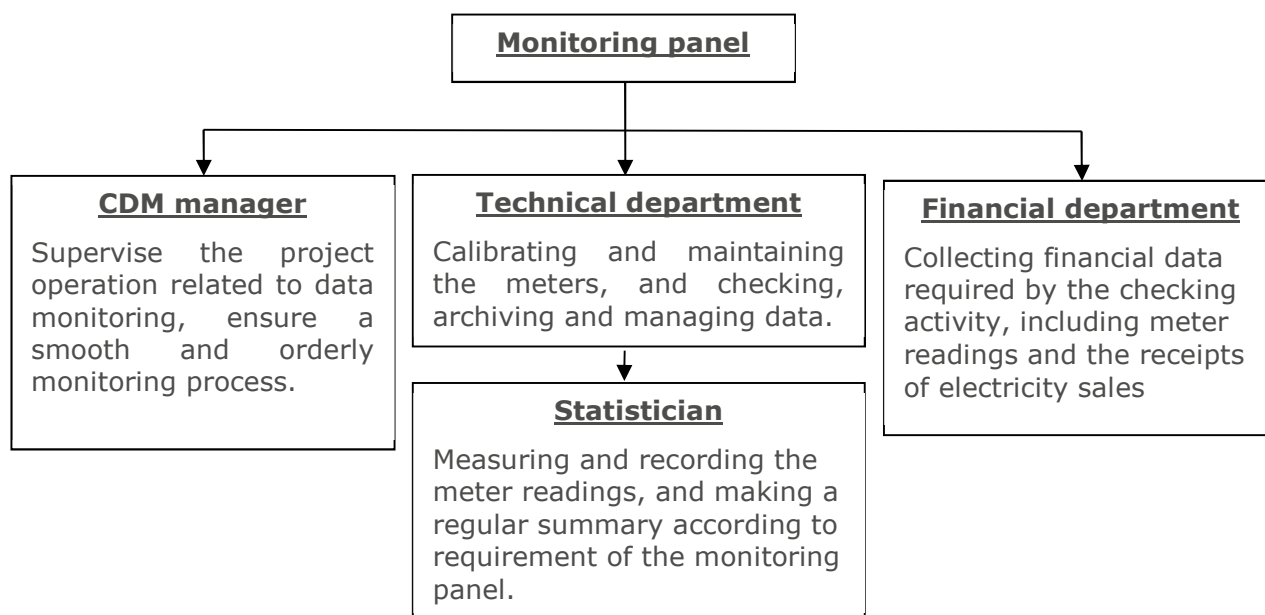


Figure C.1 Organization structure of the monitoring activity

2. Monitoring apparatus and installation:

The meters were installed in accordance with relevant national or international standard. Before the operation of the project, the metering equipment was clarified and examined by the project owner and the power grid company according to the above regulation.

The “M” in diagram indicates electric meter. The M1 and M2 are bidirectional meters which can monitor the parameter of $EG_{output,y}$ and $EG_{input,y}$ simultaneously. The accuracy of them meet to 0.2S.

The diagram for the monitoring meters is shown below:

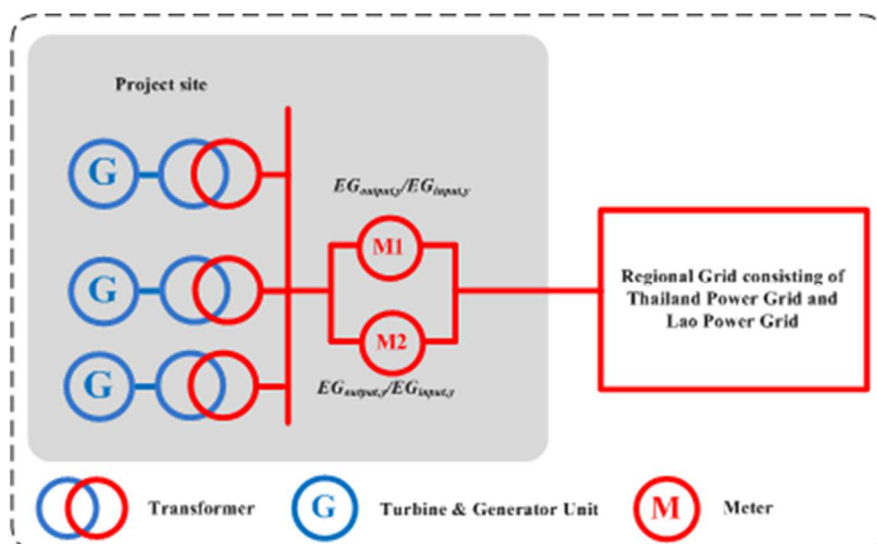


Figure C.2 Diagram of the monitoring meter(s)

3. Data collection:

The specific steps for data collection and reporting are listed below:

- During the crediting period, both the grid company and the project owner recorded the values displayed by the main meter.
- Simultaneously to step a), the project owner recorded the values displayed by the backup meters.
- The meters were calibrated according to the relevant regulation and request of EDL.
- The main meter's readings were cross-checked with the record document confirmed by EDL.
- The project owner and the grid company recorded both output and input power readings. These data were used to calculate the amount of net electricity delivered to the grid.
- The project owner was responsible of providing copies of the record document confirmed by EDL to the VVB for verification.

If the reading of the main meter in a certain month is inaccurate and beyond the allowed error or the meter doesn't work normally, the grid-connected power generation shall be determined by following measures:

- Read the data of the backup meters.
- If the backup meter's data is not accurate enough to be accepted, or the practice is not standardized, the project owner and grid company should jointly make a reasonable and conservative estimation method which can be supported by sufficient evidence and proved to be reasonable and conservative when verified by VVB.

- 3) If the project owner and the grid corporation don't agree on an estimated method, arbitration will be conducted according to the procedures set by the agreement to work out an estimation method.

4. Calibration

The calibration frequency of the monitoring meters is annually. The accuracy of the monitoring meters is 0.2s. Calibration of Meters are implemented according to relevant standards and rules accepted by the grid company EDL. After the examination, the meters are sealed. The lift of the seals requires the presence of both the project owner and the grid company. One party must not lift the seals or fiddle with the meters without presence of the other party.

All the meters installed shall be tested by a qualified metering verification institution commissioned jointly by the project owner and the grid company within 10 days after:

- 1) Detection of a difference larger than the allowed error in the readings of both meters;
- 2) The repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

5. Data management system

Physical documents such as the plant electrical wiring diagram was gathered with this monitoring plan in a single place. In order to facilitate auditors' access to project documents, the project materials and monitoring results will be indexed. All paper-based information will be stored by the technical department of the project owner and all the material will have a copy for backup. All data, including calibration records, will be kept until 2 years after the end of the total crediting period.

6. Sustainable Monitoring arranges

Air Quality

The project caused dust emission due to the construction work. The level of emission was complied with the legal dust emission limits. The project owner used wet damping, sprinklers to minimize the dust emission during the construction period.

Water Quality and quantity

The minimum flow was released to maintain the eco-system and meet demand for irrigation in the downstream. On-site treatment of construction wastewater prior to discharge. The water quality and quantity were examined by the environment

monitoring department according to the relevant standards and regulations annually. The monitoring parameters are the flow rate of water released from the weir and relevant water quality indicators.

Soil condition - Replantation

To prevent soil erosion, fast-growing trees and grass was planted in the non-plant slopes. Drain system was established in the quarry area and slag yard was covered during rainy season. Thus, the construction of the project will not lead to observable change in soil quality.

After construction is completed, the area has been replanted for long-term benefits. The excavated area at the intake weir and powerhouse are protected by planting trees and grass to control erosion. Soil removed during the construction process is stockpiled separately and would be reused later on. The local government is responsible for monitoring of the implementation.

Other pollution - Noise

To prevent noise impact, the drilling machines were equipped with noise control devices such as mufflers. Construction workers exposed to noise levels of 80 dB or more have been provided with adequate hearing protection. The monitoring parameter is noise, examined by the environment monitoring department.

Biodiversity

Conservation of locally adapted species and ecosystems are done via ensuring minimum flow and recovery of vegetation after construction. The project owner enforced soil conservation actions during and after the construction period according to relevant local regulations. The conditions are monitoring through site visits and interviews with locals annually. The monitoring parameter is the recovery of vegetation after construction.

Quality of employment

Staff has been trained for the positions created during construction & operation phases. All Health and Safety measurements have been applied according to local regulations. Trainings provided by the project owner will improve the employees' qualifications, which might help them to find job more easily in future. The project provided long-term jobs.

Quantitative employment and income generation

The employee number and their salary level were recorded by the project owner. Salary statement would be monitored and recorded annually.

The project has assessed the questions in par. 1.1.3 on p.12 of Renewable Energy activity requirements v1.4, as below:

	Assessment Questions	Justifications
a	Are there any competing uses of water resources at the project location, of what nature and how severe are they? Convincing evidence must be provided that the hydropower project does not divert water from other current users or if it does, these users are in agreement with the shift of use.	The project doesn't have any reservoir to regulate the runoff, so the water flow and its seasonal variation in the river remain the same as before, thus, village could continue use the water from the river. Thus, there is no competing use of water resources at the project location. A feasibility study report (FSR) has been provided to explain that the Nam Pha Gnai hydropower project is a newly built run-of-the river hydropower station, based on the catchment of Nam Ngum River. The implementation of the project has not resulted in a new reservoir or increase in the existing reservoir, nor has it diverted water from other existing users.
b	What is the minimum ecological flow that shall be complied with at any point in time, accounting for the specificities of local ecosystems and seasonality? What quality assurance and control procedures shall be put in place for appropriate continuous monitoring over the crediting period?	This assessment question is not relevant during verification.
c	Is the groundwater level seriously affected by the hydropower project? What quality assurance and control	This assessment question is not relevant during verification.

	procedures shall be put in place for appropriate continuous monitoring over the crediting period?	
d	Is the design of the fish passages and screens (water intake structure) installed in line with internationally recognised guidance?	This assessment question is not relevant during verification.
	Are these measures indeed effective over the crediting period, and if not, what shall be done to improve the situation?	The Concession Agreement signed between PO and Lao People Democratic Republic government has defined the obligation of PO to maintain the minimal ecological flow to the downstream which should be no less than the natural minimal flow in dry season before project implementation. During this monitoring period, according to the monitoring situation of monthly water flow and the result of water quality analysis report, the water flow is much higher than the minimum water flow 1.3 m ³ /s. In addition, the design of fish channels and screens has been installed in accordance with internationally recognized guidelines. These measures are effective during the crediting period.
e	What sediment management plan shall be considered?	This assessment question is not relevant during verification.
	Is it indeed effective over the crediting period, and if not, how shall it be improved?	Since there is no reservoir to store water and regulate river runoff causing sediment, the project did not cause sediment. Therefore, sediment management plan was not relevant.
f	What mitigation measures shall be put in place to prevent soil erosion?	This assessment question is not relevant during verification.

	Are they effective and if not, what complementary action shall be taken?	To prevent soil erosion, trees and grass have been planted in the non-plant slopes. Drain system has been established in the quarry area and slag yard has been covered during rainy season. It is confirmed by the local Environmental Protection Bureau of Vientiane Province, most of the bare ground has been replanted with lawns and palms, and the above measures are effective.
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Continuous input/grievance expression mechanism

Continuous input/grievance mechanism expression method and details, was discussed with local stakeholders.

	Method Chosen (include all known details e.g. location of book, phone, number, identity of mediator)	Justification
Continuous Input / Grievance Expression Process Book	Grievance expression book in Villages	Kept by the leader of the villages
Telephone access	+00856-20-28190844	Project manager
Internet/email access	Yaodong.lu@gmail.com	Project manager

7. Monitoring Report

At the end of each monitoring period, the monitoring officer shall produce a monitoring report covering the past monitoring period. The report shall be transmitted to the General Manager who checked the data and issued a final monitoring report in the name of the project's participants. Once the final report is issued, it will be submitted to the VVB for verification.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

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SDG13

Data/parameter	EF_{CO2,CM,y}
Unit	tCO ₂ e/MWh
Description	Combined margin CO ₂ emission factor for grid connected power generation in year y
Source of data	Registered PDD
Value(s) applied	0.5595
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of Baseline Emission
Additional comment	Parameters in section B.6.2 of the approved PDD, i.e. FC _{i,y} , NCV _{i,y} , EF _{CO2,i,y} , EG _y and EG _{import,y} , were used to calculate EF _{CO2,CM,y}

Data/parameter	A_{BL}
Unit	m ²
Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full
Source of data	Project on-site
Value(s) applied	0
Choice of data or Measurement methods and procedures	For new reservoirs, this value is zero.
Purpose of data	Calculation of Project Emission
Additional comment	-

Data/parameter	CAP_{BL}
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Unit	MW
Description	Installed capacity of the hydro power plant before the implementation of the project activity
Source of data	Project on-site
Value(s) applied	0
Choice of data or Measurement methods and procedures	For new hydro power plants, this value is zero
Purpose of data	Calculation of Project Emission
Additional comment	-

D.2 Data and parameters monitored

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SDG 13

Data / Parameter	<i>ER_y</i>
Unit	t CO ₂
Description	Emission reductions achieved in year y
Source of data	Calculated via EG _{output,y} and EG _{input,y}
Value(s) applied	80,791 tCO ₂ e in 2021 75,423 tCO ₂ e in 2022 53,004 tCO ₂ e in 2023 209,218 tCO ₂ e in total
Measurement methods and procedures	Calculated
Monitoring frequency	Each verification
QA/QC procedures	Please refer to EG _{output,y} and EG _{input,y}
Purpose of data	Calculation of baseline scenario
Additional comment	-

SDG 7

Data / Parameter	<i>EG_{output,y}</i>																				
Unit	MWh																				
Description	Electricity supplied by the project to the grid in year y																				
Source of data	Measured by meters																				
Value(s) applied	144,411.783 MWh in 2021 134,818.258 MWh in 2022 94,746.967 MWh in 2023 373,977.008 MWh in total																				
Measurement methods and procedures	The main and backup meters are installed at the grid access points. During the 2nd monitoring period, the meter functioned well, and the meter validity period covered all of monitoring period. The backup meter data will be used when the main meter doesn't work normally. During this monitoring period, the main meter M1 was working well, so the reading of the backup meter M2 was not involved. The cut-off time of the power between EDL and project owner is the 24:00 on the last day of every month. The information of the meters has been listed below. <table><tr><th>Bidirectional electronic meter</th><th>Main meter(M1)</th><th>Backup meter(M2)</th></tr><tr><td>Type</td><td>Mk6E</td><td>Mk6E</td></tr><tr><td>Accuracy class</td><td>0.2s</td><td>0.2s</td></tr><tr><td>Serial Number</td><td>218256993</td><td>218256994</td></tr><tr><td>Calibration frequency:</td><td>At least once a year</td><td>At least once a year</td></tr><tr><td>Calibration history</td><td>Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022</td><td>Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022</td></tr></table>			Bidirectional electronic meter	Main meter(M1)	Backup meter(M2)	Type	Mk6E	Mk6E	Accuracy class	0.2s	0.2s	Serial Number	218256993	218256994	Calibration frequency:	At least once a year	At least once a year	Calibration history	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022
Bidirectional electronic meter	Main meter(M1)	Backup meter(M2)																			
Type	Mk6E	Mk6E																			
Accuracy class	0.2s	0.2s																			
Serial Number	218256993	218256994																			
Calibration frequency:	At least once a year	At least once a year																			
Calibration history	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022																			

	<table> <tr> <td>07/06/2022 valid to 06/06/2023</td><td>07/06/2022 valid to 06/06/2023</td></tr> <tr> <td>25/05/2023 valid to 24/05/2024</td><td>25/05/2023 valid to 24/05/2024</td></tr> </table>	07/06/2022 valid to 06/06/2023	07/06/2022 valid to 06/06/2023	25/05/2023 valid to 24/05/2024	25/05/2023 valid to 24/05/2024
07/06/2022 valid to 06/06/2023	07/06/2022 valid to 06/06/2023				
25/05/2023 valid to 24/05/2024	25/05/2023 valid to 24/05/2024				
Monitoring frequency	Monitored continuously and recorded monthly				
QA/QC procedures	The meters were periodically checked according to the national standard, and the data measured by meters were cross-checked with the record document confirmed by EDL. The monthly meter reading ($EG_{output,y}$), receipts value and crosscheck as table E.1.				
Purpose of data	Calculation of baseline emissions				
Additional comment	N/A				

SDG 7

Data / Parameter	$EG_{input,y}$
Unit	MWh
Description	The electricity used by the project and input from the grid in year y
Source of data	Measured by meters
Value(s) applied	1.381 MWh in 2021 4.715 MWh in 2022 4.879 MWh in 2023 10.975 MWh in total
Measurement methods and procedures	The main and backup meters are installed at the grid access points. During the 2nd monitoring period, the meter functioned well, and the meter validity period covered all of monitoring period. The backup meter data will be used when the main meter doesn't work normally. During this monitoring period, the main meter M1 was working well, so the reading of the backup meter M2 was not involved. The cut-off time of the power between EDL and project owner is the 24:00 on the last day of every month.

	The information of the meters has been listed below.		
	Bidirectional electronic meter	Main meter(M1)	Backup meter(M2)
	Type	Mk6E	Mk6E
	Accuracy class	0.2s	0.2s
	Serial Number	218256993	218256994
	Calibration frequency:	At least once a year	At least once a year
	Calibration history	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022 07/06/2022 valid to 06/06/2023 25/05/2023 valid to 24/05/2024	Calibrated on 01/07/2020 valid to 30/06/2021 21/06/2021 valid to 20/06/2022 07/06/2022 valid to 06/06/2023 25/05/2023 valid to 24/05/2024
Monitoring frequency	Monitored continuously and recorded monthly		
QA/QC procedures	The meters were periodically checked according to the national standard, and the data measured by meters were cross-checked with the record document confirmed by EDL. The monthly meter reading ($EG_{input,y}$), receipts value and crosscheck as table E.2.		
Purpose of data	Calculation of baseline emissions		
Additional comment	N/A		

SDG 7

Data / Parameter	CAP_{PJ}
Unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data	The nameplate of the power units

Value(s) applied	19.2
Measurement methods and procedures	Determined in accordance with the nameplates on the generator equipment supplied by the manufacturer.
Monitoring frequency	Once at the beginning of each crediting period
QA/QC procedures	-
Purpose of data	Calculation of project emissions
Additional comment	N/A

SDG 6

Data / Parameter	Number of the installed pumps on-site (Livelihood of the poor)			
Unit	/			
Description	Number of the installed pumps on-site			
Source of data	Survey			
Value(s) applied	During the annual monitoring survey visit, a total of 4 pumps have been installed in the near village.			
	Year	2021	2022	2023
	Pump number	4	4	4
	Population number	436	442	447
	Female number	212	216	218
Measurement methods and procedures	Site visit to the water supply program			
Monitoring frequency	Each verification			
QA/QC procedures	Site visit to the water supply program, and interview with the local villager by simple random			
Purpose of data	N/A			
Additional comment	Local pumps installed onsite are not part of project operation. For it is the implementation of Water Supply Program, specially prepared for the local people to improve their water supply system in the long run. It is a primary effect - an intentional, direct effect of the project			

	and not a 'one off' or an effect generated in design, construction, distribution or start-up or decommissioning of the Project. The project owner provided 4 water pumps to nearby village- Ban Pha Gnai which has around 400 peoples and 8km away from the project. The construction was conducted since Nov. 2014 and ended at May 2015. According to monitoring data, 4 water pumps have been be installed in the villages. And 436 people benefited from these pumps in 2021, 442 people benefited from these pumps in 2022. 447 people benefited from these pumps in 2023.
--	--

SDG 7

Data / Parameter	EG_{facility,y}
Unit	MWh
Description	Access to affordable and clean energy services (Quantity of net electricity generation supplied by the project plant/units to the grid in year y)
Source of data	$EG_{facility,y} = EG_{output,y} - EG_{input,y}$
Value(s) applied	144,410.402 MWh in 2021 134,813.543 MWh in 2022 94,742.088 MWh in 2023 373,966.033 MWh in total
Measurement methods and procedures	Calculated
Monitoring frequency	N/A
QA/QC procedures	Please refer to $EG_{output,y}$ and $EG_{input,y}$
Purpose of data	Calculation of Baseline Emissions
Additional comment	N/A

SDG 8

Data / Parameter	Quantitative employment and income generation																			
Unit	N/A																			
Description	Number of employment generated from the project and their salary level.																			
Source of data	Employment records from project owner																			
Value(s) applied	17 local people have been employed for this project and the salary of all the workers is far beyond 1,150,000 LAK per month, which is the lowest salary standard of Laos³ According to the salary statement 2021-2023, the Project has created 17 long term work positions for local people during operational period. And among them, 5 are female employees. The salary of all the workers is far beyond the lowest salary standard of Laos. The average monthly salary of different positions is shown as below: <table><tr><th>Position</th><th>2021</th><th>2022</th><th>2023</th></tr><tr><td>Admin</td><td>4,150,500</td><td>4,303,000</td><td>4,550,500</td></tr><tr><td>Operator</td><td>3,558,182</td><td>3,668,636</td><td>3,295,000</td></tr><tr><td>Driver</td><td>2,881,000</td><td>2,995,000</td><td>3,222,500</td></tr></table>				Position	2021	2022	2023	Admin	4,150,500	4,303,000	4,550,500	Operator	3,558,182	3,668,636	3,295,000	Driver	2,881,000	2,995,000	3,222,500
Position	2021	2022	2023																	
Admin	4,150,500	4,303,000	4,550,500																	
Operator	3,558,182	3,668,636	3,295,000																	
Driver	2,881,000	2,995,000	3,222,500																	
Measurement methods and procedures	Through checking materials of employment and wage payment.																			
Monitoring frequency	Annually																			
QA/QC procedures	With the operation of the Project, 17 long term work positions are created for local people with higher salary level, which effectively improve the family income status of those employees.																			
Purpose of data	N/A																			
Additional comment	N/A																			

SDG 8

Data / Parameter	Quality of employment
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³ <http://www.salaryexplorer.com/salary-survey.php?loc=117&loctype=1>

Unit	N/A
Description	The project provides employment for qualified people. The project organizes employee trainings about topics of technical knowledge and design, safety and procedures.
Source of data	Training records
Value(s) applied	Based on the training document and the training records, the PP held three training sessions for the staff in 2021, 2022 and 2023, and the starting time of the training is 23/08/2021, 09/08/2022 and 25/07/2023 respectively. Each training is four days in total, including hydro-power project general introduction, operating work, data collection and recording.
Measurement methods and procedures	Check employment records and training documents
Monitoring frequency	Annually
QA/QC procedures	By interviewing with the worker, the training is held regularly.
Purpose of data	N/A
Additional comment	N/A

D.3. Comparison of monitored parameters with last monitoring period

>>

Not applicable

D.4. Implementation of sampling plan

>>

Not applicable.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

>>

SDG 13

The project activity is a newly built run-of-river hydropower station without reservoir. Therefore, the emission reductions (SDG 13) under baseline scenario is 0.

SDG 7

In the baseline scenario, local energy is shortages. There is no local access to affordable, reliable, sustainable and modern energy, so the benefit from SDG 7 is 0.

SDG 8

In the baseline scenario, there is insufficient local employment opportunities to achieve inclusive and sustainable economic growth, employment for all, and decent work, so the benefit from SDG 8 is 0.

E.2. Calculation of project value or estimation of project situation of each SDG Impact

>>

SDG 13

According to Methodology, baseline emission of the project in this monitoring crediting period (01/01/2021-31/08/2023) is calculated as below:

Calculation of baseline emissions	Symbol	Amount	Unit	Formula
Quantity of net electricity generation supplied by the project to the grid	$EG_{\text{facility},y}$	373,966.033	MWh	/
Emission factor	$EF_{\text{CO}_2,\text{CM},y}$	0.5595	tCO ₂ /MWh	/

Remarks

1. $EG_{\text{facility},y} = EG_{\text{output},y} - EG_{\text{input},y}$

2. $EF_{\text{CO}_2,\text{CM},y}$ fixed for crediting period.

- Power supplied to the grid ($EG_{\text{output},y}$)

The monthly electricity receipt confirmed by EDL are used to crosscheck this monitoring data. If different, the minimum value is used for calculation for conservative.

Table E-1 Power supplied to the grid ($EG_{\text{output},y}$) Crosscheck

2nd Monitoring Period	$EG_{\text{output},y}$		
	Values from Electricity Receipts	Values from Main Meter Reading Records	Verified
	A	B	C=MIN(A, B)
Starting Point: A.M. 00:00 01/01/2021	MWh	MWh	MWh
01/01/2021~31/01/2021	12,630.719	12,638,759	12,630.719
01/02/2021~29/02/2021	10,464.062	10,470,294	10,464.062
01/03/2021~31/03/2021	10,241.232	10,247,726	10,241.232
01/04/2021~30/04/2021	11,169.147	11,175,693	11,169.147

01/05/2021~31/05/2021	12,457.105	12,464,601	12,457.105
01/06/2021~30/06/2021	12,411.444	12,419,192	12,411.444
01/07/2021~31/07/2021	12,868.988	12,876,077	12,868.988
01/08/2021~31/08/2021	12,241.300	12,248,016	12,241.300
01/09/2021~30/09/2021	11,840.438	11,847,340	11,840.438
01/10/2021~31/10/2021	12,818.114	12,825,536	12,818.114
01/11/2021~30/11/2021	12,538.335	12,545,296	12,538.335
01/12/2021~31/12/2021	12,730.899	12,738,556	12,730.899
SUM	144,411.783	144,497.086	144,411.783
01/01/2022~31/01/2022	12,844.301	12,851,609	12,844.301
01/02/2022~29/02/2022	11,022.782	11,028,968	11,022.782
01/03/2022~31/03/2022	12,382.657	12,389,583	12,382.657
01/04/2022~30/04/2022	11,516.033	11,522,657	11,516.033
01/05/2022~31/05/2022	11,085.374	11,092,202	11,085.374
01/06/2022~30/06/2022	8,366.374	8,371,545	8,366.374
01/07/2022~31/07/2022	9,884.482	9,890,395	9,884.482
01/08/2022~31/08/2022	8,282.887	8,287,712	8,282.887
01/09/2022~30/09/2022	11,505.920	11,512,619	11,505.920
01/10/2022~31/10/2022	12,741.929	12,750,038	12,741.929
01/11/2022~30/11/2022	12,507.364	12,514,799	12,507.364
01/12/2022~31/12/2022	12,678.155	12,685,791	12,678.155
SUM	134,818.258	134,897.918	134,818.258
01/01/2023~31/01/2023	13,143.688	13,151,636	13,143.688
01/02/2023~29/02/2023	11,317.821	11,324,800	11,317.821
01/03/2023~31/03/2023	11,733.022	11,740,260	11,733.022
01/04/2023~30/04/2023	12,075.892	12,083,328	12,075.892
01/05/2023~31/05/2023	10,895.641	10,902,331	10,895.641
01/06/2023~30/06/2023	11,568.694	11,575,864	11,568.694
01/07/2023~31/07/2023	12,318.365	12,325,984	12,318.365
01/08/2023~31/08/2023	11,693.844	11,701,347	11,693.844
SUM	97,746.967	97,805.550	97,746.967
Total	373,977.008	374,200.554	373,977.008

■ Power input from the grid in year y ($EG_{input,y}$)

The monthly electricity receipt confirmed by EDL are used to crosscheck this monitoring data. If different, the maximum value is used for calculation for conservative.

Table E-2 Power input from the grid ($EG_{input,y}$) Crosscheck

2nd Monitoring Period	$EG_{input,y}$		
	Values from Electricity Receipts	Values from Main Meter Reading Records	Verified
	A	B	C=MAX (A,B)
Starting Point: A.M. 00:00 01/01/2021	MWh	MWh	MWh
01/01/2021~31/01/2021	0.066	0.000	0.066
01/02/2021~29/02/2021	0.026	0.031	0.031
01/03/2021~31/03/2021	0.027	0.036	0.036

01/04/2021~30/04/2021	0.062	0.127	0.127
01/05/2021~31/05/2021	0.099	0.170	0.170
01/06/2021~30/06/2021	0.140	0.211	0.211
01/07/2021~31/07/2021	0.107	0.198	0.198
01/08/2021~31/08/2021	0.130	0.211	0.211
01/09/2021~30/09/2021	0.062	0.092	0.092
01/10/2021~31/10/2021	0.048	0.077	0.077
01/11/2021~30/11/2021	0.057	0.115	0.115
01/12/2021~31/12/2021	0.083	0.113	0.113
SUM	0.907	1.381	1.381
01/01/2022~31/01/2022	0.144	0.146	0.146
01/02/2022~29/02/2022	0.105	0.112	0.112
01/03/2022~31/03/2022	0.182	0.279	0.279
01/04/2022~30/04/2022	0.951	0.862	0.862
01/05/2022~31/05/2022	0.240	0.337	0.337
01/06/2022~30/06/2022	0.100	0.187	0.187
01/07/2022~31/07/2022	0.258	0.380	0.380
01/08/2022~31/08/2022	0.739	1.022	1.022
01/09/2022~30/09/2022	0.314	0.524	0.524
01/10/2022~31/10/2022	0.106	0.188	0.188
01/11/2022~30/11/2022	0.252	0.453	0.453
01/12/2022~31/12/2022	0.147	0.225	0.225
SUM	3.538	4.715	4.715
01/01/2023~31/01/2023	0.163	0.280	0.280
01/02/2023~29/02/2023	0.058	0.112	0.112
01/03/2023~31/03/2023	0.226	0.494	0.494
01/04/2023~30/04/2023	0.049	0.108	0.108
01/05/2023~31/05/2023	1.738	2.866	2.866
01/06/2023~30/06/2023	0.087	0.154	0.154
01/07/2023~31/07/2023	0.325	0.565	0.565
01/08/2023~31/08/2023	0.266	0.300	0.300
SUM	2.912	4.879	4.879
Total	7.357	10.975	10.975

- Baseline Emission in year y (BE_y)

Table E-3 Baseline Emission (BE_y)

2nd Monitoring Period	$EG_{output,y}$ C MWh	$EG_{input,y}$ F MWh	$EG_{facility,y}$ G=C-F MWh	$EF_{CO_2,CM,y}$ H tCO ₂ e/MWh	BE_y I=G*H tCO ₂ e
01/01/2021~31/12/2021	144,411.783	1.381	144,410.402	0.5595	80,791
01/01/2022~31/12/2022	134,818.258	4.715	134,813.543		75,423
01/01/2023~31/08/2021	94,746.967	4.879	94,742.088		53,004
Total	373,977.008	10.975	373,966.033		209,218

SDG 13

The project activity is a run-of-river hydropower station without reservoir, as per ACM0002, "Grid-connected electricity generation from renewable sources", no project

emissions (PE_y) need to be considered and no leakage emissions (LE_y) are considered. Therefore, the emission reductions (ER_y) beneficial from project under SDG 13 is calculated as: $ER_y = BE_y - PE_y - LE_y = 209,218 \text{ tCO}_2\text{e}$.

SDG 7

According to Table E-3, the project supply 144,410.402MWh to the grid in 2021, 134,813.543MWh to the grid in 2022, and in 2023 the project supply 94,742.088MWh to the grid. In this monitoring period, the project supplies 373,966.033 MWh to the local grid.

SDG 8

For this project, 17 local people have been employed in 2021, 2022 and 2023 vintage. And 3 training sessions have been held for the staff in 2021, 2022 and 2023.

E.3. Calculation of leakage

>>

No leakage emissions are considered.

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
13	Take urgent action to combat climate change and its impacts	0	209,218 tCO ₂ e	209,218 tCO ₂ e
7	Ensure access to affordable, reliable, Sustainable and modern energy	0	373,966.033 MWh	373,966.033 MWh
8	Promote inclusive and sustainable economic growth, employment and decent work for all	0	17 local people have been employed for this project in 2021, 2022 and 2023 vintage. 3 training sessions have been held for	17 local people have been employed for this project in 2021, 2022 and 2023 vintage. 3 training sessions have been held for

the staff in 2021, the staff in 2021,
2022 and 2023. 2022 and 2023.

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values ⁴ achieved during this monitoring period
13	72,735 tCO ₂ e per year estimated in registered PDD, and during the 973 days of this monitoring period, a total of 193,894 tCO ₂ e were produced.	209,218 VERs
7	130 GWh clean power will be generated annually, ensuring the access to electricity for local household. And there are 973 days in this monitoring period, 346,547.945 MWh will supply to the grid.	373,966.033 MWh
8	30 employments will be provided for qualified people and trainings about topics of technical knowledge and design, safety and procedures provided for employee yearly.	17 local people have been employed for this project in 2021, 2022 and 2023 vintage. 3 training sessions have been held for the staff in 2021, 2022 and 2023.

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

>>

For SDG 13

⁴ Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

According to the amount estimated ex ante in PDD is equal to 193,894 tCO₂e, the length of this monitoring period is equal to 973 days.

The “amount estimated ex ante for this monitoring period in the PDD” is calculated based on annual GHG emission reductions in registered PDD, which is 72,735 tCO₂e when NN3 has not yet been completed. Multiplying the duration length of this monitoring period from 01/01/2021 to 31/08/2023 (namely 973 days):

$$72,735 \text{ tCO}_2\text{e}/365 \text{ days} \times 973 \text{ days} = 193,894 \text{ tCO}_2\text{e}$$

For SDG 7

During the monitoring period from 01/01/2021 to 31/08/2023 (973 days in total), the corresponding value in PDD (973 days covered by this monitoring period when the upstream hydropower station NN3 is not in production) is 130,000 MWh * 973/365 = 346,547.945 MWh.

For SDG 8

According to the amount estimated ex ante in PDD, 30 employments will be provided for qualified people and trainings provided for employee.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

>>

This table shows that the actual value is 7.90% more than the estimated emission reduction of the registered CDM PDD during this monitoring period. Since the amount of the actual rainfall and water flow was higher than expected during this monitoring period. Rainfall and water flow are fluctuating values, so the actual power generation of the project fluctuate slightly, which is normal.

According to the additionality demonstration in the approved PDD, only if the power supplied amount is increased by 31.18%, the project IRR can reach the benchmark. During the monitoring period from 01/01/2021 to 31/08/2023 (973 days in total), the net power supplied to the grid was 373,966.033 MWh. The corresponding value in PDD (973 days covered by this monitoring period when the upstream hydropower station NN3 is not in production) is 130,000 MWh * 973/365 = 346,547.945 MWh. The actual power supplied amount is just 7.91% higher than the value in PDD, so the project is still additional.

SECTION F. SAFEGUARDS REPORTING

>>

Safeguarding Principle 9.10 High Conservation Value Areas and Critical Habitats

Data / Parameter	Biodiversity
Unit	N/A
Description	The project owner will enforce soil conservation actions during and after the construction period according to relevant local regulation.
Source of data	The recovery of vegetation.
Value(s) applied	Implementation entity is local villagers hired by hydropower station, the replanting measure was conducted in line with environment protection law and environmental management plan of IEE, it was confirmed by local EPB that the project had carried out vegetation restoration and the vegetation restoration had met the standard. The recovery of vegetation photo is as follows:

	
Measurement methods and procedures	Site visits
Monitoring frequency	Annually
QA/QC procedures	According to the stakeholder meeting memo in 10/08/2021, 26/07/2022 and 13/07/2023 provided by project owner, there are no impact on biodiversity in the project area.
Purpose of data	N/A
Additional comment	N/A

Safeguarding Principle 9.4 Release of pollutants

Data / Parameter	Other pollution - Noise
Unit	N/A
Description	To prevent noise impact, the drilling machines should be equipped with noise control devices such as mufflers.

	Construction workers exposed to noise levels of 80 dB or more should be provided with adequate hearing protection.								
Source of data	Examine by the environment monitoring department								
Value(s) applied	Confirmed by local EPB, the noise environment in which workers work met the requirements. Workers exposed to noise levels has been provided with adequate hearing protection, the drilling machines were equipped with noise control devises, and the construction time is strictly limited to reduce the impact. As the project is away from the village, the noise impacts to the residents are minor. The monitoring situation of noise is listed below. <table><tr><th>Date</th><th>Executing Agency</th><th>Frequency</th></tr><tr><td>08/09/2021</td><td rowspan="3">Water Resource of Environmental Administration of Vientiane Province (local EPB)</td><td rowspan="3">Annually</td></tr><tr><td>28/07/2022</td></tr><tr><td>04/07/2023</td></tr></table>	Date	Executing Agency	Frequency	08/09/2021	Water Resource of Environmental Administration of Vientiane Province (local EPB)	Annually	28/07/2022	04/07/2023
Date	Executing Agency	Frequency							
08/09/2021	Water Resource of Environmental Administration of Vientiane Province (local EPB)	Annually							
28/07/2022									
04/07/2023									
Measurement methods and procedures	Examine by the environment monitoring department								
Monitoring frequency	Annually								
QA/QC procedures	According to the stakeholder meeting memo in 10/08/2021, 26/07/2022 and 13/07/2023 provided by project owner, stakeholders from nearby villages viewed the site during the stakeholder’s meeting, there was no negative impact of the noise.								
Purpose of data	N/A								
Additional comment	N/A								

Safeguarding Principle 9.1 Landscape Modification and Soil

Data / Parameter	Soil condition - Replantation
Unit	N/A
Description	To prevent soil erosion, trees and grass will be planted in the non-plant slopes. Drain system will be established in the quarry area and slag yard will be covered during rainy

	season. Thus, the construction of the project will not lead to observable change in soil quality.						
Source of data	Observations during site visits and continuous monitoring during construction						
Value(s) applied	Soil condition protection and recovery was accepted by local Environmental Protection Bureau. The monitoring situation of soil condition during this monitoring period is listed below. <table border="1"> <thead> <tr> <th>Date</th><th>Executing Agency</th></tr> </thead> <tbody> <tr> <td>19/07/2021</td><td rowspan="3">Water Resources and Environment Administration of Vientiane Province</td></tr> <tr> <td>05/07/2022</td></tr> <tr> <td>20/06/2023</td></tr> </tbody> </table> The soil condition had been continuously monitored during construction by the project owner. During the operation period, the project owner also continuously observes the condition of the soil, the bared soil due to the project construction had been covered during rainy season in construction period. And the trees and grass had been covered after project construction. It is confirmed by the local Environmental Protection Bureau of Vientiane Province the inspection for the land restoration work was in charged by independent supervisor, most of bared ground have been replanted by grass lawn and palm, proper irrigation facilities have been equipped. The state of the ground after restoration and replantation is shown in the picture below: 	Date	Executing Agency	19/07/2021	Water Resources and Environment Administration of Vientiane Province	05/07/2022	20/06/2023
Date	Executing Agency						
19/07/2021	Water Resources and Environment Administration of Vientiane Province						
05/07/2022							
20/06/2023							
Measurement methods and procedures	Observations during site visits and continuous monitoring during construction						

Monitoring frequency	Annually
QA/QC procedures	According to the stakeholder meeting memo in 10/08/2021, 26/07/2022 and 13/07/2023 provided by project owner, stakeholders from nearby villages viewed the site during the stakeholder's meeting, there was no negative impact of the soil.
Purpose of data	N/A
Additional comment	N/A

Safeguarding Principle 8.1 Impact on Natural Water Patterns/Flows

Data / Parameter	Water Quality and quantity																																																		
Unit	N/A																																																		
Description	The minimum flow will be released to maintain the eco-system and meet demand for irrigation in the downstream. On-site treatment of construction wastewater prior to discharge.																																																		
Source of data	Examination by the environment monitoring department																																																		
Value(s) applied	The water quality in the weir and powerhouse was conducted monthly by the Water Resource of Environmental Administration of Vientiane Province (local EPB), according to the result of water quality analysis report conducted by local EPB, the parameters such as TDS, NO₃⁻, NH₄⁺ are better than guideline for drinking water established by WHO⁵. The monitoring parameters are shown in below: <table><tr><th>Date</th><th>Parameters</th><th>Weir</th><th>Power house</th><th>WHO Guideline</th></tr><tr><td rowspan="9">18/10/2021</td><td>TDS</td><td>158</td><td>163</td><td>1000</td></tr><tr><td>Hardness</td><td>38</td><td>39</td><td>-</td></tr><tr><td>pH</td><td>7.6</td><td>7.5</td><td>6.5-8.5</td></tr><tr><td>NO₃⁻</td><td>9.8</td><td>10.2</td><td>50</td></tr><tr><td>NO₂⁻</td><td>0.04</td><td>0.07</td><td>3</td></tr><tr><td>NH₄⁺</td><td>0.98</td><td>1.03</td><td>35</td></tr><tr><td>Fe</td><td>0.0208</td><td>0.0217</td><td>0.3</td></tr><tr><td>Mn</td><td>0.135</td><td>0.146</td><td>0.4</td></tr><tr><td>As</td><td>0.0014</td><td>0.0017</td><td>0.01</td></tr><tr><td>Cu</td><td>0.507</td><td>0.483</td><td>2</td></tr></table>					Date	Parameters	Weir	Power house	WHO Guideline	18/10/2021	TDS	158	163	1000	Hardness	38	39	-	pH	7.6	7.5	6.5-8.5	NO ₃ ⁻	9.8	10.2	50	NO ₂ ⁻	0.04	0.07	3	NH ₄ ⁺	0.98	1.03	35	Fe	0.0208	0.0217	0.3	Mn	0.135	0.146	0.4	As	0.0014	0.0017	0.01	Cu	0.507	0.483	2
Date	Parameters	Weir	Power house	WHO Guideline																																															
18/10/2021	TDS	158	163	1000																																															
	Hardness	38	39	-																																															
	pH	7.6	7.5	6.5-8.5																																															
	NO ₃ ⁻	9.8	10.2	50																																															
	NO ₂ ⁻	0.04	0.07	3																																															
	NH ₄ ⁺	0.98	1.03	35																																															
	Fe	0.0208	0.0217	0.3																																															
	Mn	0.135	0.146	0.4																																															
	As	0.0014	0.0017	0.01																																															
Cu	0.507	0.483	2																																																

⁵ The whole version of guidelines for Drinking-water Quality:
https://www.unicef.org/cholera/Chapter_4_prevention/01_WHO_Guidelines_for_drinking_water_quality.pdf

	Zn	0.025	0.032	3 may not desirable
	Pb	0.0016	0.0015	0.01
12/09/2022	TDS	154	161	1000
	Hardness	39	39	-
	pH	7.4	7.5	6.5-8.5
	NO ₃ ⁻	10.1	10.3	50
	NO ₂ ⁻	0.06	0.05	3
	NH ₄ ⁺	1.02	0.97	35
	Fe	0.0197	0.0206	0.3
	Mn	0.124	0.148	0.4
	As	0.0015	0.0018	0.01
	Cu	0.435	0.467	2
	Zn	0.021	0.031	3 may not desirable
	Pb	0.0012	0.0011	0.01
22/08/2023	TDS	156	164	1000
	Hardness	38	39	-
	pH	7.5	7.6	6.5-8.5
	NO ₃ ⁻	9.9	10.2	50
	NO ₂ ⁻	0.05	0.06	3
	NH ₄ ⁺	1.01	0.99	35
	Fe	0.0205	0.0221	0.3
	Mn	0.131	0.145	0.4
	As	0.0012	0.0014	0.01
	Cu	0.452	0.483	2
	Zn	0.024	0.032	3 may not desirable
	Pb	0.0015	0.0014	0.01

According to the Initial Environmental Examination (IEE) of the project, it is regulated the minimum riparian releases at the Intake Weirs should be not less than the natural flow in the dry season to maintain the eco-system. The water flow record during the dry season shows that the water flow is much higher than the minimum water flow (1.3 m³/s).

The monitoring situation of monthly water flow issued by Water Resource of Environmental Administration of Vientiane Province is listed below:

Month	Average Water flow record (m ³ /s)	Minimum water flow (m ³ /s)
Jan. 2021	6.9	1.3
Feb. 2021	7.1	
Mar. 2021	7.7	
Apr. 2021	9.3	
May. 2021	9.8	
Jun. 2021	11.2	
Jul. 2021	13.5	
Aug. 2021	11.9	

	Sep. 2021	10.5	
	Oct. 2021	9.8	
	Nov. 2021	7.2	
	Dec. 2021	6.0	
	Jan. 2022	7.0	
	Feb. 2022	7.2	
	Mar. 2022	7.8	
	Apr. 2022	9.4	
	May. 2022	9.8	
	Jun. 2022	11.3	
	Jul. 2022	13.7	
	Aug. 2022	12.0	
	Sep. 2022	10.4	
	Oct. 2022	9.8	
	Nov. 2022	7.1	
	Dec. 2022	6.0	
	Jan. 2023	7.1	
	Feb. 2023	7.3	
	Mar. 2023	7.9	
	Apr. 2023	9.5	
	May. 2023	9.7	
	Jun. 2023	11.1	
	Jul. 2023	13.5	
	Aug. 2023	11.8	
Measurement methods and procedures	Examination by the environment monitoring department according to the relevant standards and regulations		
Monitoring frequency	Annually		
QA/QC procedures	The water quality and quantity of the project comply with local regulation. By interviewing with the local residents, there is no impact on surrounding villagers’ the water use.		
Purpose of data	N/A		
Additional comment	N/A		

Safeguarding Principle 9.4 Release of pollutants

Data / Parameter	Air Quality
Unit	N/A
Description	The project caused dust emission due to the construction work. The level of emission was complied with the legal dust emission limits. The project owner used wet damping, sprinklers to minimize the dust emission during the construction period.
Source of data	On-site examination

Value(s) applied	The air quality was irregular monitored by the project owner and the report shows that the air quality during construction is much lower than the air quality guideline estimated by WHO. The monitoring situation of air quality during construction is listed below: <table border="1"> <tr> <th>Date</th><th>Executing Agency</th></tr> <tr> <td>20/09/2017</td><td rowspan="3">Nam Pha Gnai Hydropower Co., Ltd. (Project owner)</td></tr> <tr> <td>27/08/2018</td></tr> <tr> <td>09/07/2019</td></tr> </table> According to the interview with local villagers, no impact on the air quality in the construction period and operation period was found. According to the Spraying water logging, the mitigation measures including 1) spraying water and 2) transporting material under tarpaulins were implemented during construction period. Since now no complaint have been received from nearby residents and workers, which shows that during construction period, the mitigation measures have been well implemented to avoid dust emission	Date	Executing Agency	20/09/2017	Nam Pha Gnai Hydropower Co., Ltd. (Project owner)	27/08/2018	09/07/2019
Date	Executing Agency						
20/09/2017	Nam Pha Gnai Hydropower Co., Ltd. (Project owner)						
27/08/2018							
09/07/2019							
Measurement methods and procedures	On-site examination by project owner						
Monitoring frequency	On-site examination during construction						
QA/QC procedures	According to the spraying water logging, the mitigation measure has been implemented. According to the air quality report and interviewing with the local residents, the impact of the Project to local air quality is negligible.						
Purpose of data	N/A						
Additional comment	N/A						

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

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During the consultation meeting, continuous input/grievance mechanism expression method and details, was discussed with local stakeholders.:

	Method Chosen (include all known details e.g.	Justification
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	location of book, phone, number, identity of mediator)	
Continuous Input / Grievance Expression Process Book	Grievance expression book in Villages	Kept by the leader of the villages
Telephone access	+00856-20-28190844	Project manager
Internet/email access	Yaodong.lu@gmail.com	Project manager

All issues identified during the crediting period through any of the Methods shall have a mitigation measure in place.

During the construction and operation of the project, it always executed in accordance with the registered PDD and GS passport. And there is no inputs or grievances received via the mechanism.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

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There are no any stakeholder mitigations that were agreed to be monitored at the registered PDD or GS passport.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

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There is no legal contest arisen during the monitoring period.

TEMPLATE

APPENDIX 1- FURTHER BACKGROUND INFORMATION ON EX ANTE CALCULATION OF EMISSION REDUCTIONS

Table 1 Net electricity generated and delivered to the grid by all power sources serving the system (GWh)

Year	2010	2009	2008
Power generation by EdL owned power plants	1,552.73	1,655.91	1,777.57
Power generation by IPP located in Laos	7,329.69	2,135.32	1,938.01
Power generation in Thailand	152,913.56	142,697.75	142,330.52
Sum up	161,795.98	146,488.98	146,046.10

Sources from:

EDL Annual Report 2012, 2010, 2009, Electricite du Laos;

Electric Power in Thailand 2010, 2009, 2008, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand;

Electricity Statistic Annual Report 2010, Electricity Generating Authority of Thailand.

Table 2 Power import from the connected system (GWh)

Year	2010	2009	2008
Malaysia	160.31	92.68	470.67
Vietnam	31.81	25.39	22.59
China	77.02	21.58	17.78
Sum up	269.14	139.65	511.04

Sources from:

Electricity Statistic Annual Report 2010, 2009, 2008, Electricity Generating Authority of Thailand.

EDL Annual Report 2012, Electricite du Laos.

Table 3 Quantity of GHG emission by all power sources serving the system

Fuel Type	Fuel Consumption		Fuel Specific EF	Net Calorific Value	GHG emission
	FC _{i,y}		EF _{CO₂,m,i,y}	NCV _{i,y}	FC _{i,y} x EF _{CO₂,m,i,y} x NCV _{i,y} /1000000
	Unit	FC/Unit	tCO ₂ /TJ	MJ/Unit	tCO ₂
2010					
Natural Gas	scf.	1,073,084,673,019	54.3	1.02	59,433,868
Lignite	ton	16,043,174	90.9	10470	15,268,658
Bituminous	ton	5,502,160	89.5	26370	12,985,730

Bunker	liter	233,229,746	75.5	39.77	700,304
Diesel	liter	24,026,558	72.6	36.42	63,528
2009					
Natural Gas	scf.	968,924,717,809	54.3	1.02	53,664,864
Lignite	ton	15,818,265	90.9	10470	15,054,607
Bituminous	ton	5,486,248	89.5	26370	12,948,176
Bunker	liter	158,017,445	75.5	39.77	474,469
Diesel	liter	13,825,937	72.6	36.42	36,557
2008					
Natural Gas	scf.	977,016,893,281	54.3	1.02	54,113,058
Lignite	ton	16,407,465	90.9	10470	15,615,362
Bituminous	ton	5,578,567	89.5	26370	13,166,060
Bunker	liter	350,209,394	75.5	39.77	1,051,551
Diesel	liter	51,941,958	72.6	36.42	137,339

Sources from:

Electricity Statistic Annual Report 2010, Electricity Generating Authority of Thailand.

IPCC 2006, Guidelines for National Greenhouse Gas Inventories, Volume 2 Chapter 1 Table 1.4.

Electric Power in Thailand 2010, Energy Content of Fuel, Department of Alternative Energy Development and Efficiency, Ministry of Energy, Thailand.

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y}$$

$$= 1 \times 0.5595$$

$$= 0.5595 \text{ tCO}_2\text{e/MWh.}$$

Based on the equation and above data, the $EF_{grid,OM-ave,y} = 0.5595 \text{ tCO}_2\text{/MWh}$

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption