Gold Standard
for the Global Goals

TEMPLATE

# KEY PROJECT INFORMATION & PROJECT DESIGN DOCUMENT (PDD)

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.2**

RELATED SUPPORT

– **TEMPLATE GUIDE Key Project Information & Project Design Document v.1.2**

This document contains the following Sections

# KEY PROJECT INFORMATION

| | |
|---|---|
| GS ID of Project | 2766 |
| Title of Project | Xenamnoy 1 Hydropower project |
| Time of First Submission Date | 24/02/2014 |
| Date of Design Certification | 21/02/2014 |
| Version number of the PDD | 01 |
| Completion date of version | 08/02/2021 |
| Project Developer | Phongsubthavy Road & Bridge Construction Co., Ltd. |
| Project Representative | Swiss Carbon Assets Limited |
| Project Participants and any communities involved | Phongsubthavy Road & Bridge Construction Co., Ltd.<br>**Swiss Carbon Assets Limited** |
| Host Country (ies) | Lao PDR |
| Activity Requirements applied | ☐ Community Services Activities<br>☒ Renewable Energy Activities<br>☐ Land Use and Forestry Activities/Risks & Capacities<br>☐ N/A |
| Scale of the project activity | ☐ Micro scale<br>☒ Small Scale<br>☐ Large Scale |
| Other Requirements applied | N/A |
| Methodology (ies) applied and version number | AMS-I.D.: Grid connected renewable electricity generation (Version 18.0) |
| Product Requirements applied | ☒ GHG Emissions Reduction & Sequestration<br>☐ Renewable Energy Label<br>☐ N/A |
| Project Cycle: | ☐ Regular<br>☒ Retroactive |

**Table 1 – Estimated Sustainable Development Contributions**

| Sustainable Development Goals Targeted | SDG Impact (defined in Error! Reference source not found.) | Estimated Annual Average | Units or Products |
|---|---|---|---|
| 13 Climate Action (mandatory) | Emissions Reductions | 47,930 | $tCO_2$ |
| 7 Ensure access to MWh affordable, reliable, sustainable and modern energy for all (Affordable and Clean Energy) | MWh of renewable energy generated | 85,000 | MWh |
| 6 Ensure availability and sustainable management of water and sanitation for all | Number of the installed pumps on-site | 8 | / |

# SECTION A. DESCRIPTION OF PROJECT

## A.1. Purpose and general description of project

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Xenamnoy 1 Hydropower project (hereafter referred to as the "the project") is located on the Xenamnoy River, Attapeu Province in the southern part of Lao PDR, developed by PHONGSUBTHAVY Road & Bridge Construction Co., Ltd.

The project is a run-of-the-river hydropower station. The installed capacity of the project is 14.8 MW, with the annually 85 GWh power supplied to the power grid.

Following the Lao PDR's electrification policy, the electricity supply falls in short compared to the increased electricity demand. The project is expected to constantly contribute clean energy to the Lao Power Grid. For the Lao Power Grid is connected with the power grid in Thailand, the power supplied by the project will 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. By displacing part of the power generated by thermal power plants, the emission reductions are 47,558 $tCO_2e$/year during the first crediting period and the emission reductions in the second crediting period are 47,930 $tCO_2e$/year.

As a renewable energy project, the project will produce positive environmental and economic benefits and contribute to the local sustainable development in following aspects:

- During the construction period, plenty of job opportunities were provided to local residents, and the newcomers surged in the area will bring local people lots of employment opportunities thus bring more revenue for the local residents;
- The infrastructures were greatly improved. The implementation of water supply program, transportation and electricity system enhancement will bring substantial benefits to local villagers;
- Reduce the local use of firewood displacing by electricity, reduce the damage to the local vegetation;
- The project owner built a new temple for the local community, respect the religion of local residents.

- Power supplied to the regional grid consisting of Thailand Power Grid and the Lao Power Grid, will provide clean & cheap electricity power in this region, promote the sustainable development in this region and slowing down the increasing trend of GHG emissions.

This project has been registered as GS project with ID of 2766. The first crediting period is from 01/03/2014 to 28/02/2021. The project is applying for crediting period renewal and the start date of the second crediting period will be from 01/03/2021.

### A.1.1. Eligibility of the project under Gold Standard

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The project activity meets the eligibility criteria as per section 3.1.1 of GS4GG Principles & Requirements document as described below:

- Types of project:

The project type is power generation using a run-of-the-river hydropower station which is an eligible project type as it is in accordance with 2.1.2 a) and 2.1.2 b) of the Eligible Project Types & Scope under Renewable Energy Activity Requirements.

- Location of Project:

The project is located in Lao PDR. Therefore, the project is eligible.

- Project Area, Project Boundary and Scale:

The project is located at Attapeu Province, Lao PDR. The project location and boundary is clearly defined in A.2.
The total installed capacity of the project is 14.8 MW, it satisfies the requirement that the capacity of the project should be at most 15 MW for a small-scale project.
.
The project has not and will not claim in any other voluntary or compliance standards programme except GS.

- Host Country Requirements

The project is in compliance with applicable Lao PDR's legal, environmental, ecological and social regulations.

- Contact details

Contact details is listed in Appendix 2.

- Legal ownership

The full and uncontested legal ownership is demonstrated and listed in A.1.2.

- Official Development Assistance (ODA) Declaration:

The project does not use ODA directly or indirectly.

### A.1.2. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

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The project owner (Phongsubthavy Road & Bridge Construction Co., LTD) has full and uncontested legal ownership of the emission reductions that are generated under this Gold Standard project, and has legal rights concerning changes in use of resources required to service the project. The legal ownership of the project can be demonstrated via the following documents:

1. Project FSR approval by Department of Electricity of the Ministry of Energy and Mines of Lao PDR
2. Initial Environmental Examination (IEE) approval by Ministry of Natural Resource and Environment of Lao PDR

## A.2. Location of project

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The Project site is located at the on the main Stream of the Xenamnoy River, south-eastern part of the Boloven Plateau, Attapeu Province, Lao PDR. It takes about 1 hour by car from the project site to the Pakxe Town. The approximate coordinates of the project site is: 15°9’11’’N, 106°43’7’’ E.

Figure A.1 shows the location of the Project.


**Figure A.1 Geographical locations of the project**

## A.3. Technologies and/or measures

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After completion of the project, the newly built plant will provide clean electric power to the regional grid consisting of Thailand Power Grid and the Lao Power Grid. The scenario prior to the start of implementation of the project activity is provision of the

equivalent amount of electricity generated by the power plants connected with the regional grid, which is dominated by thermal power plants, thus leads to mass of GHG emissions. The baseline scenario is the same as the scenario prior to the start of implementation of the project activity.

The Xenamnoy 1 Hydro project is a run-of-river hydropower project. The total install capacity of the project is 14.8 MW. The construction of the project includes fixed weir, a sand flush, intake, headrace channel, head tank, penstock, powerhouse with 2 units of turbines (2*7,400 kW), and a tailrace. The parameters of the main equipments are shown as follow:

Table A.1 Major technical parameters of the key equipments of the Project

**Table A.1. Main Technical Parameters of propose project**

| **Turbine** | | **Generator** | |
|---|---|---|---|
| Type | HLA743-LJ-115 | Type | SF7400-10/2600 |
| Quantity | 2 | Quantity | 2 |
| Spindle arrangement type | vertical | Rated capacity | 7400 kW |
| Rated head | 75 m | Rated voltage | 6300 V |
| Rated flow | 11.45 $m^3/s$ | Frequency | 50Hz |
| Rated Rotation speed | 600 r/min | Rated speed | 600 r/min |
| direction of rotation | clockwise | Power factor | 0.80(lag) |
| Lifetime | 25 yr | Lifetime | 25 yr |
| Annual equivalent full load operation hour | 5,743 h | | |
| Manufacturer | Dongfang Electric Corporation International | | |

The power generated will be delivered to EDL through at Ban Lak 52 by 22kV transmission line 3 circuits, 5.2 km length.

## A.4. Scale of the project

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The project is a small-scale project utilizing renewable water resources to generate electricity. The total installed capacity of the project is 14.8 MW, it satisfies the

requirement that the capacity of the project should be at most 15 MW for a small-scale project.

## A.5. Funding sources of project

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The project is financed by the project owner.

The project does not receive any public funding from Parties included in Annex I. The project does not use Official Development Assistance ODA directly or indirectly.

# SECTION B. APPLICATION OF APPROVED GOLD STANDARD METHODOLOGY (IES) AND/OR DEMONSTRATION OF SDG CONTRIBUTIONS

## B.1. Reference of approved methodology (ies)

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Approved methodology applied: AMS I.D. Grid connected renewable electricity generation (Version 18.0).

Reference:

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

Sectoral Scope: 01

The methodology was applied with the following tools:

- Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (version 03.0.1)
- Tool to calculate the emission factor for an electricity system (version 07.0)

Further information pertaining to the methodology can be obtained at:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

## B.2. Applicability of methodology (ies)

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Justification for the choice of the selected methodology is given below in the table:

| Criteria | Analysis | Applicable for the project? |
|---|---|---|
| This methodology is applicable to project activities that:<br>(a) Install a Greenfield plant;<br>(b) Involve a capacity addition in (an) existing plant(s);<br>(c) Involve a retrofit of (an) existing plant(s);<br>(d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or<br>(e) Involve a replacement of (an) existing plant(s). | The project is a greenfield grid-connected hydro power project. | Applicable |

| | | |
|---|---|---|
| Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:<br>a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir;<br>b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 $W/m^2$;<br>c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 $W/m^2$. | The project activity results in new reservoirs and the power density of the project is greater than 4 $W/m^2$. Thus, the project is applicable to criteria b). | Applicable |
| If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW. | The project is a hydro power plant without non-renewable components (e.g. a wind/diesel unit). Therefore, this is not applicable. | Not applicable |
| Combined heat and power (co-generation) systems are not eligible under this category. | The project is a hydro power plant and do not involve the combined heat and power (co-generation) systems. Therefore, this is not applicable. | Not applicable |
| In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct1 from the existing units. | The project does not involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, Therefore, this is not applicable. | Not applicable |
| In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW. | The project is not retrofit, rehabilitation, replacement, or capacity addition project. Therefore, this item is not applicable. | Not applicable |
| In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant | The project is a hydro power project. Therefore, this is not applicable. | Not applicable |

| | | |
|---|---|---|
| Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as "AMS-I.C.: Thermal energy production with or without electricity" shall be explored. | | |
| In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply. | The project is a hydro power project. Therefore, this is not applicable. | Not applicable |

The criteria and assessment of "Tool to calculate the emission factor for an electricity system (version 07.0)" are in the following table B.1.

**Table B.1. Applicability analysis of "*Tool to calculate the emission factor for an electricity system (version 07.0)*"**

| Criteria | Analysis |
|---|---|
| This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects). | The project generates electricity to regional grid consisting of Thailand Power Grid and the Lao Power Grid. This tool is used to calculate the OM, BM and CM.<br><br>This is applicable. |

| | |
|---|---|
| Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity. | Since the project activity is grid connected, this condition is applicable and the emission factor has been calculated accordingly. |
| In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country. | The project is not located in annex I country. Therefore, the tool is applicable. |
| Under this tool, the value applied to the $CO_2$ emission factor of biofuels is zero. | The proposed project is a grid connected hydropower project/ unit and does not involve emission from biofuels.<br>Therefore, this criterion is not applicable. |

Applicability conditions of "Assessment of the validity of the original/current baseline and update the baseline at the renewal of the crediting period (Version 03.0.1)" is shown in table B.2.

**Table B.2. Applicability analysis of "*Assessment of the validity of the original/current baseline and update the baseline at the renewal of the crediting period (version 03.0.1)*"**

| Criteria | Analysis |
|---|---|
| This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period. | Applicable. The baseline is assessed by the procedure of this tool. |

## B.3. Project boundary

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According to the methodology AMS-I.D., the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The electricity system connected is identified according to the "Tool to calculate the emission factor for an electricity system" (Version 07.0). According to paragraph 17 of the Tool:

*Project participants may delineate the project electricity system using any of the following options:*

**(a)** ***Option 1.*** *A delineation of the project electricity system and connected electricity systems published by the DNA or the group of the DNAs of the host country(ies), In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries;*

**(b)** ***Option 2.*** *A delineation of the project electricity system defined by the dispatch area of the dispatch centre responsible for scheduling and dispatching electricity generated by the project activity. Where the dispatch area is controlled by more than one dispatch centre, i.e. layered dispatch area, the higher level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centres are required to comply with dispatch orders of the national dispatch centre then area controlled by the national dispatch centre shall be used);*

**(c)** ***Option 3.*** *A delineation of the project electricity system defined by more than one independent dispatch areas, e.g. multi-national power pools.*

The power generated by the project will be supplied to the Lao Power Grid, which is tightly connected with Thailand Power Grid through transmission lines. Thus (C) Option 3 is selected. According to the Tool, in case of option 3, transmission lines between dispatch areas included in the proposed delineation shall be checked for the existence or non-existence of transmission constraints following the paragraph 19 below:

*There are no transmission constraints if any one of the following criteria is met:*

*(a) In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of less than five per cent between the two electricity systems at least during 90 per cent of the hours of the most recent year for which information is available (at least one year data is required); or*

*(b) The transmission line(s) is operated at 75 per cent or less of its rated capacity during 90 per cent or more of the hours of the most recent year for which information is available (at least one year data is required) using the algorithm below:*

*(i)* For every hour of the year check whether the transmission line is operated at 75 per cent or less of its rated capacity;

*(ii) Each hour of the year when the transmission line was operated at 75 per cent or less of its rated capacity should be counted as zero;*

*(iii) Each hour of the year when the transmission line was operated at 75 per cent or more of its rated capacity should be counted as one;*

*(iv) There is no transmission constraint if the total sum is less than ten per cent of the hours of the year (e.g. 876 for even year and 878 for leap year);*

*(v) The algorithm can be illustrated by the following equation:*

$$\sum_{1}^{8760}\left[\frac{Hourly\ power\ transmission\ (MWh)}{[Maximum\ line's load\ capacity\ (MW)]} > 75\ per\ cent\right] < 876$$

*(vi) The maximum line's load capacity should be based on official information (e.g. from the operator of the system);*

*(c) The transmission capacity of the transmission line(s) that is connecting electricity systems is more than 10 per cent of the installed capacity either of the project electricity system or of the connected electricity system, whichever is smaller.*

Criteria (C) is met with following description:

In 2019, the total transmission capacity that transferred from Lao PDR in Thailand is 5420.6 MW[1], which is 59.80% of total installed capacity of Lao PDR and 13.70% of total install capacity of Thailand[2], more than 10 per cent of the installed capacity either of the Lao or Thailand, the power grid of these two countries is tight connected. It is

[1] See Page 132, Annual Report, 2019, EGAT
[2] See ER spread sheet for calculation details.

demonstrated that there are no transmission constraints between Lao and Thailand.

Besides, the DNA of Lao has published a delineation[3] of the project electricity system and connected electricity systems in 2010. The Project will supply power to Lao Power Grid, which according to the delineation published by Lao DNA, is a part of the regional power grid consisted by Lao and Thailand power grid.

*In addition, in cases involving international interconnection (i.e. transmission line is between different countries and the project electricity system covers national grids of interconnected countries) it should be further verified that there are no legal restrictions for international electricity exchange.*

The grid between Lao and Thailand kept enormous power exchange, and the power comparison of Laos export, import and domestic demand are listed below:

**Table B.3 Power exchange between Lao and Thailand (Unit: GWh)**

| | **2019** | **2018** | **2017** |
|---|---|---|---|
| Lao power export to Thailand[4] | 25,407.09 | 26,386.04 | 24,196.64 |
| Domestic demand in Lao[5] | 8166.26 | 9386.77 | 7863.56 |
| Lao power import from Thailand (EDL)[6] | 1,316.51 | 253.86 | 365.27 |

[3] See Calculation for the emission factor for electricity generation in Lao PDR, 2010
[4] EGAT Annual Report 2019, page 134 & Annual Report 2018, page 132, Electricity Generating Authority of Thailand.
[5] EDL Electricity Statistic 2019, page 9-11, Electricity du Laos.
[6] EGAT Annual Report 2019, page 135 & Annual Report 2018, page 133, Electricity Generating Authority of Thailand.[7] https://wle-mekong.cgiar.org/thailand-signals-plans-to-purchase-more-lao-electricity/ [8] According to Annual Report 2019, 2018, 2017, issued by EGAT, the Thailand import power from Lao PDR and Malaysia. Lao is considered as part of the project electricity system, and Malaysia is considered as the connected electricity system. Vietnam and China are also considered as connected electricity system for the power supply to Lao according to the Annual Repot 2019 by the Lao Power Grid Electric du Lao (EDL).

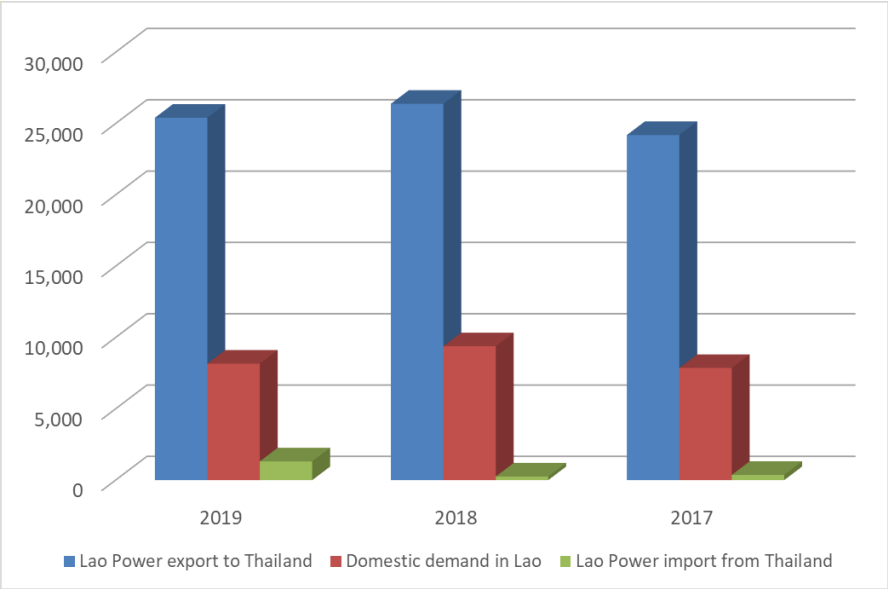


**Figure B.1 Power exchange between Lao and Thailand (Unit GWh)**

The data listed above indicates the close relationship between the power system of Lao and Thailand. According to the Memorandum of Understanding (MOU) signed between Lao government and Thailand government, that through the interconnection between the two countries, Lao power grid could sell the surplus energy to Thailand, and the deficits of Lao demand in rush hours can be covered by imports. Besides, Lao PDR will supply 7,000 MW to Thailand by 2020[7].

Based on the above information, it could be concluded that there are no legal restrictions for international electricity exchange.

Based on the reasons listed above, it is shown that the most appropriate definition of the spatial extension of the project electricity system is a regional grid consisting of Thailand Power Grid and the Lao Power Grid.

| Source | | GHGs | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline scenario | $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor emission source |
| | | $N_2O$ | No | Minor emission source |
| Project | | $CO_2$ | No | Minor emission source |

[7] https://wle-mekong.cgiar.org/thailand-signals-plans-to-purchase-more-lao-electricity/[8] According to Annual Report 2019, 2018, 2017, issued by EGAT, the Thailand import power from Lao PDR and Malaysia. Lao is considered as part of the project electricity system, and Malaysia is considered as the connected electricity system. Vietnam and China are also considered as connected electricity system for the power supply to Lao according to the Annual Repot 2019 by the Lao Power Grid Electric du Lao (EDL).

| | | | | |
|---|---|---|---|---|
| | Emission Sources of Project Activity | $CH_4$ | No | Minor emission source |
| | | $N_2O$ | No | Minor emission source |

A flow diagram of the project boundary is presented in Figure B.2 below. The flow diagram physically delineates the project boundary, includes the flow of electricity and the project electricity system (the regional grid consisting of Thailand Power Grid and the Lao Power Grid), and the GHG emissions.

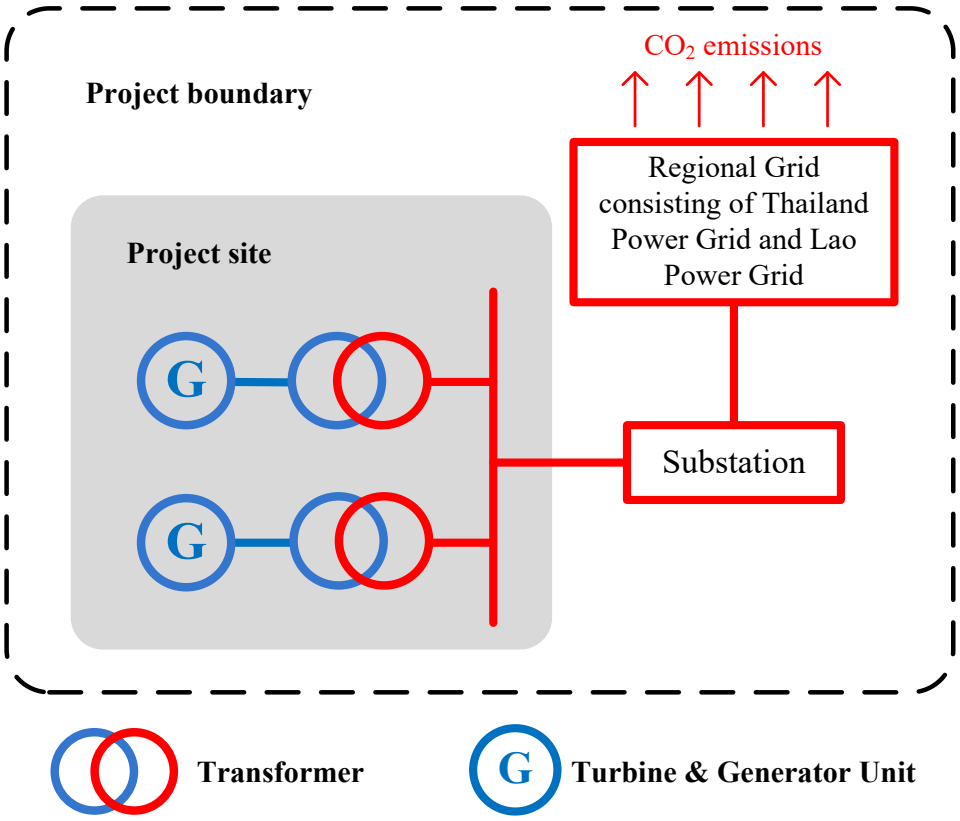


**Figure B.2. Flow diagram of the project boundary**

## B.4. Establishment and description of baseline scenario

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According to ASM I.D, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

For the second crediting period, the continued validity of the original baseline should be assessed.

According to the Methodological Tool "*Assessment of the validity of the original/current baseline and update the baseline at the renewal of the crediting period*" (version 03.0.1), the stepwise procedure as follows should be adopted to assess the continued validity of the baseline and to update the baseline:

*Step 1: Assess the validity of the current baseline for the next crediting period*

*Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies*

There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. Thus, go to Step 1.2.

*Step 1.2: Assess the impact of circumstances*

Firstly, the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment;
Secondly, the market characteristics have no significant change which would impacts the current baseline. The current practice for the baseline emissions is still the GHG emitted by project: the equivalent electricity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

*Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which the renewal is requested.*

The current baseline scenario is the continuation of the current practice. In the absence of the project, the electricity would have been supplied by power grid, and it will not request an investment by the project proponent or third party. So, this step is not applicable.

*Step 1.4: Assessment of the validity of the data and parameters*

Since there are some parameters, which were determined at the start of the first crediting period and not monitored during the first crediting period, are not valid anymore, therefore, the current baseline emissions needs to be updated for the second crediting period according to this tool.

Before the time of requesting renewal of the crediting period, data source for calculating the emission factor has been updated, so the emission factor is updated for the second crediting period according to this Notice.

In summary, the emission factor and all values have been updated to the latest data for the second crediting period according to this Notice.

Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the second crediting period but data and parameters need to be updated. Therefore step 2 is used.

*Step 2: Update the current baseline and the data and parameters*
*Step 2.1: Update the current baseline*

The baseline emissions for the second crediting period have been updated, without reassessing the baseline scenario, based on the latest approved version of the methodology ASM I.D. More details for the updated baseline emissions for the second crediting period can be seen in section B.6.

*Step 2.2: Update the data and parameters*

As mentioned in step 1.4 above, all parameters regarding the grid emission factor calculation have been updated for this second crediting period. More details can be seen in section 4.

## B.5. Demonstration of additionality

This section has been assessed and validated in the first crediting period.

### B.5.1. Prior Consideration

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The project operation start date was 14/11/2011. And entering into GS pipeline was on 01/03/2014.

B.5.2. Ongoing Financial Need

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Carbon revenues derived from Gold Standard certification have been playing a very important role in helping PO to contribute to SDGs, e.g providing renewable electricity and 8 pumps has been be installed in the villages, ensuring the access to water for 146 households with population more than 1000 persons.

## B.6. Sustainable Development Goals (SDG) outcomes

Relevant Target/Indicator for each of the three SDGs

| Sustainable Development Goals Targeted | Most relevant SDG Target | SDG Impact<br>Indicator (Proposed or SDG Indicator) |
|---|---|---|
| 13 Climate Action (mandatory) | Target 13.2: Integrate climate change measures into national policies, strategies and planning. | Emissions Reductions |
| 7 Affordable and Clean Energy | Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services | 7.1.1 Proportion of population with access to electricity |
| 6 Clean Water and Sanitation | Target: 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all. | 6.1.1 Proportion of population using safely managed drinking water services. |

B.6.1. Explanation of methodological choices/approaches for estimating the SDG Impact

>>

| SDGs | Method |
|---|---|
| SDG 7 Affordable and Clean Energy | Target 7.1: By 2030, ensure universal access to affordable, reliable and modern energy services. |

| | |
|---|---|
| | Indicator: 7.1.1 Proportion of population with access to electricity<br>Monitoring Parameter: $EG_{facility,y}$ Quantity of net electricity generation supplied by the project plant/unit to the grid in year y<br>Monitoring Method: Calculated<br>Calculation Method: $EG_{facility,y} = EG_{output,y} - EG_{input,y}$ |
| SDG6 Clean Water and Sanitation | Target 6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all.<br>Indicator: 6.1.1 Proportion of population using safely managed drinking water services.<br>Monitoring Parameter: Number of the installed pumps on-site<br>Monitoring Method: Site-visit to the water supply program and interviewing with the local villager by simple random.<br>Calculation Method: N/A |
| SDG 13 Climate Action | Indicator: Emissions Reductions in $tCO_2e$ from the project activity.<br>Monitoring Parameter: $ER_y$ emission reductions in year y<br>Monitoring Method: Calculated<br>Calculation Method: Details as below. |

For SDG 13, the applied methodology AMS I.D is applied in the project in the following four steps:

- **Step 1, calculate the project emissions;**
- **Step 2, calculate the baseline emissions;**
- **Step 3, calculate the project leakage;**
- **Step 4, calculate the emission reductions.**

**Calculate the project emissions**

According to Methodology, the project emissions shall be calculated by the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad \text{(Equation B.1)}$$

Where:

$PE_y$ = Project emissions in year *y* ($tCO_2e/yr$)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* ($tCO_2/yr$)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* ($tCO_2e/yr$)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* ($tCO_2e/yr$)

For this project, does not involve the fossil fuel consumption and geothermal power, so $PE_{FF,y}=0$, $PE_{GP,y}=0$. For hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for project emissions, estimated as follows:

a) If the power density (PD) of power plant is greater than 4 $W/m^2$ and less than or equal to 10 $W/m^2$:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000} \quad \text{(Equation B.2)}$$

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs ($tCO_2e/yr$)

$EF_{Res}$ = Default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 kg $CO_2e$ /MWh

$TEG_y$ = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh)

b) If the power density (*PD*) of the power plant is greater than 10 W/ $m^2$

$$PE_{HP,y}=0 \quad \text{(Equation B.3)}$$

The PD of the project activity is calculated as follows:

$$PD=\frac{Cap_{PJ}-Cap_{BL}}{A_{PJ}-A_{BL}} \quad \text{(Equation B.4)}$$

Where:

$PD$ = Power density of the project activity (W/ $m^2$)

$Cap_{PJ}$ = Installed capacity of the hydro power plant after the implementation of the project activity (W)

$Cap_{BL}$ = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

$A_{PJ}$ = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full ($m^2$)

$A_{BL}$ = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full ($m^2$). For new reservoirs, this value is zero

For this project, does not involve the reservoir, so $PE_{HP,y}=0$

**Calculate the baseline emissions**

Baseline emissions include only $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y} \quad \text{(Equation B.5)}$$

Where:

$BE_y$ = Baseline Emissions in year $y$ ($tCO_2/yr$)

$EG_{BLy}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{CO2,grid,y}$ = Combined margin $CO_2$ emission factor for grid connected power generation in year y

According to Methodology, if the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

$$EG_{BL,y} = EG_{facility,y} \quad \text{(Equation B.6)}$$

The emission coefficient (measured in $tCO_2e/MWh$) should be calculated in a transparent and conservative manner according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (Version 07.0).

The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

STEP 1: Identify the relevant electricity system;
STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3: Select a method to determine the operating margin (OM);
STEP 4: Calculate the operating margin emission factor according to the selected method;
STEP 5: Calculate the build margin (BM) emission factor;
STEP 6: Calculate the combined margin (CM) emissions factor.

**STEP 1: Identify the relevant electricity system**

As descripted in Section B.3., there are no transmission constraints between Lao and Thailand, the project electricity system is a regional grid consisting of Thailand Power Grid and Lao Power Grid.

And as electricity imported from Malaysia, China and Vietnam Power Grid[8], these three Power Grids are considered as **connected electricity system.**

**STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)**

According to "Tool to calculate the emission factor for an electricity system" (Version 07.0), there are two options to calculate the operating margin and build margin emission factor:

**Option I:** Only grid power plants are included in the calculation.
**Option II:** Both grid power plants and off-grid power plants are included in the calculation.

Option I is chosen for emission factor calculation.

**STEP 3: Select a method to determine the operating margin (OM)**

According to "Tool to calculate the emission factor for an electricity system" (Version

[8] According to Annual Report 2019, 2018, 2017, issued by EGAT, the Thailand import power from Lao PDR and Malaysia. Lao is considered as part of the project electricity system, and Malaysia is considered as the connected electricity system. Vietnam and China are also considered as connected electricity system for the power supply to Lao according to the Annual Repot 2019 by the Lao Power Grid Electric du Lao (EDL).

07.0), there are four methods for calculating the $EF_{grid,OM,y}$:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data Analysis OM, or
(d) Average OM

The method (d), average OM, is selected.

$EF_{grid,OM\text{-}ave,y}$ is calculated using ex ante option: a 3-year generation-weighted average in 2019, 2018, 2017, without requirement to monitor and recalculate the emissions factor during the crediting period.

**STEP 4: Calculate the operating margin emission factor according to the selected method**

The average OM emission factor is calculated as the average emission rate of all power plants serving the grid, using the methodological guidance as described under Step 4 in the "Tool to calculate the emission factor for an electricity system" (Version 07.0) for the simple OM, but also including the low-cost / must-run power plants in all equations.

According to "Tool to calculate the emission factor for an electricity system" (Version 07.0), there are two options based on different data for calculating average OM:

Option A: Based on the net electricity generation and a $CO_2$ emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

For the project, the necessary data for Option A is not available, so Option B was used.

Under this option, the average OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, including low-

cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OM\text{-}ave,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})}{EG_y} \quad \text{(Equation B.7)}$$

Where:

| | | |
|---|---|---|
| $EF_{grid,OM\text{-}ave,y}$ | = | Average operating margin $CO_2$ emission factor in year *y* ($tCO_2/MWh$) |
| $FC_{i,y}$ | = | Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit) |
| $NCV_{i,y}$ | = | Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit) |
| $EF_{CO2,i,y}$ | = | $CO_2$ emission factor of fossil fuel type i in year y ($tCO_2/GJ$) |
| $EG_y$ | = | Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year *y* (MWh) |
| ***i*** | = | All fossil fuel types combusted in power sources in project electricity system in year *y* |
| ***y*** | = | The data available in the most recent 3 years |

According to the "Tool to calculate the emission factor for an electricity system" (Version 07.0), electricity imports from the connected electricity systems $EG_{import,y}$ are included in the $EG_y$.

The detailed calculating procedures please refer to Appendix 4 of the PDD.

**Step 5. Calculate the build margin (BM) emission factor**

To calculate the build margin (BM) emission factor, the data for determine the sample group of power units m about the most recently units in the electricity system is needed. However, as an international project system, it's difficult to obtain the information for all the units in both Lao and Thailand (power generation data, commissioning date, and the fuel consumption). The data requirements for the application for calculate the build margin (BM) emission factor cannot be met.

As the Simplified CM is adopted in the step 6, the weighting of build margin emissions factor is 0.

**STEP 6: Calculate the combined margin (CM) emissions factor**

According to "Tool to calculate the emission factor for an electricity system" (Version 07.0), the calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

According to "Tool to calculate the emission factor for an electricity system" Version 07.0, the simplified CM can be used if:
(a) The project activity is located in: (i) a Least Developed Country (LDC); or in (ii) a country with less than 10 registered CDM projects at the starting date of validation; or (iii) a Small Island Developing States (SIDS); and
(b) The data requirements for the application of Step 5 above cannot be met.

The project located in Lao, which is a Least Developed Country, therefore the criteria (a) is met; As mentioned in step 5, the data requirements for the application for calculate the build margin (BM) emission factor is not available, therefore the criteria (b) is also met.

The Simplified CM method is calculated as follow:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \quad \text{(Equation B.8)}$$

Where:

$w_{OM}$ = Weighting of operating margin emission factor (%);
$w_{BM}$ = Weighting of build margin emission factor (%).

The weighs $w_{OM}$ and $w_{BM,}$ for simplified CM by default, are $w_{OM}$=1 and $w_{BM}$= 0.

**Calculate the project leakage**

No leakage emissions are considered.

**Calculate the emission reductions**

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \text{(Equation B.9)}$$

Where:

| | | |
|---|---|---|
| $ER_y$ | = | Emission reduction in year *y* (t $CO_2e$/yr) |
| $BE_y$ | = | Baseline emission in year *y* (t $CO_2e$/yr) |
| $PE_y$ | = | Project emission in year *y* (t $CO_2e$/yr) |

B.6.2. Data and parameters fixed ex ante

**SDG13**

| Data/parameter | **$FC_{i,y}$** |
|---|---|
| Unit | mass or volume unit of the fuel i |
| Description | Amount of fossil fuel type i consumed in the project electricity system in year y (mass, volume unit) |
| Source of data | - Fuel consumption in Lao PDR is calculated based on the Sustainability Report 2019, Banpu Power Public Company Limited[9].<br>- Fuel consumption in Thailand is from "Energy Balance of Thailand 2019", EGAT |
| Value(s) applied | See the Table 5 and 6 in Appendix 3. |
| Choice of data or Measurement methods and procedures | Data are from Banpu Power Public Company Limited (shareholder of Hongsa power plant) and Thailand authority, EGAT |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | / |

[9] Banpu Power Public Company Limited is the shareholder of Hongsa power plant.

| | |
|---|---|
| Data/parameter | **$NCV_{i,y}$** |
| Unit | kJ/kg, $kJ/m^3$ |
| Description | The net calorific value (energy content) per mass or volume unit of fuel i in year y. |
| Source of data | - Data used for Lao PDR, default value from IPCC 2006<br>- Data used for Thailand is from Unit converter and glossary, International Energy Agency. |
| Value(s) applied | See the Table 5 and 6 in Appendix 3. |
| Choice of data or Measurement methods and procedures | Data used are from IPCC 2006 and Unit converter and glossary, International Energy Agency. |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | / |

| | |
|---|---|
| Data/parameter | **$EF_{CO2,i,y}$** |
| Unit | $tCO_2/TJ$ |
| Description | The $CO_2$ emission factor per unit of fuel i in year y |
| Source of data | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Chapter 1 Table 1.4 |
| Value(s) applied | See the Table 5, 6 in Appendix 3. |
| Choice of data or Measurement methods and procedures | No specific local value available, the value form IPCC 2006, Guidelines for National Greenhouse Gas Inventories was adopted. |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | / |

| | |
|---|---|
| Data/parameter | **$EG_y$** |
| Unit | MWh |
| Description | Net electricity generated and delivered to the grid by all power sources serving the system, including low-cost/must-run power plants/units, in year y. |
| Source of data | - The data of the electricity generated and delivered to Lao PDR National Power Grid are from Electricity Statistic (2019), EDL<br>- The data of the electricity generated and delivered to Thailand National Power Grid are from Annual Report (2019, 2018), EGAT<br>- The data of the electricity generated and delivered by Lao IPP directly supply to Thailand are from Electricity Statistic (2019), EDL |
| Value(s) applied | See the Table 1, 2, 3 in Appendix 3. |
| Choice of data or Measurement methods and procedures | Data used are from Thailand authority, EGAT and Lao authority, EDL. |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | / |

| | |
|---|---|
| Data/parameter | **$EG_{import,y}$** |
| Unit | MWh |
| Description | The electricity (MWh) imported from Malaysia, China, Vietnam Power Grid in year y. |
| Source of data | - Annual report (2019, 2018), EGAT<br>- Electricity Statistic (2019, 2018, 2017), EDL |
| Value(s) applied | See the Table 4 in Appendix 3. |

| | |
|---|---|
| Choice of data or Measurement methods and procedures | Data used are from Thailand authority, EGAT and Lao authority, EDL. |
| Purpose of data | Calculation of baseline emissions |
| Additional comment | / |

| | |
|---|---|
| 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 emissions |
| Additional comment | / |

| | |
|---|---|
| Data/parameter | **$CAP_{BL}$** |
| 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 emissions |
| Additional comment | / |

| | |
|---|---|
| Data/parameter | **$EF_{Res}$** |
| Unit | $kgCO_{2e}/MWh$ |
| Description | Default emission factor for emissions from reservoirs |
| Source of data | Methodology ACM0002 (Version 18.0.0) |
| Value(s) applied | 90 |
| Choice of data or Measurement methods and procedures | - |
| Purpose of data | Calculation of project emissions |
| Additional comment | / |

### B.6.3. Ex ante estimation of SDG Impact

>>

| **SDGs** | **Ex ante estimation of outcomes** |
|---|---|
| 6 Clean Water and Sanitation | Baseline outcomes: 0<br>Project outcomes: 8 pumps has been be installed in the villages, ensuring the access to water for 146 households with population more than 1000 persons. |
| SDG 7 Affordable and Clean Energy | Baseline outcomes: 0<br>Project outcomes: The net generation supplied by the project to the grid is estimated to be 85,000 MWh/yr, which could replace the equivalent electricity from fossil fuel based grid. |

| | |
|---|---|
| SDG 13 Climate Action | Baseline outcomes: 0<br>Project outcomes: The project will directly contribute by reducing 47,930 tons of $CO_2$ equivalent every year in the second crediting period.<br>The estimation is as below. |

**Project Emissions**

In accordance to ACM0002, the project emission for most renewable energy (including wind farm) project activities is zero ($PE_y$=0).

**Leakage**

Based on ACM0002, there is no need of leakage calculation or monitoring for this kind of activity, thus leakage is considered to be zero (0 $tCO_2e$).

**Baseline Emissions**

According to section B.6.1, in second crediting period, the baseline emission factor of the project:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} = 0.5639 \text{ } tCO_2e/MWh.$$

The baseline emission of the project:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y} = 85{,}000 \times 0.5639 = 47{,}930 \text{ } tCO_2e$$

Emission reductions

$$ER_y = BE_y - PE_y = 47{,}930 - 0 = 47{,}930 \text{ } tCO_{2e}$$

**The result of emission reduction:**

| | | | |
|---|---|---|---|
| $EG_{BL,y}$ | Quantity of net electricity supplied to the grid as a result of the implementation of the GS project activity in year y (MWh/yr) | 85,000 | MWh/year |
| $EF_{CO2,grid,y}$ | Combined margin $CO_2$ emission factor for grid connected power generation in year y | 0.5639 | $tCO_2e/MWh$ |

| | | | |
|---|---|---|---|
| $ER_y$ | Emission reductions annually | 47,930 | $tCO_2e$/year |

B.6.4. Summary of ex ante estimates of each SDG Impact

**SDG13**

| Year | Baseline estimate | Project estimate | Net benefit |
|---|---|---|---|
| **Year 1** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 2** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 3** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 4** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 5** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 6** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Year 7** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |
| **Total** | **0** | **335,510 $tCO_2e$** | **335,510 $tCO_2e$** |
| **Total number of crediting years** | 7 | | |
| **Annual average over the crediting period** | 0 | 47,930 $tCO_2e$ | 47,930 $tCO_2e$ |

**SDG7**

| Year | Baseline estimate | Project estimate | Net benefit |
|---|---|---|---|
| **Year 1** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 2** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 3** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 4** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 5** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 6** | 0 | 85,000 MWh | 85,000 MWh |
| **Year 7** | 0 | 85,000 MWh | 85,000 MWh |
| **Total** | **0** | **595,000 MWh** | **595,000 MWh** |
| **Total number of crediting years** | 7 | | |
| **Annual average over the crediting period** | 0 | 85,000 MWh | 85,000 MWh |

**SDG6**

Local pumps installed onsite are 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. This parameter is monitored via site-visit to the water supply program and interviewing with the local villager by simple random.

## B.7. Monitoring plan

### B.7.1. Data and parameters to be monitored

**SDG 13**

| Data / Parameter | **$ER_y$** |
|---|---|
| Unit | $tCO_2/yr$ |
| Description | Emission reduction in year y |
| Source of data | Calculated |
| Value(s) applied | 47,930 |
| Measurement methods and procedures | Calculated |
| Monitoring frequency | Each verification |
| QA/QC procedures | / |
| Purpose of data | To monitor the SDG 13 Indicator |
| Additional comment | / |

| Data / Parameter | **$EG_{output,y}$** |
|---|---|
| Unit | MWh |
| Description | Electricity supplied by the project to the grid in year y |
| Source of data | Measured by Meters |

| | |
|---|---|
| Value(s) applied | 85,000 |
| Measurement methods and procedures | Measured |
| Monitoring frequency | Continuous measurement and monthly recording |
| QA/QC procedures | According to the recommendation by the manufacturer or the regulations of the grid company, meters are calibrated periodically. Data measured by meters are cross-checked with the record document confirmed by EDL. |
| Purpose of data | Calculation of Baseline Emission |
| Additional comment | / |

| Data / Parameter | $EG_{input,y}$ |
|---|---|
| Unit | MWh |
| Description | Electricity supplied by the project to the grid in year y |
| Source of data | Measured by Meters |
| Value(s) applied | Estimated to be 0 MWh for ex-ante calculation |
| Measurement methods and procedures | Measured |
| Monitoring frequency | Continuous measurement and monthly recording |
| QA/QC procedures | According to the recommendation by the manufacturer or the regulations of the grid company, meters are calibrated periodically. Data measured by meters are cross-checked with the record document confirmed by EDL. |
| Purpose of data | Calculation of Baseline Emission |
| Additional comment | / |

**SDG 7**

| Data / Parameter | $EG_{facility,y}$ |
|---|---|

| | |
|---|---|
| Unit | MWh |
| Description | Quantity of net electricity supply of the Project activity to the grid in year y. |
| Source of data | Calculated value |
| Value(s) applied | $EG_{facility,y} = EG_{output,y} - EG_{input,y}$ |
| 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 | / |

**SDG 6**

| | |
|---|---|
| Data / Parameter | **Number of the installed pumps on-site** |
| Unit | / |
| Description | Number of the installed pumps on-site |
| Source of data | Survey |
| Value(s) applied | 8 |
| 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 | To Monitor the SDG 6 Indicator |
| 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. As confirmed by local village organization, 8 pumps are installed in the village in Nov. 2014 and the project also build temple and road to meet the local villagers' demand. According to the statistic by local EPB, over 146 households with population 1083 persons are benefits from the water supply program and temple. The PP has also placed Stakeholder Feedback and Complaint Form around the village and project site, no complaint has received yet. |

| Data / Parameter | **Quantitative employment and income generation** |
|---|---|
| Unit | / |
| Description | During the construction period, job opportunities were provided to local residents, and the existence of the project in the area will bring local people especially the poor and disadvantaged groups lots of employment chances |
| Source of data | Number of jobs created |
| Value(s) applied | N/A |
| Measurement methods and procedures | Through checking materials of employment and wage payment. |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| Data / Parameter | **Quality of employment** |
|---|---|
| Unit | / |
| Description | Staff will be trained for the positions created during construction& operation phases. All Heath and Safety measurements will be applied according to local regulations. |

| | |
|---|---|
| Source of data | Training Plan & Records |
| Value(s) applied | N/A |
| Measurement methods and procedures | Check employment records and training documents/certificates |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| | |
|---|---|
| Data / Parameter | **Biodiversity** |
| Unit | / |
| 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 vegetations |
| Value(s) applied | N/A |
| Measurement methods and procedures | Site visits and interviews with locals |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| | |
|---|---|
| Data / Parameter | **Other pollution** |
| Unit | / |
| Description | For the solid waste, the project will adopt following measures:<br><br>(i) Minimize the waste production and maximize waste recycling and reuse; and (ii) Promote safe waste disposal. |

| | |
|---|---|
| | For fuel, oil and lubricant storage areas should be located well away from any watercourses. All hydrocarbons (e.g. fuels and lubricants) and chemical reagents will be stored in safe places. |
| Source of data | Site visits and interviews with locals |
| Value(s) applied | N/A |
| Measurement methods and procedures | Site visits and interviews with locals |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| Data / Parameter | **Soil condition** |
|---|---|
| Unit | / |
| 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 | N/A |
| Measurement methods and procedures | Observations during site visits and continuous monitoring during construction |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| | |
|---|---|
| Data / Parameter | **Flow rate of water released & Water quality indicators** |
| Unit | / |
| 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 water prior to discharge. |
| Source of data | Examination by the environment monitoring department according to the relevant standards and regulations |
| Value(s) applied | N/A |
| Measurement methods and procedures | Examination by the environment monitoring department according to the relevant standards and regulations |
| Monitoring frequency | Annually |
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

| | |
|---|---|
| Data / Parameter | **The air quality indicators** |
| Unit | / |
| 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 | Examination by the environment monitoring department according to the relevant standards and regulations |
| Value(s) applied | N/A |
| Measurement methods and procedures | Examination by the environment monitoring department according to the relevant standards and regulations |
| Monitoring frequency | Annually |

| | |
|---|---|
| QA/QC procedures | N/A |
| Purpose of data | N/A |
| Additional comment | N/A |

### B.7.2. Sampling plan

>>

The data and parameters monitored in section B.7.1 above are not determined by a sampling approach.

### B.7.3. Other elements of monitoring plan

>>

The purpose of the monitoring plan is to ensure that the monitoring and calculation of emission reductions of the project within the crediting period is complete, consistent, clear and accurate. The plan will be implemented by the project owner with the support of the grid corporation.

**1. Monitoring organization**

The monitoring process will be carried out and responsibility by the project owner. A monitoring panel will be 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 CDM manager will be assigned full charge the monitoring works. The operation and management structure is shown below:

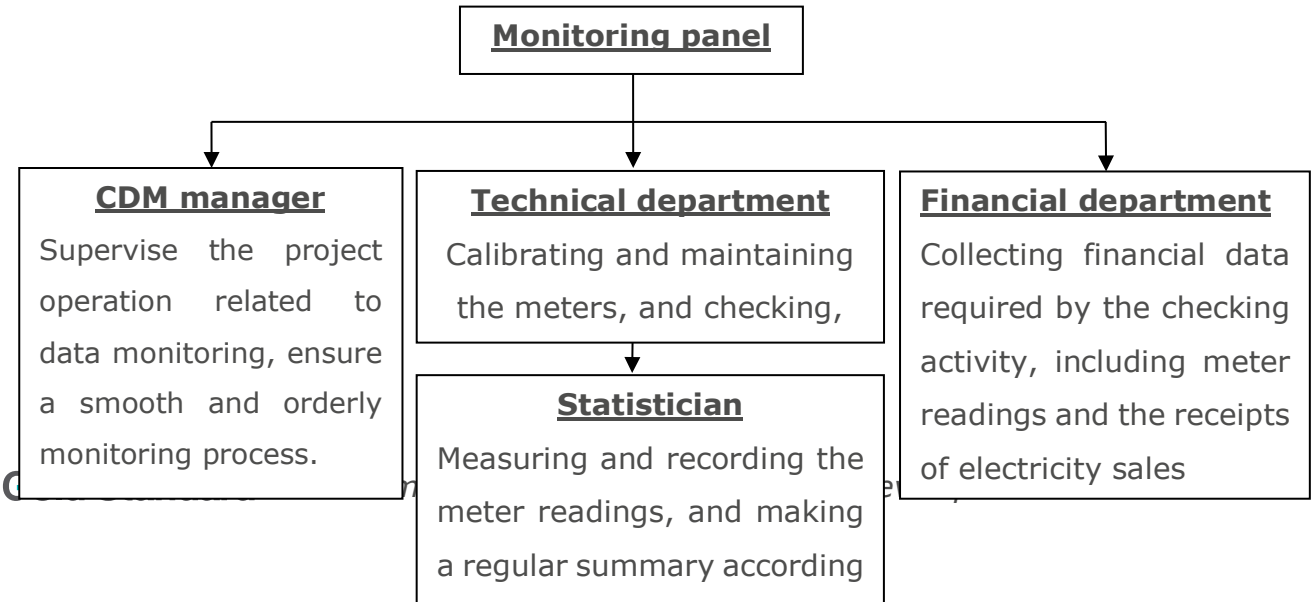

**Figure B.3. Management Structure of Monitoring Plan**

**2. Monitoring apparatus and installation:**

Two bidirectional electronic meters were installed in the Sekong station. Before the operation of the project, the metering equipment was clarified and examined by the project owner and the power grid company according to relevant national and industrial regulation. The power generated was delivered to EDL through at Ban Lak 52 by 22kV transmission line by 3 circuits, 5.2 km length.

**3. Data collection:**

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

a) During the crediting period, both the grid company and the project owner will record the values displayed by the main meter on the last day of every month.
b) Simultaneously to step a), the project owner will both record the values displayed by the backup meters.
c) The meters will be calibrated according to the relevant regulation and request of EDL.
d) The main meter's readings will be cross-checked with record document confirmed by EDL.

e) The project owner and the grid company will record both output and input power readings from the main meter. These data will be used to calculate the amount of net electricity delivered to the grid.
f) The project owner will be responsible of providing copies of record document confirmed by EDL to the DOE for verification.

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

g) Read the data of the backup meters.

h) If the backup meter's data is not so accurate as to be accepted, or the practice is not standardized, the project owner and the grid corporation 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 DOE.

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

**4. Calibration**

Calibration of Meters should be implemented according to relevant standards and rules accepted by the grid company EDL. After the examination, the meters should be 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 the 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 allowable 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 document such as the plant electrical wiring diagram will be 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 arrangement

### Air Quality

The Indicator had been monitored and verified during 1st Verification. Thus, the monitoring of the indicator is deleted and no longer required monitoring.

### Water Quality and quantity

The minimum flow was released to maintain the eco-system and meet demand for irrigation in the downstream. The construction wastewater was treated prior to discharge. The water quality and quantity are examined by the environment monitoring department according to the relevant standards and regulations annually. The monitoring parameters are the flow rate of water released and relevant water quality indicators.

### Soil condition

To prevent soil erosion, trees and grass was planted in the non-plant slopes. Drain system was 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. Observations during site visits and continuous monitoring during construction was carried out annually. The monitoring parameters are the restoration of land and tree plantation activities.

### Other pollutions

Check the solid waste treatment and interview with local villagers about the impact of solid waste was done by the project owner. Recorded solid waste treatment when it happens, while interview with local villagers once in each monitoring period.

**Biodiversity**

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**

Training of staff and safe and healthy working condition was monitored and recorded by the project owner. Record each training when it happens, while monitor and record the safe and healthy working condition monthly annually. The training records and the pictures of working condition was collected and achieved.

**Livelihood of the poor**

Water supply program was prepared for the local people to improve their water supply system. The condition was monitored through site visit to the water supply program annually by the project owner.

**Access to affordable and clean energy services**

Net electricity generation by project activity was supplied to local residents. Continuous monitoring was conducted for the net electricity generation according to the electricity generation meter.

**Quantitative employment and income generation**

The employee number and their salary level were recorded by the project owner. HR records or report were monitored and recorded monthly in annually.

## 7. Monitoring Report

During the crediting period, at the end of each year, the monitoring officer shall produce a monitoring report covering the past monitoring period. The report shall be transmitted to the General Manager who will check the data and issue a final monitoring report in the name of the project participants. Once the final report is issued, it will be submitted

to the DOE for verification.

# SECTION C. DURATION AND CREDITING PERIOD

## C.1. Duration of project

### C.1.1. Start date of project

>>

14/11/2011 (Equipment purchase contact signed)

### C.1.2. Expected operational lifetime of project

>>

25 years and 0 months

## C.2. Crediting period of project

### C.2.1. Start date of crediting period

>>

The start date of second crediting period is 01/03/2021. The first crediting period is from 01/03/2014 to 28/02/2021.

### C.2.2. Total length of crediting period

>>

Seven years for the 2nd crediting period.

# SECTION D. SUMMARY OF SAFEGUARDING PRINCIPLES AND GENDER SENSITIVE ASSESSMENT

## D.1. Safeguarding Principles that will be monitored

A completed Safeguarding Principles Assessment is in Appendix 1, ongoing monitoring is summarized below.

| Principles | Mitigation Measures added to the Monitoring Plan |
|---|---|
| **Principle 9.10** | Refer to B.7.1 Biodiversity |
| **Principle 9.4** | Refer to B.7.1 Air Quality |
| **Principle 9.1** | Refer to B.7.1 Soil condition |
| **Principle 9.1** | Refer to B.7.1 Other pollutants |
| **Principle 8.1** | Refer to B.7.1 Flow rate of water released & Water quality |

| | |
|---|---|
| **Principle 6.1** | Refer to B.7.1 Quantitative employment and income generation |
| **Principle 6.1** | Refer to B.7.1 Quality of employment |

### D.2. Assessment that project complies with GS4GG Gender Sensitive requirements

| | |
|---|---|
| Question 1 - Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy? | As per Gold Standard Gender Policy, para 4.2 (i) "Foundational gender-sensitive requirement - This strengthens Gold Standard's 'do no harm' approach and addresses safeguards to prevent or mitigate adverse impacts on women or men and girls and boys. Such action is mandatory for all projects seeking Gold Standard certification and includes compliance with the gender 'do no harm' safeguards, gender gap analysis and gender sensitive stakeholder consultations."<br>The project being a renewable energy project is not gender sensitive project. The project does not adversely impact women or men. |
| Question 2 - Explain how the project aligns with existing country policies, strategies and best practices | Lao PDR is party to "Convention on the Elimination of All Forms of Discrimination against Women"[10] and the project has aligned its policies which does not discriminate on gender. |
| Question 3 - Is an Expert required for the Gender Safeguarding Principles & Requirements? | No. The project is a renewable energy project and it does not discriminate among gender. |
| Question 4 - Is an Expert required to assist with Gender issues at the Stakeholder Consultation? | No. The project is a renewable energy project and it does not discriminate among gender. |

## SECTION E. SUMMARY OF LOCAL STAKEHOLDER CONSULTATION

During the Initial Environmental Examination (IEE) compiled period, stakeholder comments are collected in a series of ground survey, village profile and household survey with the use of questionnaires and interviews.

[10] https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=IV-8&chapter=4&lang=en

The participants of the surveys and interviews were from different groups including: all the stakeholders who concerns about the project, representative of Lao Women's Union at village level, Lao national Old People Union at the village level, and head of village and head of household.

The stakeholders took part in the workshops, and stated their concerns on the issues on land use, water supply, infrastructure construction, and local cultures. The workshops discussed such topics and put forward corresponding mitigation measures.

In the first crediting period, in order to consult the public's opinions and suggestions about the project, the IEE author invited stakeholders to carry out a consultation meeting through local government and bulletin notices in May 2010. The geological area of stakeholders' consultation involved Xenoy Village, and Misay Village. The summary of stakeholders is as follow:

**Table E.1. Basic information of the comments participants**

| Item | Category | Number | Percentage |
|---|---|---|---|
| **Age** | Below 30 | 7 | 23% |
| | 30~40 | 11 | 37% |
| | 40~50 | 10 | 33% |
| | Above 50 | 2 | 7% |
| **Gender** | Male | 19 | 63% |
| | Female | 11 | 37% |
| **Education** | Elementary school | 12 | 40% |
| | Junior high school | 9 | 30% |
| | Senior high school | 7 | 23% |
| | College and above | 2 | 7% |

To further collect the information from the stakeholders, inform the project process and the opinion exchanging for the Gold Standard project application, two Stakeholder Meetings were held in Misay Village (project site) in Jul 2013 and Vientiane Capital in Aug 2013 respectively. During the stake consultation meetings in village level and in Vientiane, the project owner introduced the information of the project, and a draft Gold Standard Passport was provided for the participants.

During the consultation meeting, the stakeholders were informed that they are invited for the feedback round. Since no significant issue has been identified in the consultation meeting, the stakeholder feedback round was not conducted as a physical meeting, instead, the relevant documents such as PDD, LSC report, passport, IEE which includes the information collected from the first round LSC were made public available by the project owner. Hard copies of the stakeholder consultation report, PDD and Passport were sent to the stakeholders through the leader of the village community. Besides, the relevant documents were also published at website of credit buyer and GS since 13th March 2014 to invite further comments from local and global stakeholders.

After the 2-month long stakeholder consultation round, no comments were received from the stakeholder regarding to the documents or other related influence of the project activity.

### E.1. Summary of stakeholder mitigation measures

>>

Since no significant issue had been identified during the local stakeholder consultation meetings and no comments received during the Stakeholder feedback round, no mitigation measures were proposed.

### E.2. Final continuous input / grievance mechanism

| Method | Include all details of Chosen Method (s) so that they may be understood and, where relevant, used by readers. |
|---|---|
| Continuous Input / Grievance Expression Process Book (mandatory) | Grievance expression book in local villages, kept by the leader of the villages |
| GS Contact (mandatory) | help@goldstandard.org |
| Other | Telephone access<br>+856-20-5534-5678 (for project owner) |

| | |
|---|---|
| | Local stakeholders can call the working staff of the project owner and GS expert to express their comments, suggestion and complaint.<br><br>Internet/email access<br>phongsab@yahoo.com (for project owner)<br>Local stakeholders can send email to the project owner and GS expert to express their comments, suggestion and complaint. |

# APPENDIX 1 - SAFEGUARDING PRINCIPLES ASSESSMENT

Complete the Assessment below and copy all Mitigation Measures for each Principle into SECTION D above. Please refer to the instructions in the Guide to Completing this Form below.

| Assessment Questions/ Requirements | Justification of Relevance (Yes/potentially/no) | How Project will achieve Requirements through design, management or risk mitigation. | Mitigation Measures added to the Monitoring Plan (if required) |
|---|---|---|---|
| **Principle 1. Human Rights** | | | |
| 1. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights<br>2. The Project shall not discriminate with regards to participation and inclusion | No | The project does not involve any conflict with livelihood of local people and respect all human rights. Stakeholder consultation had been carried out to take their opinion. The host country prohibits discrimination on the basis of a person's race, sex, religion, place of birth, or social status.<br><br>1. The Project is not in conflict with the economic livelihood or other issue of the local community. Thus, the Project does not cause any human rights abuse and respects internationally proclaimed human rights issue.<br><br>2. Project activities are not expected to cause any human rights abuse. As a member of United Nations and part of UN Agreement on Human | N/A |

| | | | |
|---|---|---|---|
| | | Rights[11], it is ensured by law in Lao PDR that no action can be taken against human rights. | |
| **Principle 2. Gender Equality** | | | |
| 1. The Project shall not directly or indirectly lead to/contribute to adverse impacts on gender equality and/or the situation of women.<br>2. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work<br>3. The Project shall refer to the country's national gender strategy or equivalent national commitment to aid in assessing gender risks<br>4. (where required) Summary of opinions and recommendations of an Expert Stakeholder(s) | No | 1. As a project combined of positive environmental, economic, and sustainable development benefits, the project is to generate clean electricity from the hydro power station to replace fossil fuel power. The project abides the rules of equality accordingly and does not involve and is not complicit in any form of discrimination. Specifically regarding the gender equality, detailed enforcement rules are regulated in 'Law on Development and Protection of Women'[12] to provide support and benefits to women.<br>2. Qualified local residents, both men and women, are recruited to work for the project. During stakeholders' consultation process, comments were collected from the local people, including both men and women. The details can be seen in registered passport.<br>During previous monitoring periods, stakeholder interviews were conducted to collect comments about impacts of the project from the local people, including both men and women. The details can be seen in previous verification report. | |

[11] https://www.ilo.org/newdelhi/lang--en/index.htm
[12] http://www.na.gov.la/files/laws/105Development%20and%20Protection%20of%20Women%20Law.pdf

| | | | |
|---|---|---|---|
| | | 3. The project abides the rules of equality accordingly. Regarding the gender equality, detailed enforcement rules are regulated in 'Labor Law'[13] and 'Law on Development and Protection of Women'[14]<br>4. No expert required. | |
| **Principle 3. Community Health, Safety and Working Conditions** | | | |
| 1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community | No | The project is renewable energy technology based power generation Technology) and does not have exposure to increased health risks and shall not adversely affect the health of the workers and the community.<br><br>The project provides workers with a safe and healthy work environment and is not complicit in exposing workers to unsafe or unhealthy work environments.<br>All the safety and hygiene measures are being ensured in order maintain a safe and healthy environment for the workers at site. In case of any emergency, the site incharge will ensure to take adequate action and preventive measures to avoid any miss happening.<br>Necessary health and safety measures will be taken during<br>construction and operation phase, relevant staff will be trained to be able to work with safety. The project is in compliance with all relevant local and national laws. | N/A |

[13] http://laoofficialgazette.gov.la/
[14] http://www.na.gov.la/files/laws/105Development%20and%20Protection%20of%20Women%20Law.pdf

| | | | |
|---|---|---|---|
| | | The project proponent is committed to the employee's workplace health & safety during all phases of the project. All employees will attend health & safety trainings. This is issued in the Labour code on Occupational Safety, Health and Working Conditions and UN Agreement on Human Rights[15]. | |
| **Principle 4.1 Sites of Cultural and Historical Heritage** | | | |
| Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture? | No | According to the IEE reports, the Project area does not include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture. | N/A |
| >> | | | |
| **Principle 4.2 Forced Eviction and Displacement** | | | |
| Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)? | No | As described in the IEE reports, the Project is constructed distanced to residential area, thus the Project does not require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial). | No |
| >> | | | |
| **Principle 4.3 Land Tenure and Other Rights** | | | |
| Does the Project require any change, or have any uncertainties related to land tenure arrangements and/or access | No | No resettlement or relocation required for the project construction, the land occupied will be compensated according to the relevant law and regulations. | N/A |

[15] https://www.ohchr.org/EN/countries/AsiaRegion/Pages/LAIndex.aspx

| | | | |
|---|---|---|---|
| rights, usage rights or land ownership? | | | |
| >> | | | |
| **Principle 4.4 Indigenous Peoples** | | | |
| Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples? | No | According to the IEE reports, no indigenous peoples present in or within the area of influence of the Project. | N/A |
| >> | | | |
| **Principle 5. Corruption** | | | |

| | | | |
|---|---|---|---|
| 1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects | No | The project does not condone or support corruption. Lao PDR has published relevant law[16] to against corruption. Furthermore, Lao PDR ratified the UN Convention against Corruption[17] on Sep. 25, 2009, Lao PDR will have the right to ask for assistance from other member countries in investigating and dealing with corruption cases with foreign elements. | N/A |
| **Principle 6.1 Labour Rights** | | | |
| 1. The Project Developer shall ensure that all employment is in compliance with national labour occupational health and safety laws and with the principles and standards embodied in the ILO fundamental conventions<br>2. Workers shall be able to establish and join labour organisations<br>3. Working agreements with all individual workers shall be documented and implemented and include: | No | 1. The Project complies with national labour and occupational health and safety laws, obligations under international law, and the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. Labour rights are protected in the Labour Law[18]. The project fully respects the employees' rights in accordance with all labour related laws endorsed within Lao PDR. Law compliance is subject to government's inspection and ruling.<br>2. The rights to unionize, bargain collectively are highly protected by Labor Law[19]. The project fully respects the employees' rights in accordance with all labour related laws endorsed within Lao PDR. Law compliance is subject to government's inspection and ruling. | N/A |

[16] http://www.na.gov.la/docs/eng/laws/pub_adm/Penal%20%282005%29%20Eng.pdf
[17] http://www.unlao.org/Blog/post/Lao-PDR-joins-international-fight-against-corruption.aspx
[18] http://laoofficialgazette.gov.la/
[19] http://laoofficialgazette.gov.la/

| | | | |
|---|---|---|---|
| a) Working hours (must not exceed 48 hours per week on a regular basis), AND<br>b) Duties and tasks, AND<br>c) Remuneration (must include provision for payment of overtime), AND<br>d) Modalities on health insurance, AND<br>e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND<br>f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave.<br>4. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion)<br>5. The Project Developer shall ensure the use of appropriate equipment, | | 3. Working agreements between the company and individual workers are documented and implemented, including working hours, duties and tasks, remuneration, modalities on health insurance, modalities on termination of contract, provision for annual leave, etc. The employment model applied is locally and culturally appropriate.<br>4. Lao PDR has published Children's Rights Protection Law[20]. Employment regulations are described in this Law. The Project requires skilled employees to operate, maintain, and manage the wind farm, as opposed to manufacturing industries, which may require abundant low-skilled labour. Therefore, the project does not employ and is not complicit in any form of child labour.<br>5. All equipment in the Project are operated properly according to the work procedures and safety regulation rules. The Project organizes employee training with topics on technical, environmental/safety code, and operational/maintenance procedures. The Project has established guard again and response procedure, which also regulates the documentation and reporting of accidents and incidents. Thus the Project owner ensures the use of appropriate equipment, training of workers, documentation and | |

[20] http://www.na.gov.la/files/laws/117.pdf

| | | | |
|---|---|---|---|
| training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures | | reporting of accidents and incidents, and emergency preparedness and response measures. | |
| **Principle 6.2 Negative Economic Consequences** | | | |
| 1. Does the project cause negative economic consequences during and after project implementation?<br>>> | No | The participants all recognized the positive socio-economic and environmental impacts of the proposed project, as follows:<br>1. Creating jobs for the local people<br>2. Economic benefit<br>3. Providing water<br>There is no potential risks of the project to the local economy. | N/A |
| **Principle 7. Climate and Energy** | | | |
| **Principle 7.1 Emissions** | | | |
| Will the Project increase greenhouse gas emissions over the Baseline Scenario?<br>>> | No | The project is to generate clean electricity with the abundant resources and displace part of the electricity usage from the regional grid consisting of Laos and Thailand power grid, in which coal, oil and natural gas fired power plants are the dominated power sources. It will displace part of thermal power by making use of clean and renewable energy and the expected annual average GHG emission reductions are about 47,930 $tCO_2e$ per year. | N/A |

| | | | |
|---|---|---|---|
| **Principle 7.2 Energy Supply** | | | |
| Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users? | No | The Project's does not use energy from a local grid or power supply or fuel resource that provides for other local users. | N/A |
| >> | | | |
| **Principle 8. Water** | | | |
| **Principle 8.1 Impact on Natural Water Patterns/Flows** | | | |
| Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity? | No | The project activity would not have negative impact on the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s). The opinions and recommendations of experts, such as IEE indicators, stakeholder interview feedback, confirmed opinion from village organization and annual waterflow monitoring data was sought and demonstrated as being included in the Project design and Monitoring. | N/A |
| >> | | | |
| **Principle 8.2 Erosion and/or Water Body Instability** | | | |
| Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? | No | The minimum flow will be released to maintain the eco-system and meet demand for irrigation in the downstream. The construction wastewater will be treated and reported prior to discharge. The water quality and quantity will be examined by the environment monitoring department according to the | N/A |
| >> | | | |

| | | | |
|---|---|---|---|
| | | relevant standards and regulations annually. The monitoring parameters are the flow rate of water released, relevant water quality indicators and competing uses of water resources at the project location.<br>Therefore it would not cause additional erosion and/or water body instability or disrupt natural pattern of erosion.<br><br>The project activity is only a hydropower project which not includes any planting, agriculture or similar activities.<br>Therefore the project's area of influence is not susceptible to excessive erosion and/or water body instability. | |
| **Principle 9. Environment, ecology and land use** | | | |
| **Principle 9.1 Landscape Modification and Soil** | | | |
| Does the Project involve the use of land and soil for production of crops or other products? | No | The does not involve the use of land and soil for production of crops or other products. | N/A |
| >> | | | |
| **Principle 9.2 Vulnerability to Natural Disaster** | | | |
| Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, | No | The Project is not susceptible to and does not lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions. | N/A |

| | | | |
|---|---|---|---|
| flooding, drought or other extreme climatic conditions? | | | |
| >> | | | |
| **Principle 9.3 Genetic Resources** | | | |
| Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development, or take place in facilities or farms that include GMOs in their processes and production)? | No | The project activity is only a hydropower project which not includes any planting, agriculture or similar activities. The project activity does not threaten human health or the environment. The project constructed and is operating in an environmental-friendly way. All the release (i.e. waste water, solid waste,) and hazard waste (i.e. waste oil) will be handled according to the national legislation.<br>Therefore the Project is not negatively impacted by the use of genetically modified organisms or GMOs. | N/A |
| >> | | | |
| **Principle 9.4 Release of pollutants** | | | |
| Could the Project potentially result in the release of pollutants to the environment? | No | The project activity is only a hydropower project. The project activity does not threaten human health or the environment. The project constructed and is operating in an environmental-friendly way. All the release (i.e. waste water, solid waste,) and hazard waste (i.e. waste oil) will be handled according to the national legislation.<br>Therefore the Project does not potentially result in release of pollutants to the environment. | N/A |
| >> | | | |
| **Principle 9.5 Hazardous and Non-hazardous Waste** | | | |

| | | | |
|---|---|---|---|
| Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials? | No | The Project's purpose is to supply energy from the hydro power station. Therefore, the Project does not involve the manufacture, trade, release, and/or use of hazardous and non-hazardous chemicals and/or materials. | N/A |
| >> | | | |
| **Principle 9.6 Pesticides & Fertilisers** | | | |
| Will the Project involve the application of pesticides and/or fertilisers? | No | The project is a hyro power project. Therefore, the Project does not involve the application of pesticides and/or fertilizers. | N/A |
| >> | | | |
| **Principle 9.7 Harvesting of Forests** | | | |
| Will the Project involve the harvesting of forests? | No | The project is a hyro power project. It does not involve the harvesting of forests. | N/A |
| >> | | | |
| **Principle 9.8 Food** | | | |
| Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives? | No | The project activity is only a hydropower project which not includes any planting, agriculture or similar activities. The project activity does not threaten human health or the environment. The project will be constructed and operated in an environmental friendly way. All the release (i.e. waste water, solid waste,) and hazard waste (i.e. waste oil) will be handled according to the national legislation. Therefore the Project does not modify the quantity or nutritional quality of food | N/A |
| >> | | | |

| | | | |
|---|---|---|---|
| | | available such as through crop regime alteration or export or economic incentives. | |
| **Principle 9.9 Animal husbandry** | | | |
| Will the Project involve animal husbandry?<br>>> | No | The project activity is only a hydropower project which not includes any planting, agriculture or similar activities. The project activity does not threaten human health or the environment. The project constructed and is operating in an environmental friendly way. All the release (i.e. waste water, solid waste,) and hazard waste (i.e. waste oil) will be handled according to the national legislation.<br>Therefore, the Project does not involve animal husbandry. | N/A |
| **Principle 9.10 High Conservation Value Areas and Critical Habitats** | | | |
| Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?<br>>> | No | The project is a hydro power project. According to the IEE reports, it does not physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified. | N/A |
| **Principle 9.11 Endangered Species** | | | |
| Are there any endangered species identified as potentially being present within the Project | No | According to the IEE report, there are no endangered species identified as potentially being present within the Project boundary (including those that may route | N/A |

| | | | |
|---|---|---|---|
| boundary (including those that may route through the area)?<br><br>AND/OR<br><br>Does the Project potentially impact other areas where endangered species may be present through transboundary affects? | | through the area), and the project would not potentially impact other areas where endangered species may be present through transboundary affects. | |
| >> | | | |

# APPENDIX 2- CONTACT INFORMATION OF PROJECT PARTICIPANTS

| | |
|---|---|
| Organization name | **Phongsubthavy Road & Bridge Construction Co., LTD** |
| Registration number with relevant authority | / |
| Street/P.O. Box | Phongtong Savad Village Chanthabouly District, Vientiane Capital, Lao PDR |
| Building | / |
| City | Attapeu Province |
| State/Region | / |
| Postcode | / |
| Country | Lao PDR |
| Telephone | 856-20-5534 5678 |
| E-mail | phongsab@yahoo.com |
| Website | / |
| Contact person | Phongsavath Phengsykeo |
| Title | / |
| Salutation | Mr |
| Last name | Phengsykeo |
| Middle name | / |
| First name | Phongsavath |
| Department | / |
| Mobile | / |
| Direct tel. | / |
| Personal e-mail | / |

| | |
|---|---|
| Organization name | **Swiss Carbon Assets Ltd.** |

| | |
|---|---|
| Registration number with relevant authority | / |
| Street/P.O. Box | Technoparkstrasse 1 |
| Building | / |
| City | Zürich |
| State/Region | / |
| Postcode | 8005 |
| Country | Switzerland |
| Telephone | +41 43 501 35 50 |
| E-mail | r.heuberger@southpolecarbon.com |
| Website | / |
| Contact person | Renat Heuberger |
| Title | / |
| Salutation | Mr. |
| Last name | Heuberger |
| Middle name | / |
| First name | Renat |
| Department | / |
| Mobile | / |
| Direct tel. | +41 43 501 35 99 |
| Personal e-mail | / |

# APPENDIX 3- FURTHER BACKGROUND INFORMATION ON EX ANTE CALCULATION OF EMISSION REDUCTIONS

## Calculation of Operating Margin Emission Factor

**Table 1 Electricity generated and delivered to Laos National Power Grid**

| Item | 2019 | | 2018 | | 2017 | |
|---|---|---|---|---|---|---|
| | EDL | IPP&SPP | EDL | IPP&SPP | EDL | IPP&SPP |
| | GWh | GWh | GWh | GWh | GWh | GWh |
| Lao domestic power consumption | 2,713.81 | 5,452.45 | 3,181.77 | 6,205.00 | 2,848.61 | 5,014.95 |
| **Sum Up** | **8166.26** | | **9386.77** | | **7863.56** | |

*Sources from:*

*Electricity Statistic (page 9-11, 2019), EDL*

**Table 2 Electricity generated and delivered to Thailand National Power Grid**

| **Item** | 2019 | | | 2018 | | | 2017 | | |
|---|---|---|---|---|---|---|---|---|---|
| | EGAT | IPP | SPP | EGAT | IPP | SPP | EGAT | IPP | SPP |
| | GWh | GWh | GWh | GWh | GWh | GWh | GWh | GWh | GWh |
| **Natural gas** | 38,828.25 | 39,265.45 | 43,023.09 | 37,903.77 | 38,397.08 | 39,339 | 38,916.80 | 48,453.64 | 32,644.34 |

| Item | 2019 | | | 2018 | | | 2017 | | |
|---|---|---|---|---|---|---|---|---|---|
| | EGAT | IPP | SPP | EGAT | IPP | SPP | EGAT | IPP | SPP |
| | GWh | GWh | GWh | GWh | GWh | GWh | GWh | GWh | GWh |
| **Coal (bituminous & lignite)** | 16,074.20 | 15,816.72 | 2,028.78 | 15,903.31 | 15,887.85 | 2,150.58 | 16,925.69 | 15,112.63 | 1,695.51 |
| **Renewable energy (hydropower and others)** | 6,042.72 | - | 4,398.13 | 7,360.00 | - | 2,483 | 4,593.22 | - | 1,952.60 |
| Hydropower | - | - | 35.26 | - | - | 38 | - | - | 22.33 |
| Solar power and wind power | - | - | 4,362.87 | - | - | 2,445 | - | - | 1,930.27 |
| **Fuel oil and palm oil** | 932.07 | - | 207.16 | 28.67 | - | 245 | 93.33 | 98.91 | 201.26 |
| **Diesel oil** | 127.89 | 14.84 | - | 108.60 | 7.76 | - | 188.46 | 3.82 | - |
| **Biomass** | - | - | 5,276.95 | - | - | 4,847 | - | - | 3,620.41 |
| **Other** | 311.27 | - | - | 210.75 | - | - | 105.81 | - | - |
| **Sum up** | 62,316.40 | 55,097.01 | 54,934.11 | 61,515.10 | 54,292.69 | 49,064.33 | 60,823.31 | 63,669.00 | 40,114.12 |
| **Total** | 172,347.52 | | | 164,872.12 | | | 164,606.43 | | |

*Sourced from:*

*Annual Report (page 134, 2019; page 132, 2018), EGAT*

**Table 3 Electricity generated and delivered by Lao IPP directly supply to Thailand**

| Item | 2019 | 2018 | 2017 |
|---|---|---|---|
| | GWh | GWh | GWh |
| Thailand imports from Lao (Lao IPP directly supply to Thailand) | 25407.09 | 26386.04 | 24196.64 |

| Item | 2019 | 2018 | 2017 |
|---|---|---|---|
| | GWh | GWh | GWh |
| **Sum up** | 25,564.69 | 26,545.43 | 24,402.94 |

*Sourced from:*

*Annual Report (page 134, 2019; page 132, 2018), EGAT*

**Table 4 Power import from the connected system**

| Item | 2019 | 2018 | 2017 |
|---|---|---|---|
| | GWh | GWh | GWh |
| Lao imports from Vietnam (1) | 29.87 | 25.58 | 26.32 |
| Lao imports from China (1) | 9.35 | 14.24 | 48.08 |
| Thailand imports from Malaysia (2) | 118.39 | 119.57 | 131.9 |
| **Sum up** | 25,564.69 | 26,545.43 | 24,402.94 |

*Sourced from:*

*(1) Electricity Statistic (page 11, 2019; page 11, 2018; page 11, 2017), EDL*

*(2) Annual Report (page 134, 2019; page 132, 2018), EGAT*

**Table 5 Calculation of $CO_2$ Emission within Lao PDR**

There is only one thermal power generation plant in Lao (Hongsa power plant), and the power generated will be supplied to EDL (Lao grid) and EGAT (Thai grid) separately. Since the fuel consumption of the power station cannot be obtained, a conservative way (using power generation max efficiency of thermal power) is adopted to calculate the fuel consumption of the power station. Emission from Hongsa power plant calculated as follow:

| Year | | 2017 | 2018 | 2019 |
|---|---|---|---|---|
| Installed capacity (MW) | A | 1,878 | 1,878 | 1,878 |
| Load Factor (1) | B | 83.61% | 89.65% | 82.18% |
| Power generation of Hongsa (GWh) | C=A*B*8760/1000 | 13,754.92 | 14,748.57 | 13,519.66 |
| Efficiency (2) | D | 48% | 48% | 48% |
| Total calorific (GJ) | E=C/D*3600 | 103,161,864 | 110,614,294 | 101,397,464 |
| Net Calorific Value (3) (GJ/t) | F | 5.50 | 5.50 | 5.50 |
| Fuel Consumption (t) | G=E/F | 18,756,702.56 | 20,111,689.80 | 18,435,902.60 |
| $EF_{CO2,lignite,y}$ (4) ($tCO_2/TJ$) | H | 90.90 | 90.90 | 90.90 |
| Emission ($tCO_{2e}$) | I=E*H/1000 | 9,377,413 | 10,054,839 | 9,217,030 |

*Sourced from:*

*(1) Sustainability Report 2019 of Banpu Power Public Company Limited (shareholder of Hongsa power plant), Page 61*

*(2) IPCC Technology-specific Cost and Performance Parameters, Table A.III.1, max value of plant efficiency for coal-PC, Page 5*

*(3) IPCC 2006, Guidelines for National Greenhouse Gas Inventories, Volume 2 Chapter 1 Table 1.2, page 19*

(4) *IPCC 2006, Guidelines for National Greenhouse Gas Inventories, Volume 2 Chapter 1 Table 1.4, page 23*

**Table 6 Calculation of $CO_2$ Emission within Thailand**

| Fuel Type | Fuel Consumption | | Fuel Specific EF | Net Calorific Value | GHG emission |
|---|---|---|---|---|---|
| | $FC_{i,y}$ (1) | | $EF_{CO2,m,i,y}$ (2) | $NCV_{i,y}$ (3) | $FC_{i,y} \times EF_{CO2,m,i,y} \times NCV_{i,y}$ |
| | Unit | FC/Unit | $tCO_2/TJ$ | MJ/Unit | $tCO_2$ |
| **2019** | | | | | |
| **Natural Gas** | ktoe | 25,965 | 54.3 | 41.868 | 59,029,672 |
| **Lignite** | ktoe | 3,938 | 90.9 | 41.868 | 14,987,245 |
| **Bituminous** | ktoe | 3,098 | 89.5 | 41.868 | 11,608,782 |
| **Briquettes** | ktoe | 590 | 87.3 | 41.868 | 2,156,495 |
| **Diesel (HSD)** | ktoe | 38 | 72.6 | 41.868 | 115,505 |
| **Fuel oil** | ktoe | 26 | 75.5 | 41.868 | 82,187 |
| **Municipal wastes and biomass fraction** | ktoe | 6,682 | 46.2 | 41.868 | 12,925,003 |
| Paddy husk | ktoe | 837 | - | - | - |
| Bagasse | ktoe | 3,852 | - | - | - |
| Agricultural waste | ktoe | 1,957 | - | - | - |
| MSW | ktoe | 36 | - | - | - |
| **Biogas** | ktoe | 525 | 84.7 | 41.868 | 1,861,765 |
| **Sum (2019)** | | | | | **102,766,656** |
| **2018** | | | | | |

| Fuel Type | Fuel Consumption | | Fuel Specific EF | Net Calorific Value | GHG emission |
|---|---|---|---|---|---|
| | $FC_{i,y}$ (1) | | $EF_{CO2,m,i,y}$ (2) | $NCV_{i,y}$ (3) | $FC_{i,y}$ x $EF_{CO2,m,i,y}$ x $NCV_{i,y}$ |
| | Unit | FC/Unit | $tCO_2/TJ$ | MJ/Unit | $tCO_2$ |
| **Natural Gas** | ktoe | 25,614 | 54.3 | 41.868 | 58,231,697 |
| **Lignite** | ktoe | 3,510 | 90.9 | 41.868 | 13,358,362 |
| **Bituminous** | ktoe | 3,329 | 89.5 | 41.868 | 12,474,382 |
| **Briquettes** | ktoe | 634 | 87.3 | 41.868 | 2,317,318 |
| **Diesel (HSD)** | ktoe | 35 | 72.6 | 41.868 | 106,387 |
| **Fuel oil** | ktoe | 15 | 75.5 | 41.868 | 47,416 |
| **Municipal wastes and biomass fraction** | ktoe | 7,457 | 46.2 | 41.868 | 14,424,087 |
| Paddy husk | ktoe | 691 | - | - | - |
| Bagasse | ktoe | 4,365 | - | - | - |
| Agricultural waste | ktoe | 2,334 | - | - | - |
| MSW | ktoe | 67 | - | - | - |
| **Biogas** | ktoe | 590 | 84.7 | 41.868 | 2,092,270 |
| **Sum** | | | | | **103,051,919** |
| **2017** | | | | | |
| **Natural Gas** | ktoe | 26,399 | 54.3 | 41.868 | 60,016,342 |
| **Lignite** | ktoe | 3,409 | 90.9 | 41.868 | 12,973,976 |

| Fuel Type | Fuel Consumption | | Fuel Specific EF | Net Calorific Value | GHG emission |
|---|---|---|---|---|---|
| | $FC_{i,y}$ (1) | | $EF_{CO2,m,i,y}$ (2) | $NCV_{i,y}$ (3) | $FC_{i,y} \times EF_{CO2,m,i,y} \times NCV_{i,y}$ |
| | Unit | FC/Unit | $tCO_2/TJ$ | MJ/Unit | $tCO_2$ |
| **Bituminous** | ktoe | 3,190 | 89.5 | 41.868 | 11,953,523 |
| **Briquettes** | ktoe | 737 | 87.3 | 41.868 | 2,693,791 |
| **Diesel (HSD)** | ktoe | 35 | 72.6 | 41.868 | 106,387 |
| **Fuel oil** | ktoe | 24 | 75.5 | 41.868 | 75,865 |
| **Municipal wastes and biomass fraction** | ktoe | 8,192 | 46.2 | 41.868 | 15,845,799 |
| Paddy husk | ktoe | 717 | - | - | - |
| Bagasse | ktoe | 4,786 | - | - | - |
| Agricultural waste | ktoe | 2,587 | - | - | - |
| MSW | ktoe | 102 | - | - | - |
| **Biogas** | ktoe | 653 | 84.7 | 41.868 | 2,315,681 |
| **Sum** | | | | | **105,981,364** |

*Sources from:*

*(1) Energy Balance of Thailand 2019, EGAT, table 43, Page 64*

*(2) IPCC 2006, Guidelines for National Greenhouse Gas Inventories, Volume 2 Chapter 1 Table 1.4, page 23*

*(3) Unit converter and glossary, International Energy Agency.*

*https://www.iea.org/reports/unit-converter-and-glossary*

**Table 7 Calculation of $EF_{grid,OM\text{-}ave,y}$**

| Year | Electricity generated and delivered to the power grid system (GWh) | Emission in the power grid system ($tCO_2e$) | OM Emission Factor ($tCO_2/MWh$) |
|---|---|---|---|
| 2017 | 196,873 | 112,144,069 | 0.5696 |
| 2018 | 200,804 | 113,106,758 | 0.5633 |
| 2019 | 206,078 | 115,198,394 | 0.5590 |
| **Sum up** | **603,756** | **340,449,221** | **0.5639** |

Based on the equation and above data, the $EF_{grid,OM\text{-}ave,y}$ =0.5639 $tCO_2/MWh$

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

= 1×0.5639

= 0.5639 $tCO_2e/MWh$.

# APPENDIX 4-SUMMARY OF APPROVED DESIGN CHANGES

No post registration design changes.

### Revision History

| Version | Date | Remarks |
|---|---|---|
| 1.2 | 14 October 2020 | Hyperlinked section summary to enable quick access to key sections<br>Improved clarity on Key Project Information<br>Inclusion criteria table added<br>Gender sensitive requirements added<br>Prior consideration (1 yr rule) and Ongoing Financial Need added<br>Safeguard Principles Assessment as annex and a new section to include applicable safeguards for clarity<br>Improved Clarity on SDG contribution/SDG Impact term used throughout<br>Clarity on Stakeholder Consultation information required<br>Provision of an accompanying Guide to help the user understand detailed rules and requirements |
| 1.1 | 24 August 2017 | Updated to include section A.8 on 'gender sensitive' requirements |
| 1.0 | 10 July 2017 | Initial adoption |