# PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT



**Title: 109MW LARGE SCALE BUNDLE NEPAL HYDROELECTRIC STATION BY NABIL BANK LIMITED**

Version **1.0**

Date: **30/07/2025**

First CoU Issuance Period: **2 years, 2 months**

Crediting period**: 30/10/2022 to 31/12/2024**

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

| BASIC INFORMATION | |
|---|---|
| Title of the project activity | 109MW LARGE SCALE BUNDLE NEPAL HYDROELECTRIC STATION BY NABIL BANK LIMITED |
| Scale of the project activity | Large Scale |
| Completion date of the PCN | 30/07/2025 |
| Project participants | **Project Proponent**: Nabil Bank Limited<br>**Authorised Representative**: AIROI |
| Host Party | NEPAL |
| Applied methodologies and standardized baselines | Applied Baseline Methodology :<br>**ACM0002:** Grid-connected electricity generation from renewable sources --- Version 22.0 |
| Sectoral scopes | 01 Energy industries (Renewable/Non-Renewable Sources) |
| Estimated amount of total GHG emission reductions | To be estimated during verification [An ex-ante estimate is 8,68,461 $tCO_2$ annually ] |

## SECTION A. Description of project activity

### A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The proposed project under UCR is titled "**109MW Large Scale Bundle Nepal Hydroelectric Station by Nabil Bank Limited**., here in after refer as "**HYDRONABIL**" It is a bundle of hydropower projects located in Nepal. The proposed project activity involves **TWO HYDROELECTRIC PROJECTS** located in different regions of Nepal. The details are as follows:

1. **27MW Dordi Khola Hydropower Project - (PROJECT -1)**: A Run-of-River (RoR) type hydroelectric project with a generating capacity of 27 MW. The project is being developed by **Himalayan Power Partner Ltd. (HPPL)**, Kathmandu, Nepal. The entire project area lies in Chiti, Dhodeni, and Bansar VDCs in the Lamjung district, western Nepal. It is connected to Kathmandu by a 170 km road.

2. **86MW Solu Khola (Dudhkoshi) Hydroelectric Project (SKDKHEP) (PROJECT -2)**: Also a Run-of-River (RoR) type hydroelectric project with a generating capacity of 86 MW. The project is being developed by **Sahas Urja Ltd.**, Kathmandu, Nepal. It is located in Solududhkunda Municipality & Thulung Dudh Koshi Gaupalika (formerly Tingla, Kangel, and Panchan VDCs) of Solukhumbu District, Sagarmatha Zone, Nepal. The project area is about 130 km east of Kathmandu (aerial distance).

This project is an ongoing operational activity aimed at continuous reduction of greenhouse gas (GHG) emissions and is currently being applied under the "Universal Carbon Registry" (UCR).

### Purpose of the project activity:

Nepal currently faces challenges in undertaking voluntary carbon projects in the power sector, primarily because its national electricity grid is already dominated by low-emission renewable sources, particularly hydropower. As a result, implementing additional renewable energy projects within the country yields limited incremental emission reductions, making them ineligible for carbon credit generation under typical baseline methodologies. However, by exporting clean electricity to neighbouring countries with more carbon-intensive grids, Nepal can enable measurable emission reductions beyond its borders and benefit from mechanisms such as the Universal Carbon Registry (UCR) credits program. The project involves the development and operation of two hydroelectric power plants, using advanced turbine technologies to efficiently convert the natural river flow into clean electricity without contributing to greenhouse gas emissions.

The first component of the project is the Dordi Khola Hydropower Project, which utilizes **Horizontal axis Francis- type turbines**, each with **a capacity of 9.3 MW, resulting in a total installed capacity of 27 MW.** Developed by Himalayan Power Partner Ltd. (HPPL), this project leverages the natural flow of rivers in the Lamjung district to generate renewable electricity. The power generated will be transmitted to several states in India, all part of the Northern, Eastern, Western, and North-Eastern (NEWNE) Electricity Grid, thereby supporting India's growing demand for clean energy and aligning with regional goals to reduce dependence on fossil fuels.

Similarly, the Solu Khola (Dudhkoshi) Hydroelectric Project incorporates **Vertical Axis Pelton turbines**, each with a **capacity of 30.32 MW, providing a total installed capacity of 86 MW**, including a 10% continuous overload (COL) capacity. Developed by Sahas Urja Ltd., this project will also supply renewable energy to multiple states in India connected to the NEWNE Electricity Grid. By utilizing these renewable energy resources, both projects significantly reduce carbon emissions and enhance regional energy security, supporting the transition to a more sustainable energy infrastructure for both Nepal and its neighbouring countries.

The document (Annexure : Documentation of Nepal–India Grid Power Export Arrangement ) does detail the approved power import transactions from Nepal to Haryana Discoms, through NTPC Vidyut Vyapar Nigam Limited (NVVN), for specific hydropower projects.

*Table 1: Power Distribution and Project Details*

| Sr.No | State | Allocation (in MW) | %to the installed capacity |
|---|---|---|---|
| 1 | Haryana | 109.61 | Not specified |

**Details:**

- **State:** Haryana (the allocation is directed only to Haryana Discoms)
- **Approved Allocation:** 109.61MW (comprising 83.42MW from Solu Khola (Dudhkoshi) Hydropower Project and 26.19MW from Dordi Khola Hydropower Project; other proposed projects were not approved in this document)

**PROJECT 1: Dordi Khola Hydropower Project**

For the Dordi Khola Hydropower Project (27MW), the available official wet commissioning/loss rejection tests for all three units were witnessed by NEA and company representatives and completed on the same date:

| Turbine Unit | Commissioning (Load Rejection Test) Date |
|---|---|
| Unit I | 10/09/2022 |
| Unit II | 10/09/2022 |
| Unit III | 10/09/2022 |

This indicates the turbines were commissioned (at least wet-testing and load rejection) on 10th September 2022, which fits with industry practice for such documentation.

**PROJECT 2: Solu Khola (Dudhkoshi) Hydropower Project**

There are three generating units in this project, each with an individual commission (synchronization) date as per the official commissioning test reports:

| Turbine Unit | Commissioning (Synchronization) Date |
|---|---|
| Unit 1 | 10/02/2023 |
| Unit 2 | 11/02/2023 |
| Unit 3 | 12/02/2023 |

All three units underwent their synchronization tests in February 2023, which is the official commissioning activity before commercial operation begins.

As per the ex-ante estimate, the project will generate approximately **351429.56** MWh of electricity per annum and supply it to the NEWNE grid. The renewable power generated by the project activity would be displacing equivalent quantum of grid electricity which is dominated by the fossil-fuel based power plants resulting in an estimated emission reduction of 8,68,461 tCO2 per annum. The estimated annual average and the total CO2e emission reduction by the project activity is expected to be 428269 tCO2e, whereas actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification.

Since the project activity generates electricity through Hydro energy, a clean renewable energy source it will not cause any negative impact on the environment and thereby contributes to climate change mitigation efforts.

**Project's Contribution to Sustainable Development**

This project is a Greenfield activity where grid power is the baseline. Indian grid system has been predominantly dependent on power from fossil fuel powered plants. The renewable power generation is gradually contributing to the share of clean & green power in the grid; however, grid emission factor is still on higher side which defines grid as distinct baseline.

The Government of India has stipulated following indicators for sustainable development in the interim approval guidelines for such projects which are contributing to GHG mitigations. The Ministry of Environment, Forests & Climate Change, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. It has been envisaged that the project shall contribute to sustainable development using the following ways:

**Social Well-being:**

The project would help in generating direct and indirect employment benefits accruing out of construction of the Hydro Power Plant and for maintenance during operation of the project activity. It will lead to development of infrastructure around the project area in terms of improved road network etc. and will also directly contribute to the development of renewable infrastructure in the region.

**Economic Well-being:**

The project is a clean technology investment decided based on carbon revenue support, which signifies flows of clean energy investments into the host country. The project activity requires temporary and permanent, skilled and semi-skilled manpower at the project location; this will create additional employment opportunities in the region. The generated electricity will be supplied to the grid. Besides above, indirect benefits have also accrued to the region by way of increase in agriculture and industrial production. In addition, the project has provided gainful employment to a large number of skilled and unskilled workers and has also opened the landlocked hinterland by providing essential facilities such as schools, hospitals etc. for the people of the area. Thus, **HYDRONABIL** project has ushered in the social and economic upliftment of the persons living in the vicinity of the Project i.e., of society at large.

**Technological Well-being:**

The two project activities employ state-of-the-art technology, featuring **3 x 9 MW Horizontal Axis Francis-**

**type turbines for PROJECT-1 and 3 x 30.32 MW Vertical Axis Pelton turbines for PROJECT-2**. These advanced systems offer significant power generation potential while optimizing land use. The successful operation of these projects is expected to promote the adoption of this technology and encourage further research and development efforts by technology providers to create even more efficient and innovative machinery in the future. As a result, both projects contribute to technological well-being in the region.

**Environmental Well-being:**

Prior to commencing construction, the project obtained all necessary environmental approvals and clearances. It will generate power using a hydro-based facility that produces zero emissions, significantly reducing GHG emissions and specific pollutants such as sulfur oxides (SOx), nitrogen oxides (NOx), and suspended particulate matter (SPM) commonly associated with thermal power generation. The project utilizes hydro energy as a clean source for electricity generation, ensuring that it does not contribute to air pollution, water contamination, or solid waste production. Consequently, the project has a neutral impact on the surrounding environment, contributing positively to environmental well-being.

**With regards to ESG credentials:**

With regard to ESG credentials, this project makes significant contributions across various indicators:

**Under Environment:**

Environmental criteria may include a company's energy use, waste, pollution, natural resource conservation, and treatment of animals etc. For the project proponent, energy generation pattern is now based on renewable energy due to the project and it also contributes to GHG emission reduction and conservation of depleting energy sources associated with the project baseline. Also, the criteria can be further evaluated on the basis of any environmental risks which the company might face and how those risks are being managed by the company. Here, as the power generation will be based on Hydro power, the risk of environmental concerns associated with non-renewable power generation and risk related to increasing cost of power etc. are now mitigated. Hence, project contributes to ESG credentials.

**Under Social:**

Social criteria reflect on the company's business relationships, qualitative employment, working conditions with regard to its employees' health and safety, interests of other stakeholders' etc. With respect to this project, the Project Proponent has robust policies in place to ensure equitable employment, health & safety measures, local jobs creation etc. Also, the organizational CSR activities directly support local stakeholders to ensure social sustainability. Thus, the project contributes to ESG credentials.

**Under Governance:**

Governance criteria relates to overall operational practices and accounting procedure of the organization. With respect to this project, the Project Proponent practices a good governance practice with transparency, accountability and adherence to local and national rules & regulations etc. This can be further referred from the company's annual report. Also, the project activity is a Hydro power project owned and managed by the proponent for which all required NOCs and approvals are received. The electricity generated from the project can be accurately monitored, recorded and further verified under the existing management practice of the company. Thus, the project and the proponent ensure good credentials under ESG.

## A.2 Do no harm or Impact test of the project activity>>

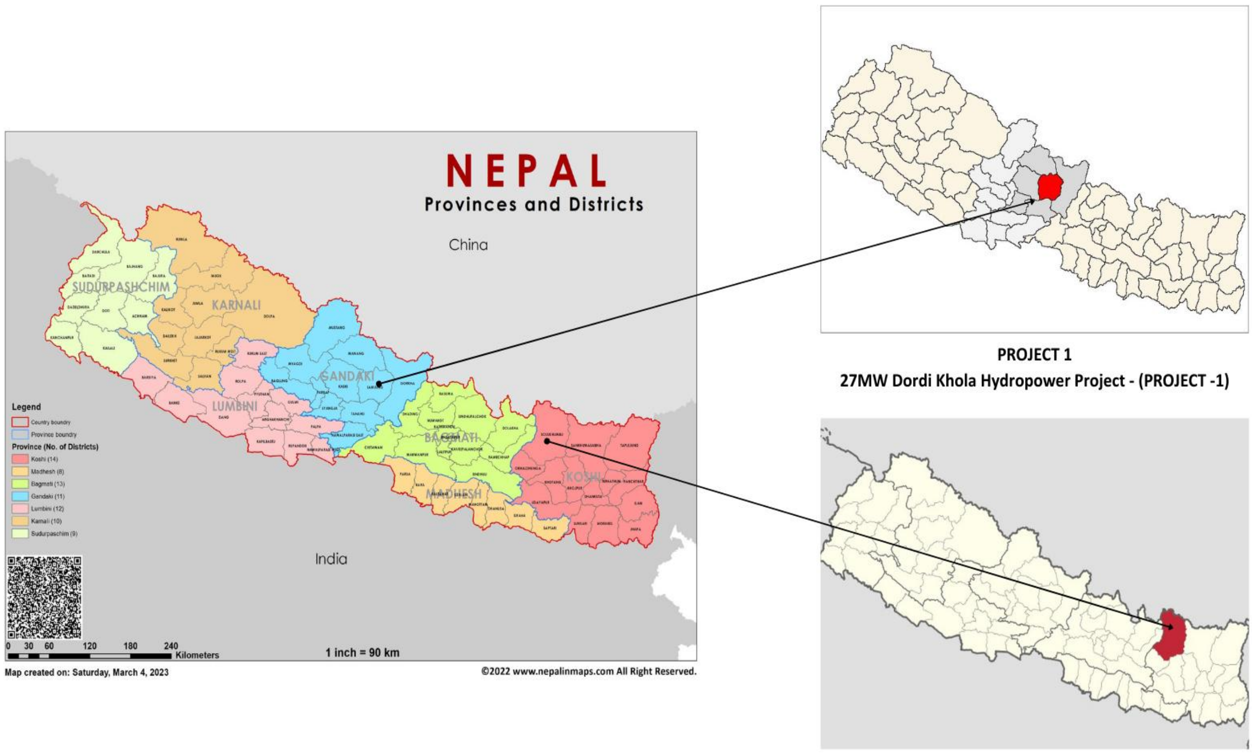
There was no harm identified form the project and hence no mitigations measures are applicable

Rational: as per 'Central Pollution Control Board (Ministry of Environment & Forests, Govt. of India)', final document on revised classification of Industrial Sectors under Red, Orange, Green and White Categories (07/03/2016), it has been declared that Hydro project activity falls under the "White category". White Category projects/industries do not require any Environmental Clearance such as 'Consent to Operate' from PCB as such project does not lead to any negative environmental impacts. However, Environmental Clearance, Forest Clearance and PIB approval was taken before the start date of the project activity.

## A.3. Location of project activity >>

## PROJECT -1

**Country:** NEPAL (western)
**District:** Lamjung
**Village:** Chiti, Dhodeni, Bansar
**Tehsil:** N/A (Nepal generally doesn't have the Tehsil administrative division)
**State:** Gandaki Province
**Code:** N/A (Nepal doesn't use postal codes in the same format as other countries)
**Geographical Co-ordinates of Project Area**
Longitude: 84° 26’E to 84° 28’30”E
Latitude: 28°10’ N to 28°13’ 32”N




PROJECT 1
27MW Dordi Khola Hydropower Project - (PROJECT -1)

PROJECT 2
86MW Solu Khola (Dudhkoshi) Hydroelectric Project (SKDKHEP)


**PROJECT -2**

**Country:** NEPAL
**District:** Solukhumbu
**Village:** Tingla, Kangel, Panchan
**Tehsil:** N/A (Nepal generally doesn't use Tehsil divisions)
**State:** Koshi Province
**Code:** N/A (Nepal does not use standard postal codes like other countries)
**Geographical Co-ordinates of Project Area**

| | |
|---|---|
| Latitude | 27°21'53"N to 27°25'15"N |
| Longitude | 86°37'35"E to 86°41'15"E |

SOLU KHOLA (DUDH KOSHI) HYDROELECTRIC PROJECT (86MW)
SOLUKHUMBU DISTRICT, NEPAL


1. Access from Biratnagar
Biratnagar-Itahari-Rupani-Mirchaiya-Katari-Okhaldhunga-Salleri = 315km
24 78 52 28 86 47
2. Access from Kathmandu via Kulekhani
Kath.-Kulekhani-Hetauda-Pathlaiya-Dhalkebar-Mirchaiya-Katari-Okhal.-Salleri = 421km
47 40 29 110 34 28 86 47
3. Access from Kathmandu via Dhulikhel-Khurkot Road
Kath.-Dhulikhel-Khurkot-Ghurmi-Okhaldhunga-Salleri = 264km
30 82 61 44 47
4. Access from Kathmandu via Narayanghat
Kath-Naubise-Mugling-Narayanghat-Hetauda-Dhalkebar-Mirchaiya-Katari-Salleri = 560km
30 83 36 77 139 34 28 133
Salleri to Ramite = 17km, Ramite to HW = 10km
Scale
20 km
20 km
CHINA
INDIA
Kathmandu
Naubise
Dhulikhel
Hetauda
Pathlaiya
Birgunj
Khurkot
Kamalamai
Bardibas
Dhalkebar
Mirchaiya
Katari
Ghurmi
Okhaldhunga
Salleri
Kangel
SKDKHEP
Project Area
Biratnagar
Jogbani
Sagarmatha National Park
Langtang National Park
Shivapuri National Park
Parsa Wildlife Reserve
Kanchanjunga Conservation Area
Koshi Tappu Wildlife Reserve
Dharan

Solu River
Solu River
Solu River
Solu Khola (Dudhkoshi)
Hydroelectric Project
Lower Solu Hydro
Power House- 82 MW

## A.4. Technologies/measures >>

The two proposed project activity is installation and operation of 3 x 9 MW Horizontal Axis Francis-type turbines for PROJECT-1 which has the capacity of 27MW and 3 x 30.32 MW Vertical Axis Pelton turbines for PROJECT-2 which has the capacity of 86MW and with this the bundle Hydro Power Plant aggregated installed capacity of **109MW** in the state of Kathmandu in Nepal.

**Technical details for Hydro Power Plants are as below:**

| **PROJECT -1** | |
|---|---|
| State | Gandaki Porvince |
| District | Lamjung |
| Vicinity | Located near Chiti, Dhodeni, and Bansar Village Development Committees (VDCs). |
| Specific Location | Approximately 170 km northwest of Kathmandu in the Lamjung district. |

**HYDROLOGY**

| | |
|---|---|
| River/Stream | Dordi-Khola |
| Catchment area at Diversion site | 277 km2 |
| Design Discharge | 15.28 m3/s |
| Design Flood at diversion site (100 year return period) | 614 m3/s |
| Design Flood at Powerhouse site (1000 year return period) | 3251 m3/s |
| **River Diversion Arrangement** | |
| 1 in 20 years dry season design flood | 27.24 m3/s |
| Top of coffer dam at upstream | El. 762.0 m |
| Top of coffer dam at downstream | El. 756.0 m |

**DIVERSION STRUCTURE**

| | |
|---|---|
| Type | Ogee Type weir, free over flow with under sluice bays |
| Average river bed level | El. 758.0 m |
| Bridge deck level | El. 768.0 m |
| Width of diversion structure | 55 m |
| Highest flood level | El. 767.75 m |
| Full supply level | El. 764.50 m |
| Weir Crest elevation of overflow weir<br>Width of weir | El. 764.25 m<br>70 m |

**UNDER SLUICE BAY**

| | |
|---|---|
| No. of under sluice bays | 2 |
| Width of each bay | 5 m |
| Thickness of pier | 1.5 m |
| Crest level of under sluice bay | El. 756.0 m |
| Clear width of under sluice bays | 11.5 m |
| Type and height of gate | Vertical gates, 3 m high. |
| **Energy Dissipation System** | Hydraulic Jump Type Stilling Basin |
| Length of stilling basin from toe of sloping glacis | 25 m |
| Total width of basin | 83 m |
| Cistern level | El. 753.0 m |
| End Sill Level | El. 754.0 m |
| **Intake Structure** | Side Intake |
| Type | Side Intake |
| Track rack size | 4.75 m (W) x 4.0 m (H) |
| Numbers of trash rack | 2 |
| Intake diversion flow (including 20% flushing discharge) | 18.33 $m^3/s$ |
| Intake size | Two bays; each 2.25 m (W) x 2.7 m (H) |
| Invert level of Intake | El. 760.0 m |
| Intake stop log | 1 no. Vertical lift gate (2.25 m x 2.7 m) |
| Intake service gate | 2 nos. Vertical lift gate (2.25 m x 2.7 m) |

**FEEDER CHANNEL**

| | |
|---|---|
| Type | Rectangular |
| Numbers | 2 |
| Size | 2.25 m wide, height varies from 3.45 m to 3.6 m |
| Length | 34.68 m & 30.78 m |

**DESILTING BASIN**

| | |
|---|---|
| Type | Hopper Type |
| Numbers of chambers | 2 nos |
| Size of particles to be removed | 0.2 mm and above |
| Dimension (L x B x H) | 60 m x 8.5 m x 8.0 m |
| Design discharge | 18.33 m3/s |
| Flow through velocity | 0.26 m/s |

**SILT FLUSHING PIPE**

| | |
|---|---|
| Type | Circular |
| Diameter | 0.9 m |
| Total length | 100 m |

**WATER CONDUCTOR PIPE**

| | |
|---|---|
| Type | Steel Pipe |
| Size | 2.65 m diameter |
| Total length | 3237.47 m |

**HEAD RACE TUNNEL (CONCRETE LINED)**

| | |
|---|---|
| Type & shape | Underground, D-shaped |
| Diameter | 3.3 m |
| Total Length | 2661.67 m |

**STEEL LINED TUNNEL**

| | |
|---|---|
| Type & shape | Underground, circular |
| Diameter | 2.65 m u/s of HRT, 2.3 m d/s of HRT |
| Total length | 25 m, 82 m respectively |

**SURGE SHAFT**

| | |
|---|---|
| Type | Restricted orifice type |
| Height | 45 m |
| Diameter | 7 m |
| Orifice size | 1.3 m diameter, circular |
| Top of surge shaft | El. 780.0 m |
| Maximum upsurge level | El. 778.06 m |
| Minimum down surge level | El. 746.39 m |

**VALVE HOUSE**

| | |
|---|---|
| Type | Surface |
| Number | 1 |
| Size ( L x W x H) | 10 m x 8 m x 12 m |
| Type of valve | Buttery valve |
| Diameter of valve | 2.3 m |

**PENSTOCK**

| | |
|---|---|
| Type | Surface and Buried Penstock |
| Nos. | One no. starting from outlet portal and trifurcating before Power House. |
| Diameter | 2.3 m, circular shaped |
| Liner thickness | 10 mm to 20 mm |
| Length | 830.5 m |
| Length of penstock after trifurcation | 163.8 m |
| Branch penstock | Circular, 1.3 m diameter each |

**POWER HOUSE**

| | |
|---|---|
| Type | Surface |
| Gross Head | 214 m |

| | |
|---|---|
| Rated Head | 203.32 m |
| Design discharge | 15.28 m3/s |
| Normal Tail water Level | El. 550.0 m |
| Center line of penstock | El. 549.95 m |
| Size of Powerhouse at machine floor | 52.2 m (L) x 17.0 m (W) x 35.1 m (H) |

**TAIL RACE CHANNEL**

| | |
|---|---|
| Type | RCC Box culvert |
| Length | 333.66 m |
| Size | 3.5 m x 2.5 m |
| Normal tail water level | El. 550 m |

**SWITCHYARD**

| | |
|---|---|
| Size | 30 m x 40 m |
| Voltage level | 132 kVA |

**TURBINE**

| | |
|---|---|
| Turbine Type | Horizontal axis Francis |
| Number | 3 |
| Rated Capacity of each turbine | 9.3 MW |

**GENERATOR**

| | |
|---|---|
| Generator Type | Synchronous three phase |
| Number | 3 |
| Rated Capacity | 3 x 10590 kVA |
| Power Factor | 0.85 |
| Voltage | 11 kV |
| Frequency<br>Excitation system | 50 Hz<br>Brushless/ static |

**TRANSFORMER**

| | |
|---|---|
| Rated capacity | Bank of 3 x 10.67 MVA, 11/132/√3, single phase |
| Voltage ratio | 11 kV/ 132 kV |

**TRANSMISSION LINE**

| | |
|---|---|
| Voltage level | 132 kV Single Circuit |
| Length | 3.2 km |

**POWER GENERATION**

| | |
|---|---|
| Installed capacity | 27 MW |
| Net annual energy after transmission & outage losses | 142.75 GWh |

**Technical details for Hydro Power Plants are as below:**

| **PROJECT -2** | |
|---|---|
| State | Koshi Province (Province 1, Nepal) |
| District | Solukhumbu |
| Vicinity | The intake site is at Gairigaun village, about 600 m downstream of the suspension bridge over Solu Khola at Sanghutar. |
| Specific Location | Details indicate the project lies in the eastern region of Nepal, about 130 km (aerial distance) east of Kathmandu, and is situated near the confluence of Solu Khola and Dudh Koshi Rivers. |

**PROJECT LOCATION**

Solukhumbu District, Province 1

| | |
|---|---|
| Intake Site | Solududhkunda Municipality |
| Powerhouse Area | Thulung Dudhkoshi Gaupalika |
| Latitude | 27°21’53”N to 27°25’15”N |
| Longitude | 86°37’35”E to 86°41’15”E |

**GENERAL**

| | |
|---|---|
| Name of River | Solu Khola |
| Type of Scheme | Run-of-River |
| Gross Head | 613.20 m |
| Net Head | 598.09 m |
| Installed Capacity | 86,000 kW |

**HYDROLOGY**

| | |
|---|---|
| Catchment Area | 454 $km^2$ |
| Design Discharge | 17.05 $m^3/s$ |
| Design Flood Discharge | 475 $m^3/s$ (100 Yr. Flood) |

**DIVERSION WEIR**

| | |
|---|---|
| Type of Weir | Gravity free flow concrete |
| Length of Weir | 34.8 m |
| Max. Height of Weir | 13.50 m from foundation level |
| Crest Elevation | EL. 1,262.00 masl |

**INTAKE STRUCTURE**

| | |
|---|---|
| Type | 3 no.s of Side intake |
| Size (W x H) | 4.00 m (W) x 2.00 m (H) |
| Crest elevation of Intake | EL. 1,258.00 masl |

**UNDERSLUICE STRUCTURE**

| | |
|---|---|
| Type and number | 3 nos with Gate |
| Size (W x H) | 1.50 m (W) x 1.00 m (H) |
| Crest elevation of Undersluice | EL. 1,256.00 masl |

**GRAVEL TRAP**

| | |
|---|---|
| Type | Rectangular, RCC |
| Size | 5.00m (W) x 5.00 m (L) |
| Bed load size to trap | 5 mm |

**APPROACH CANAL**

| | |
|---|---|
| Type and Number | Free flow box culvert, total 3 nos |
| Size | 2.6 m x 2.6 m |

**DESANDING BASIN**

| | |
|---|---|
| Type | Surface |
| No of Bays | 3 Nos |
| Dimension (L x B x H) m | 85 m (L) x 9.00 m (W) x 5.00 m (H) |
| Particle Size to be Settled | 0.15 mm (90% trapping efficiency) |
| Outlet Water Level | EL. 1,259.30 m |

**HEADRACE BOX CULVERT**

| | |
|---|---|
| Length | 34.50 m |
| Size | 4.5m (W) x 4.5m (H) |
| Numbers | 1 (One) |

**HEADRACE TUNNEL**

| | |
|---|---|
| Section Type | Inverted-D |
| Length | 4469.61m |
| Size | 4.0m (W) x 4.25m (H) |
| Support | Shotcrete, Ribs, Rock bolt |

**SURGE TUNNEL**

| | |
|---|---|
| Size | 4.0m x 4.0m of 375.0m length in slope |

**PENSTOCK TUNNEL**

| | |
|---|---|
| Length up to Bifurcation | 1867.17 m |
| Horizontal section before Drop Shaft 1 | 220.0 m |
| Drop Shaft-1 | 187.0 m |
| Inclined Section 2 | 536.0 m |
| Drop Shaft-2 | 251.7 m |
| Inclined Section 3 | 672.47 m |
| Internal Diameter and length | 2.50 m for 1st 1198 m length,<br>2.25m for next 268 m length and<br>2.1m for 396 m length (last portion) |
| Thickness of steel penstock | 12 mm ~ 46 mm with yield strength 350 to 460 MPA |

**POWERHOUSE**

| | |
|---|---|
| Type | Surface |
| Size | 49.6 m x 15.2 m x 32.96 m |

**TAILRACE**

| | |
|---|---|
| Type | Free Flow, Box Culvert |
| Length | 70 m |
| Size (B x H) | 4.6 m x 1.9 m |

**TURBINE**

| | |
|---|---|
| Type | 3 no. Vertical Axis Pelton |
| Speed of Turbine | 750 RPM |
| Rated Output Capacity per Unit | 3 x 30.32 MW with 10% COL |
| Efficiency | 91% |

**GOVERNOR**

| | |
|---|---|
| Type | Digital/Hydraulic with PID Control |
| Adjustment for Speed Drop | Between 0 to 5 % |

**GENERATOR**

| | |
|---|---|
| Type | Synchronous 3 Phase |
| Rated Output Capacity per Unit | 34.6 MVA |
| Voltage | 11 kV |
| Efficiency | 97% |

**TRANSFORMER**

| | |
|---|---|
| Type | Out Door, Oil Immersed |
| Rated Capacity per Unit | Three Phase 35 MVA total Nos 3 |
| Frequency | 50 Hz |

**TRANSMISSION LINE**

| | |
|---|---|
| Length | 12.0 km |
| Voltage | 132 KV |
| Interconnection Point | NEA sub-station at Lammane, Tingla, Solukhumbu. |

**POWER AND ENERGY GENERATION**

| | |
|---|---|
| Mean annual energy per year | 520.20 GWh (Dry- 100.27 GWh, Wet- 419.93 GWh) |

## A.5. Parties and project participants >>

| Party (Host) | Participants |
|---|---|
| NEPAL | Project Proponent: Nabil Bank Limited<br><br>Authorised Representative: AIROI |

**A.6. Baseline Emissions>>**

In the absence of the Dordi Khola (27 MW) and Solu Khola (Dudhkoshi, 86 MW) hydropower projects, the baseline electricity supply for Nepal would have relied on the existing grid mix, which is constrained by limited hydropower output during dry seasons and peak demand periods. The Nepal Electricity Authority (NEA) typically addresses this gap through:

- Imports of grid electricity from India, where a significant share is generated from fossil fuel-based thermal power plants, mainly coal and gas,
- Supplemental domestic generation, including diesel-based peaking plants during shortages,
- Load-shedding and extensive use of backup diesel generators for commercial and institutional consumers, particularly in the hilly regions where reliable supply is challenging.

Without these new clean energy projects, growing demand in Kathmandu, Lamjung district, and regions served by these plants would continue to be met through this carbon-intensive mix. This situation sustains high grid emission factors, especially given the emissions profile of Indian grid electricity and the inefficiencies and pollution associated with diesel backup generation.

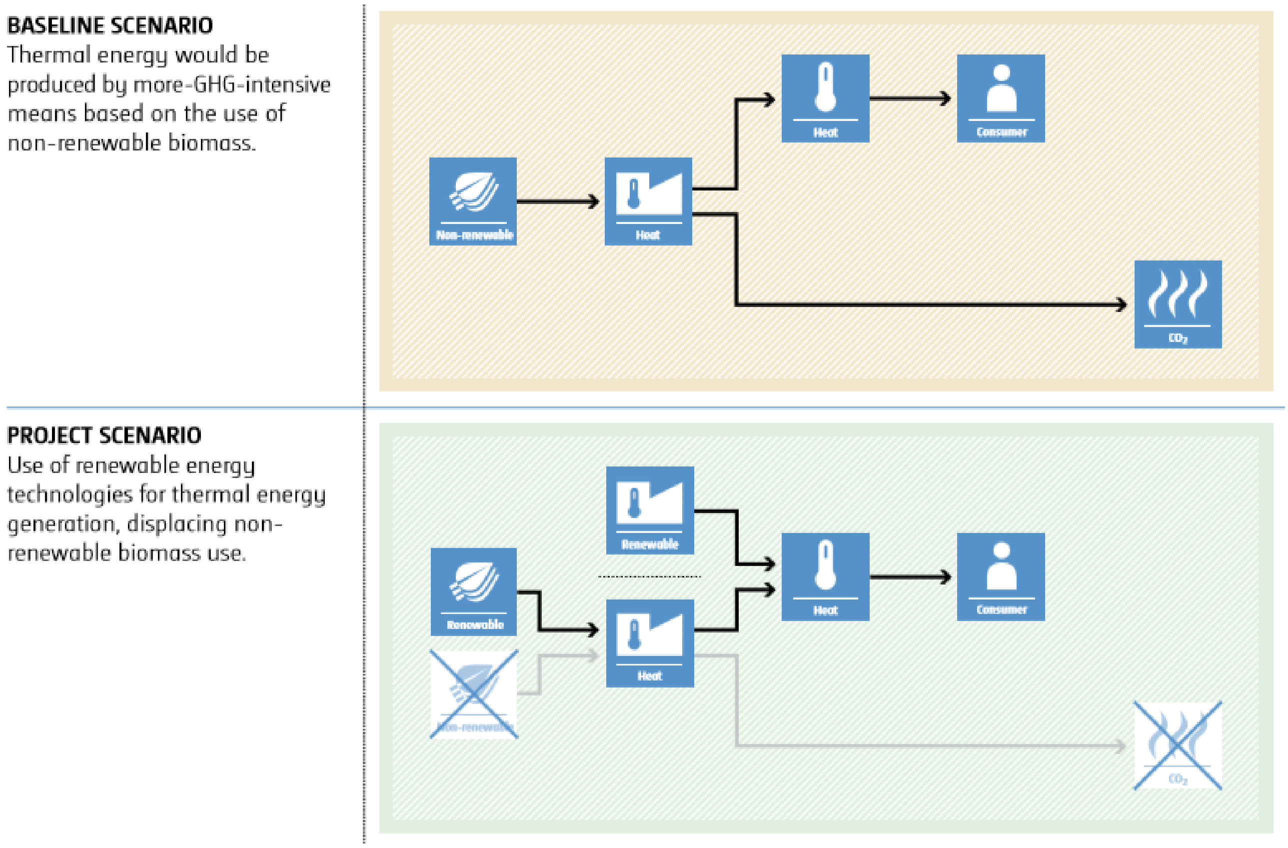
The baseline scenario is characterized by:

- Continued dependence on high-emission energy imports from India and on fossil-based local generation,
- Ongoing use of backup diesel generators during outages or peak demand,
- Delay of renewable energy deployment due to infrastructure and investment hurdles in challenging, underdeveloped areas.

Socio-economic and environmental benefits, including job creation, local grid stability, and clean power injection, would not materialize in the absence of these projects.

Both the Solu Khola (Dudhkoshi) and Dordi Khola projects are voluntary private sector initiatives, not mandated by government policy or required under any regulatory framework at the time of investment. They reflect independent commitments by project proponents to Nepal's energy security and cross-border decarbonization, as well as to participation in international carbon markets through measurable greenhouse gas (GHG) reductions.

This scenario is further substantiated by official correspondence from India's Central Electricity Authority, which, in its letter dated 5 September 2023, approved the import of up to 83.42 MW from Solu Khola (Dudhkoshi) and up to 26.19 MW from Dordi Khola to Haryana DISCOMs during the monsoon months from August 2023 to October 2027. This confirmation underscores that the clean hydropower generated is directly replacing grid electricity in India's system, which would otherwise be sourced primarily from fossil fuel plants.




## A.7. Debundling>>

This project activity is not a debundled component of a larger project activity.

## SECTION B. Application of methodologies and standardized baselines

## B.1. References to methodologies and standardized baselines >>

**SECTORAL SCOPE:** 01, Energy industries (Renewable/Non-renewable sources)
**TYPE:** I - Renewable Energy Projects
**CATEGORY:** ACM0002 (Title: “Grid-connected electricity generation from renewable sources”, Version 22.0)

## B.2. Applicability of methodologies and standardized baselines >>

The project activity involves generation of grid connected electricity from the construction and operation of a new Hydro Power Project. The project activity has installed capacity of 109 MW which will qualify for a large-scale project activity of the Large-Scale methodology. The project status is corresponding to the methodology ACM0002, Version 22.0 and applicability of methodology is discussed below:

| Applicability Criterion | Project Case |
|---|---|
| 1. This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing | The project activity consists of installation of Greenfield power plant at a site where no renewable power plant was in operation prior to the implementation of the project activity. Thus, it fulfils the point (a) of criteria 1. |

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| operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s). | |
| 2. The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, Hydro power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; | The project activity is the installation of six Hydro turbine generators. Hence, meets this criterion. |
| 3. In the case of capacity additions, retrofits, rehabilitations or replacements (except for Hydro, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity. | The project activity does not involve capacity additions, retrofits, rehabilitations or replacements. Hence this criterion is not applicable to the project activity. |
| 4. In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance". | The project is not a retrofit, rehabilitations, replacements or capacity addition; hence this applicability criterion is not relevant. |
| 5. In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity | For Solu Khola (Dudhkoshi) and Dordi Khola Hydropower Projects, unless there is creation or expansion of a reservoir with a calculated power density greater than $4W/m^2$, or they are integrated projects as defined, typically condition (a) applies (project activity in existing river/reservoir with no change in volume). However, to conclusively determine which condition (a–d) applies, the project's reservoir and power density data must be confirmed. |

| | |
|---|---|
| of the integrated project, as per equation (8), is greater than 4 W/m2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: (a) Lower than or equal to 15 MW; and (b) Less than 6 per cent of the total installed capacity of integrated hydro power project. | |
| 6. In the case of integrated hydro power projects, project proponent shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity. | No, this requirement is not applicable for Solu Khola (Dudhkoshi) and Dordi Khola Hydropower Projects, as they are not integrated, multi-reservoir projects according to the available documentation and commissioning reports |
| 7. The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units. | Project activity does not involve: (a) Switching from fossil fuels to renewable energy sources at the site of the project activity. (b) Biomass fired plants. Hence this criterion is not applicable |
| 8. In addition, the applicability conditions included in the tools referred to above apply. | Applicability conditions of the applied tool is justified. |

From the above it is concluded that the project activity meets all the applicability conditions of the methodology ACM0002 Version 22.0 “Grid connected electricity generation from renewable sources”.

**B.3. Applicability of double counting emission reductions >>**

There is no double accounting of emission reductions in the project activity due to the following reasons:
• Project is uniquely identifiable based on its location coordinates,
• Project has dedicated commissioning certificate and connection point,
• Project is associated with energy meters which are dedicated to the consumption point for project developer

### B.4. Project boundary, sources and greenhouse gases (GHGs)>>

As per applicable methodology ACM0002 Version 22.0, the project boundary is as follow:

"The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the project power plant is connected to."

Thus, the project boundary includes the Hydro Power Plant and the Indian grid system.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the below table:

| Source | | GHG | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Grid connected electricity generation | CO2 | Yes | Main emission source |
| | | CH4 | No | Minor emission source |
| | | N2O | No | Minor emission source |
| | | Other | No | No other GHG emission were emitted from the project |
| Project Activity | Greenfield Hydro Power Project Activity | CO2 | No | No CO2 emissions are emitted from the project |
| | | CH4 | No | Project activity does not emit CH4 |
| | | N2O | No | Project activity does not emit N2O |
| | | Other | No | No other emissions are emitted from the project |

### B.5. Establishment and description of baseline scenario (UCR Standard or Methodology) >>

This section provides details of emission displacement rates/coefficients/factors established by the applicable methodology selected for the project. As per the approved consolidated methodology ACM0002 Version 20.0, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

**"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".**

The project activity involves setting up of a new Hydro power plant to harness the green power from Hydro energy and to use for captive purpose via grid interface through wheeling arrangement. In the absence of the project activity, the equivalent amount of power would have been supplied by the Indian grid, which is fed mainly by fossil fuel fired plants. The power produced at grid from the other conventional sources which are predominantly fossil fuel based. Hence, the baseline for the project activity is the equivalent amount of power produced at the Indian grid.

A "grid emission factor" refers to a CO2 emission factor (tCO2/MWh) which will be associated with each unit of electricity provided by an electricity system. The Universal Carbon Registry (UCR) recommends a default conservative emission factor of 0.9 $tCO_2$/MWh for the vintage years 2013–2023.

The project uses a more recent and conservative figure of 0.757 $tCO_2$/MWh for the 2024 vintage year, which is aligned with the combined margin emission factor calculated by the Central Electricity Authority (CEA) in India. This emission factor reflects a weighted average of both the operating margin and build margin and considers the growing contribution of renewable energy but still reflects the dominance of fossil fuel-based generation. As this value results in higher emissions than the default factor, it has been used for emission reduction calculations to ensure a conservative and credible approach.

**Net GHG Emission Reductions and Removals**

$$\text{Thus, ERy} = \text{BEy} - \text{PEy} - \text{LEy}$$

Where:

ERy = Emission reductions in year y (tCO2/y)
BEy = Baseline emissions in year y (t CO2/y)
PEy = Project emissions in year y (tCO2/y)
LEy = Leakage emissions in year y (tCO2/y)

**Baseline Emissions**

Baseline emissions include only CO2 emissions from electricity generation in 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:

$$BEy = EGPJ{,}y \times EFgrid{,}\text{CM}{,}y$$

| | |
|---|---|
| $BEy$ | Baseline emissions in year y (t CO2) |
| $EGPJ{,}y$ | Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh) |
| $EFgrid{,}\text{CM}{,}y$ | UCR recommended emission factor of 0.9 tCO2/MWh has been considered. (Reference: General Project Eligibility Criteria and Guidance, UCR Standard, page 19 equation 11) |

**Project Emissions**

As per ACM0002 Version 22.0, only emission associated with the fossil fuel combustion, emission from operation of geo-thermal power plants due to release of non-condensable gases, emission from water reservoir of Hydro should be accounted for the project emission.

Since the project activity is a Hydro power project. Considering ACM0002 methodology paragraph 57 equation 11. The project power density is higher than 10 W/m^2.

Hence**, PEy = 0**

**Leakage**

As per ACM0002 Version 22.0, ‘No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g., extraction, processing, transport etc.) are neglected.

Hence, **LEy = 0**

The actual emission reduction achieved during the first CoU period shall be submitted as a part of first monitoring and verification. However, for the purpose of an ex-ante estimation, following calculation has been submitted:

Estimated Annual baseline emission reductions (BEy)= 428269tCO2/year (i.e., 428269CoUs/year)

**B.6. Prior History>>**

The project activity is not registered in any other GHG mechanism. Hence there will not be any double counting.

**B.7. Changes to start date of crediting period >>**

The crediting period under UCR has been considered from 30/10/2022

**B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>**

PCN version 1.0 should be considered for the latest information about the project activity.

**B.9. Monitoring period number and duration>>**

First Issuance Period: 2 years, 2 months – 30/10/2022 to 31/12/2024

**B.8. Monitoring plan>>**

**Data and Parameters available at validation (ex-ante values):**

| Data/Parameter | UCR recommended emission factor |
|---|---|
| Data unit | tCO2 /MWh |
| Description | A "grid emission factor" refers to a CO2 emission factor (tCO2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.9 tCO2/MWh for the 2013- 2023 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach. |
| Source of data | https://a23e347601d72166dcd6-16da518ed3035d35cf0439f1cdf449c9.ssl.cf2.rackcdn.com//Documents/UCR StandardAug2024updatedVer7_020824191534797526.pdf |
| Value applied | 0.9 |
| Measurement methods and procedures | - |
| Monitoring frequency | Ex-ante fixed parameter |
| Purpose of data | For the calculation of Emission Factor of the grid |

| Data/Parameter | UCR recommended emission factor |
|---|---|
| Data unit | tCO2 /MWh |
| Description | A "grid emission factor" refers to a CO2 emission factor (tCO2/MWh) which will be associated with each unit of electricity provided by an electricity system. The UCR recommends an emission factor of 0.757 tCO2/MWh for the 2024 years as a fairly conservative estimate for Indian projects not previously verified under any GHG program. Hence, the same emission factor has been considered to calculate the emission reduction under conservative approach. |
| Source of data | https://cea.nic.in/wp-content/uploads/2021/03/User_Guide_Version_20.0.pdf |
| Value applied | 0.757 |
| Measurement methods and procedures | - |
| Monitoring frequency | Ex-ante fixed parameter |
| Purpose of data | For the calculation of Emission Factor of the grid |

| Data / Parameter: | *EGPJ,facility, y* |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity supplied to the NEWNE grid facility by the project activity |
| Source of data: | Deviation settlement account (DSA) The Deviation Settlement Account are issued as per Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) Regulations, 2014 and amendments. |
| Measurement procedures (if any): | Data Type: Measured<br>Monitoring equipment : Energy Meters are used for monitoring<br>Archiving Policy: Electronic<br>Calibration frequency: Once in 5 years (considered as per provision of CEA India). |
| Measurement Frequency: | Weekly |
| Value applied: | As per Deviation settlement account (DSA) |
| Purpose of data: | The Data/Parameter is required to calculate the baseline emission. |

| Data / Parameter: | *EGy* |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity supplied (adjusted measured values) to the NEWNE grid facility by the project activity. |
| Source of data: | Daily Generation Reports (DGR) Deviation settlement account (DSA) The Deviation Settlement Account are issued as per Central Electricity Regulatory Commission (Deviation Settlement Mechanism and related matters) Regulations, 2014 and amendments. |

| | |
|---|---|
| Measurement procedures (if any): | Data Type: Measured<br>Monitoring equipment: Energy Meters are used for monitoring<br>Archiving Policy: Electronic<br>Calibration frequency: Once in 5 years (considered as per provision of CEA India). |
| Measurement Frequency: | Weekly |
| Value applied: | As per Deviation settlement account (DSA) |
| Purpose of data: | The Data/Parameter is required to calculate the baseline emission. |

| Data / Parameter: | *Cap* |
|---|---|
| Data unit: | W |
| Description: | Installed capacity of the hydro power plant after the implementation of the project activity. |
| Source of data: | Project Site |
| Measurement procedures (if any): | Determine the installed capacity based on manufacturer’s specifications or commissioning data or recognized standards. |
| Monitoring Frequency: | Once at the beginning of each crediting period. |
| Value applied: | 27MW |
| Purpose of data: | The Data/Parameter is required to calculate the Power Density of the project activity used to determine the Project Emissions. |

| Data / Parameter: | *Ap* |
|---|---|
| Data unit: | m2 |
| Description: | Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full. |
| Source of data: | Project Site |
| Measurement procedures (if any): | Measured from topographical surveys, maps, satellite pictures, etc. |
| Monitoring Frequency: | Once at the beginning of each crediting period. |
| Value applied: | - |
| Purpose of data: | The Data/Parameter is required to calculate the Power Density of the project activity used to determine the Project Emissions. |