RIDI Grouped Hydro Solar Power Project in Nepal

Document Prepared by EKI Energy Services Limited

Project Title	RIDI Grouped Hydro Solar Power Project in Nepal
Version	01
Date of Issue	11-May-2023
Prepared By	EKI Energy Services Limited
Contact	Office no. 201, Plot 48, Scheme 78 Part 2 Vijay Nagar, Near Brilliant Convention Centre Indore - 452010 (M.P, India) Website www.enkingint.org

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of this Grouped project activity is to generate clean form of electricity through renewable Solar energy and Hydro energy sources. The project activity involves installation of combined capacity of 25.4 MW Solar power projects and Hydro Power projects in Nepal.

The proposed grouped project activity supports development of renewable energy generation plants based on Solar PV technology in Nepal and delivering electricity to the NEA grid. Each instance of project activity under this grouped project consists of one or more renewable power generation plant using solar PV technology. The proposed grouped project is a voluntary action being undertaken by NEA.

All the project instances i.e. renewable energy generation plants to be included in this grouped project will be from within Nepal only. Hence the location and geographical boundary of the grouped project can be defined as Nepal. The annual generation in grouped project activity in over crediting period is 1,31,576 MWH/year and The estimated annual emission reductions over a 7 year period from initial five project activity instances and additional five project activity instances are 38,222 tCO2e/year.

Instant 1 - ISSPL has carried out techno commercial evaluation of multiple commercially established solar PV technologies for the proposed site location based on the benefits that any particular technology can offer for the project lifecycle of 25 years. As per this evaluation, polycrystalline technology has been chosen for the 4 MW solar park project. The solar project is commissioning on 22-August-2022.

Instant 2 - Integrated Sustainability Services Pvt. Ltd. (hereafter referred as "ISSPL") has been appointed by **API Power Company Limited** (hereafter referred as "APCL") for conducting a technical feasibility study and preparing a detailed project report for setting up a 1 MW solar PV power plant in Dhanusa District in the Janakpur Zone of south-eastern Nepal. The project commissioning on 16-January-2016

APCL has successfully obtained approval from Nepal Electricity Authority (NEA) to install 1 MW Solar PV plant in Dhalkebar at a tariff of NPR 8.95/kWh. The generated electricity from this plant will be evacuated to the NEA grid through 11kV transmission line and a separate Power Purchase Agreement shall be signed with the NEA for this solar PV project.

Instant 3 - Integrated Sustainability Services Pvt. Ltd. (hereafter referred as "ISSPL") has been appointed by **API Power Company Limited** (hereafter referred as "APCL") for conducting a technical feasibility study and preparing a detailed project report for setting up a 1 MW solar PV power plant in Sarlahi District, Nepal.

APCL has successfully obtained approval from Nepal Electricity Authority (NEA) to install 1 MW Solar PV plant in Simara at a tariff of NPR 9.15/kWh. The generated electricity from this plant will be evacuated to the NEA grid through 11kV transmission line and a separate Power Purchase Agreement shall be signed with the NEA for this solar PV project.

Instant 4 - Arun Valley Hydropower Development Company Limited has complete Kabeli B1 Hydroelectric Project with an installed capacity of 25MW. Same company is developing Kabeli B1 Cascade Hydroelectric Project as a cascade system with an installed capacity of 9.94 MW and will utilize the water from the tailrace of Kabeli B1 HEP. The project activity is commissioning on 26-March-2022

Arun Valley Hydropower Development Company Ltd. has awarded consulting services to Professional Network for Engineering Services Pvt. Ltd. (PNet) for Detail Project Report of Kabeli B1 Cascade HEP. Design team visited project site and obtained topographic survey of the area. Feasibility study has proposed underground waterway, but possibility of surface waterway system is observed during field visit. Optimized layout with surface waterway system has been prepared by consultant and taken consent from developer. Finalizing details of all components, final report is prepared. This report contains description of project, design data and detailed drawings.

Instant 5 Ingwa Hydropower Ltd. is a “Developer” of Upper Ingwa Hydropower Project (UIHPP) in the eastern region of Nepal (State 1). 9.7 MW Hydro power project is currently under development on the left bank of Ingwa River to harness the hydro potential to generate electricity. Previously, developer carried out feasibility study and entered into PPA with Nepal Electricity Authority (NEA). Further developer intended to have independent review of the previous feasibility and update the feasibility using a run-of-river type scheme. In view of this, Ingwa Hydropower Limited Appointed Feedback Infrastructure Services Nepal Limited (“Consultant”), to carry out the review and updating of Feasibility Report with suitable design modifications with site verification of Geology, Topography, Hydrology data. This report is the outcome of the study, which covers the updated design and detailed feasibility including the design drawings for the project. he Upper Ingwa Hydropower Project is located on the Ingwa Khola, a tributary of the Kabeli River, in Taplejung and Panchthar district of Province No. 1, The project area lies just downstream of the confluence of the Suwa Khola and Ingwa the project are commissioning on 15-May-2022

Power house of the project is located at EL. 911amsl near Ambot, Yangwarak R. Municipality, Panchthar. A free flow ogee shaped diversion weir of 5m height from river bed and 45m long weir is designed for intake at EL 1106.5 amsl. The diversion weir and its appurtenances are designed considering a one in 100-year high flood event whose magnitude is estimated to be 1129 m3/s. Three intake of 1.7m width x 2.4m height each is provided on the left bank Ingwa River near Khudibari, Yangwarak R. Muncipality, Pancthar. With the available gross head of 195.5m and considering the losses in water conveyance, a net head of 182.15m is available at Power house. Two units of horizontal axis Franci’s turbines 5.057 MW (each) is designed to generate 9.7 MW power at design discharge of 6.21 m3/s and 182.15m head. 16 km long 33 kV double circuit transmission line will be laid to evacuate the power from the switchyard to NEA’s substation at Kabeli Substation, Pachthar district. The total annual energy generation from the plant

The details of the project, their investors and their location of installation are mentioned in the table below: -

Name of Investor	Capacity in MW	Technology	Connection with Grid	State	Usage
Upper Ingwa	9.70 MW	Hydro	NEA Grid	Nepal	
Kaberi-B1 Cascade	9.70 MW	Hydro	NEA Grid	Nepal	
Chandrapur Solar	4.0 MW	Solar	NEA Grid	Nepal	
Dhalkeber Solar	1.0 MW	Solar	NEA Grid	Nepal	
Simara Solar	1.0 MW	Solar	NEA Grid	Nepal	

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources)

Project Type : I - Renewable Energy Projects

Project Category: Large Scale project activity

1.3 Project Eligibility

As Per section 3.6.16 of VCS standard 4.4 Grouped projects shall include one or more sets of eligibility criteria for the inclusion of new project activity instances. At least one set of eligibility criteria for the inclusion of new project activity instances shall be provided for each combination of project activity and geographic area specified in the project description. Where grouped projects include multiple baseline scenarios or demonstrations of additionality, such projects will require at least one set of eligibility criteria for each combination of baseline scenario and demonstration of additionality specified in the project description. A set of eligibility criteria shall ensure that new project activity instances:

The project is a grouped project and following are the eligibility criteria for inclusion of new project activity instances into the grouped project activity:

1) **Applicability Conditions**: The project activity instances shall meet applicability conditions for applicable methodology as defined in section in 3.4

2) **Geographical Area**: The project activity instances to be included in the grouped project activity will be activities involving renewable electricity generation power plants with grid connection using solar and hydro technology located within Nepal

3) **Baseline scenario**: All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 3.3

4) **Technology type:** The project activity instances to be included in the grouped project activity will be Greenfield activities involving renewable electricity generation power plants with grid connection using solar technology.

5) **Additionality:** The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology. The additionality tool will be followed by project activity instances.

General criteria (to be fulfilled by all project activity instances for inclusion in the grouped project activity)

1.4 Project Design

The project is a grouped project. New project activity instances can be introduced in phase.

☐ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☒ **The project is a grouped project**

Eligibility Criteria

The project is a grouped project and following are the eligibility criteria for inclusion of new project activity instances into the grouped project activity:

2) Applicability Conditions: The project activity instances shall meet applicability conditions for applicable methodology AMS I.F version 3.0 as defined in section 3.2

3) Geographical Area: The project activity instances to be included in the grouped project activity will be activities involving renewable electricity generation power plants connection using solar technology located within India that would be generating electricity for captive purpose.

4) Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 3.4

5) Technology type: The project activity instances to be included in the grouped project activity will be Greenfield activities involving renewable electricity generation power plants (mini grid or captive use) using solar technology.

6) Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology.

7) For small scale project activity instances - As per Guidelines on the Methodological Tool for the demonstration of additionality of small- scale project activities - Version 18 (EB 105, Annex a positive list of grid-connected renewable electricity generation technologies are listed that are automatically defined as additional, without further documentation of barriers.

8) The positive list comprises of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW:

1. Solar technologies (photovoltaic and solar thermal electricity generation);
2. Off-shore wind technologies;
3. Marine technologies (wave, tidal).
4. Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 KW;

Since the small-scale project activity instances involve solar photovoltaic electricity generation projects, it can be concluded from the above list that this project activity is automatically additional and does not require demonstration of barriers.

6) Start Date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.

7) Conditions that avoid double counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program.

8) The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.

9) The project activity using solar project will supply electricity to grid or to users through grid network (micro grid) or in house captive consumption.
The following table demonstrates how the initial project activity instances being included in the grouped project activity fulfil above mentioned eligibility conditions:

No.	Criterion	How the new project activity instances to comply
1	Meet the applicability conditions set out in the methodology applied to the project	All project activity instances meet applicability conditions of methodology (AMS I.D Version 18.0 (project activity instances having capacity less than 15 MW), hence this eligibility criteria is fulfilled. Please refer section 3.2 of this document for methodology applicability criteria.
2	Use the technologies or measures specified in the project description.	The technology used for project activity is renewable energy solar power and hydro power plant.
3	Apply the technologies or measures in the same manner as specified in the project description.	All project activity instances Instance are solar PV power plants and Hydro power plants supplying electricity for mini grid or captive use. All are green field projects. Hence this condition is fulfilled.
4	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	All initial project activity instances have same baseline as per methodology as detailed in subsequent sections. Hence this eligibility criterion is fulfilled. Please refer section 3.3 of this document for baseline scenario.

5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	The additionality for the all project activity instances included in the grouped project has been demonstrated in section 3.4 of PD.As per CDM Tool for demonstration of additionality for small scale project activities, solar PV projects with capacity up to 15 MW fall in positive list of technologies termed as automatically additional. Here all the project activity instances are small scale projects and are automatically additional.
6	Where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: Each project activity instance that exceeds one percent of the capacity limit shall be identified. Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometre of at least one other instance in the cluster. Instances that are not within one kilometres of any other instance shall not be assigned to clusters. None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit.	All project activity instances being included in the grouped project are located within geographic boundaries of India. Hence this condition is fulfilled. Please refer commissioning certificate for Geographical area of project activity.

Along with above points, the Inclusion of New Project Activity Instances follows below criteria Grouped projects provide for the inclusion of new project activity instances subsequent to the initial validation of the project.

No.	Criterion	How the new project activity instances to comply
1	Occur within one of the designated geographic areas specified in the project description	New project activity instances (Renewable energy project) will be occurred in the designated geographic areas specified in the project description.
2	Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance	New project activity instances will comply with complete set of eligibility criteria as mentioned above for the inclusion of new project activity instances.

No.	Criterion	How the new project activity instances to comply
	with multiple sets of eligibility criteria is insufficient.	
3	Be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body.	New project activity instances information be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body
4	Be included in an updated project description, with updated project location information (as set out in Section 3.11), which shall be validated at the time of verification against the applicable set of eligibility criteria.	New project activity instances should be included by validating eligibility criteria as mentioned in this document
5	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	New project activity instances ownership needs to be evidenced from start date of respective project activity instance.
6	Have a start date that is the same as or later than the grouped project start date.	New project activity instances start date should be after the start date of grouped project activity.
7	Be eligible for crediting from the start date of the project activity instance through to the end of the project crediting period (only).	New project activity instances are eligible to claim credits from crediting period start date to the end of the project crediting period.
8	Only eligible for crediting from the start of the verification period in which they were added to the grouped project.	
9	Not be or have been enrolled in another VCS project.	

No.	Criterion	How the new project activity instances to comply
10	Adhere to the clustering and capacity limit requirements for multiple project activity instances set out in 3.6.8 - 3.6.9.	

1.5 Project Proponent

Organization name	RIDI POWER COMPANY LIMITED
Contact person	Kuber Mani
Title	Grouped Projects 25.4 MW from RIDI POWER in Nepal
Address	Kathmandu, Nepal
Telephone	01-5111015, +977-9841250864
Email	kmnepal2003@gmail.com

1.6 Other Entities Involved in the Project

Organization name	EKI energy services Limited
Role in the project	Project Representative
Contact person	Manish Dabkara
Title	MD & CEO
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91 99075 34900
Email	manish@enkingint.org

1.7 Ownership

RIDI POWER COMPANY LIMITED has the legal right to control and operate the activities registered under this grouped project. RIDI POWER or its group companies either own the installed PV panels, rent the rooftop space on which the panels are installed or have an agreement with the panel owners regarding ownership of the group project.

1.8 Project Start Date

The start date of the project is 22 August 2021, which is the date of commissioning of the first PV installation at the site. This is the date on which the group project began generating GHG emission reductions.

1.9 Project Crediting Period

Grouped Project and 1st Project Activity Instance

Crediting period: renewable.

Total number of years: 7 years 00 months, renewable twice.

Start and end date of first crediting period: 22 August 2021 to 21 August 2028 (total 7 years and 00 months)

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☒ 20,000 – 100,000 tCO_2e/year

☐ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	
Large project	√

Year	Estimated GHG emission reductions or removals (tCO_2e)
2021	38,222
2022	38,222
2023	38,222

2024	38,222
2025	38,222
2026	38,222
2027	38,222
Total estimated ERs	2,67,554
Total number of crediting years	7
Average annual ERs	38,222

1.11 Description of the Project Activity

ISSPL Solar is responsible for the commissioning of new, small-scale solar PV installations in Nepal. Each project activity instance will comprise one or more solar PV facilities, where the total maximum installed capacity of the facilities is below 6 MW, per project activity instance.

The Project has been configured into a single modular plot having a DC capacity of 1.2 MWp with one inverter of 1000 kW, with a maximum AC output of 1 MW. In order to minimize DC ohmic losses, inverters, MV transformers and switchgear shall be suitably located within the modular plot. The PV modules are electrically connected with cables sized to minimize DC ohmic losses. The DC electrical output from the PV modules is fed through DC cables of suitable grade to junction boxes, which are then connected to inverters. These inverters convert the DC electrical input to AC output and the same is then stepped up using a single 1 MVa 300 V/11kV Transformer. The 11kV AC electrical supply is then evacuated into the NEA owned grid through 11kV transmission lines that connect the project step-up transformer to the NEA owned grid substation.

The general arrangement of the project comprises a connection structure on the left bank of the Kabeli River, located at about 400 m upstream from the confluence of Kali Khola with Kabeli River.

The main features of the Project are as follows:

• Interconnection structure comprising RCC Box canal and pipe canal, side channel spillway of 75 m

length, and forebay, the total length of interconnection conduit up to forebay is 1160 m.

• Headrace pipe consisting of 1165 m long Steel pipe of 3.75 m internal diameter (ID) with thickness

of 12mm.

- Surge tank of diameter 18 m to manage effect of water hammer during closure and startup
- Two parallel steel penstock pipe of 2.3 m diameter
- A surface powerhouse (25*14m) with two generating units.
- Tailrace canal of 160 m; and
- A 33 kV single circuit, 3.0 km long transmission line from the powerhouse to switchyard at Kabeli

pooling station.

Simara

Summary of 1 MW Solar PV Power Plant

1	Project Authority	API Power Company Limited
2	Project Capacity (MW) (AC side)	1 MW
3	Selected Location	Simara
4	Nearest Major Town	Simara
5	Accessibility	By East-West National highway
6	Nearest Airport	Siddharthanagar, Nepal
7	Solar module type	Trina TSM-315PD14 (Si-Poly)
8	Capacity of each module (W)	315
9	No. of modules	3840
10	PV System Mounting Structure type	MS Galvanized
11	Power conditioning unit (Invertors) capacity	1000 kW X1 Nos
12	Power conditioning unit specifications	Input voltage range600-850V (1000 kW)
13	No. of invertors	1
14	Invertors make	ABB
15	Cables and earthing systems	1 Set
16	Plant Load Factor%	As per Contract Energy Table with NEA: 18.71%P50 PVSyst19.52%
17	Total Project cost (NPR in Crs)	9.55
18	Equity from Promoters (NPR In Crs)	2.86
19	Term loan from Financial Institutions (NPR in Crs)	6.69
20	Working Capital and Interest on term loan	10%
21	Project IRR %	11.84%
22	Equity IRR %	13.01%
23	Land	5 Acres of vacant land
24	Land Development	The entire station will be laid at a plain land.
25	Power Evacuation	Through11kV transmission lines to NEA owned grid substation located at4 kms

Dhalkeber

Efficiency of Commercially Available PV Technologies

Model	**315PD14**
Manufacturer	Trina Solar
Max. output, P_{max},at STC (W)	315
Maximum power voltage, V_{mpp}, (Volts)	37
Maximum power current, I_{mpp}, (A)	8.51
Open-circuit voltage, V_{oc}, (V)	45.6
Short-circuit current, I_{sc}, (A)	9.00
Temperature co-efficient of Power (%/0c)	-0.4
Length(mm)	1956
Width (mm)	992
Thickness (mm)	40
Weight (kg)	22.5

Chandranigahapur

T Project Summary of proposed 4 MW Solar PV Plant

1	Project Authority	API Power Company Limited
2	Project Capacity (MW) (AC side)	4 MW
3	Selected Location	Chandranigahapur
4	Nearest Major Town	Chandranigahapur
5	Accessibility	By East-West National highway
6	Nearest Airport	Siddharthanagar, Nepal
7	Solar module type	Trina TSM-315PD14 (Si-Poly)
8	Capacity of each module (W)	315
9	No. of modules	15360
10	PV System Mounting Structure type	MS Galvanized
11	Power conditioning unit (Invertors) capacity	1000 kW X4 Nos
12	Power conditioning unit specifications	Input voltage range650-850V (1000kW)
13	No. of invertors	4
14	Invertors make	ABB
15	Cables and earthing systems	1 Set
16	Plant Load Factor%	As per Contract Energy Table with NEA: 19.77%P50 PVSyst:20.60%
17	Total Project cost (NPR in Crs)	38.20
18	Equity from Promoters (NPR In Crs)	11.46
19	Term loan from Financial Institutions (NPR in Crs)	26.74
20	Working Capital and Interest on term loan	10%
21	Project IRR %	11.61%
22	Equity IRR %	13.32%
23	Land	20 Acres of vacant land

24	Land Development	The entire station will be laid at a plain land.
25	Power Evacuation	Through33kV transmission lines to NEA owned grid substation located at2 kms distance from the proposed project site.
26	Mode of Implementation	EPC Contractor will carry out the entire

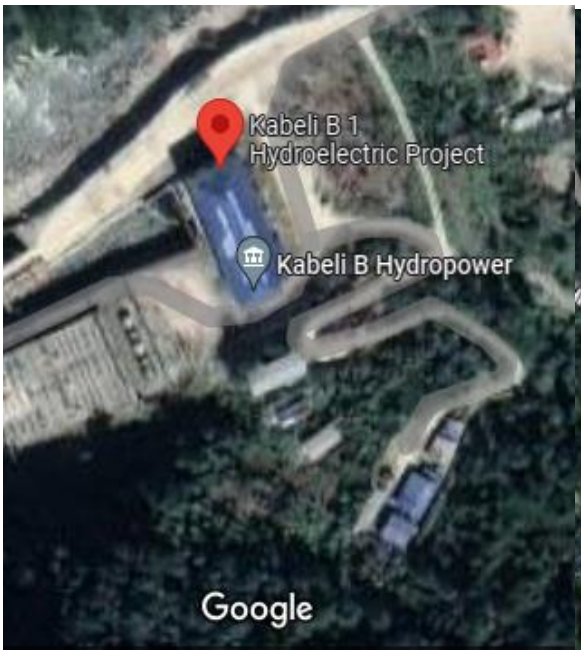
Kabeli B1 Cascade Hydroelectric Project

Parameters	Value
Number of units	2
Rating	6.23 MVA
Power factor	0.85 over-excited
Cooling	TEWAC (Totally Enclosed Water Air Cooling)
Synchronous speed	375 rpm
Runaway speed	784 rpm
Number of Poles	16
Rated Frequency	50 Hz
Rated voltage	11 kV
Rated range of voltage variation	±5%
Range of frequency variation	±2%
Stator winding connection	Y (Star)
Rotor and Stator insulation	Class F
Installed Capacity	9.94 MW
Gross Head	37.1 m
Rated Design Head	32.5 m
Design Plant Discharge	35.14 m3/sec
Catchment Area	710 sq. km
Average Precipitation	2509 mm/year
100 years Design Flood (HW)	1065 m3/sec
Minimum Monthly Flow	9.17 m3/sec
Design Discharge	35.14 m3/sec

1.12 Project Location

Project	Location	Technology	Capacity	Latitude	Longitude
RIDI Power Solar & Hydro projects	Chandrapur	Solar	4 MW	27°06'27.0"N, 27.1075	85°22'05.6"E, 85.3682
	Dhalkeber	Solar	1 MW	26°55'21.2"N, 26.9225	85°56'42.8"E, 85.9452
	Simara	Solar	1 MW	27°09'04.0"N, 27.1510	85°00'44.7"E, 85.0124

	Upper Ingwa	Hydro	9.7 MW	27°17'04.6"N, 27.2846	87°54'28.7"E, 87.9079
	Kabelli B1	Hydro	9.7 MW	27°16'22.7"N, 27.2729	87°46'58.8"E, 87.7829



1.13 Conditions Prior to Project Initiation

There was no project at the site of the project participant prior to the implementation of this project activity. The project participant was not involved in generation of Hydro power & solar PV based power and supplying it to the grid under the pre-project scenario, therefore, in the absence of the proposed project activity, the equivalent amount of electricity would have been generated from the connected / new power plants in the Nepal electricity grid, while proposed project activity is a green field project. Therein, the main emission source in the pre-project scenario is the power plants connected to the Nepal electricity grid and the primary GHG involved is CO2.

The project activities were newly implemented and these activities were not constructed to

- increase in the reservoir capacities and the power density of the project activity,
- new reservoir for power generation.
- modify/retrofit of any existing grid-connected renewable power plant/unit,

The conditions prior to initiation of the project are

Electricity has a universal role in the economic development. It has a dual function as a "factor of production" and as a "consumer good" that increases the quality of life. Energy needs of the country are growing in tune with the needs of the liberalized economy.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

Table 10-1: List of Project Related Policies, Acts and Regulations

Legislations	Functions
Company Act 2053 (1996)	Registration and operation
Hydropower Development Policy 2058 (2001)	Guidelines for hydropower development
National Biodiversity Strategy and Action Plan 2071 B.S. (2014)	Management of Diversity
Income Tax Acts and Budgets	Taxation and other provisions
Electricity Act 2049 (1992)	Regulations for survey, generation, transmission and distribution of Small Hydropower power
Water Resources Act 2049 (1992)/	Regulations for rational utilization, conservation,
NEA's policy regarding small hydropower 2055 (1998)	Regulation regarding buy back rates and Power purchase agreement of small hydropower projects by private sectors
Environment Protection Act 2053 (1997) Environment Protection Regulations (as amended) 2055(1999)	Regulations regarding environment protection and hydropower development
VAT and TAX Provision	Recent Developments, Budget declarations
National Energy Crises Policy, 2073	To improve Energy Crisis in Nepal

- National Water Plan Nepal, 2005
- Statistical Pocket Book Nepal, 2004
- District Profile of Taplejung and Pachathar District
- Water Resources Strategy Nepal: Published by WECS, January 2002.
- Rules to handover Forest land for other Purpose, 2063
- Guidelines on use of government forest for National Priority projects, 2074
- Directive for issuing license for energy production, 2073 and 2075

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

Project has not been registered and it is not seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

Project has not been rejected by any other GHG programs.

1.16 Other Forms of Credit

The project activity neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

1.16.2 Other Forms of Environmental Credit

The project activity neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

1.16.3 Supply Chain (Scope 3) Emissions

Not Applicable

1.16.4 Sustainable Development Contributions Activity Description

Contribution to Sustainable Development

Implementation of project activity will support in the sustainable development primarily in the local area surrounding the project site and also at the national level. Expected contribution of proposed project activity towards sustainable development can be categorized under four indicators as explained below:

Social well-being:

- Proposed project activity is Greenfield power plant based on solar PV technology. Installation of this power plant will generate direct and indirect employment in the local area around the project site. This generation of direct and indirect employment will help in poverty alleviation and hence contributing towards social well-being.
- Being a Greenfield project, there will be improvement in the infrastructure in the local area around the project site. The infrastructure related to connectivity in terms of road networks etc. is expected to improve. This will lead to improvement in standard of living of population surrounding project site and hence leading to social wellbeing.

Environmental well-being:

- The project activity is installation of solar PV based power generation system. This system will generate power without any kind of emissions into atmosphere. Also, in the absence of project activity, the equivalent amount of power would have been generated through grid connected fossil fuel powered power plants thereby leading to emissions. This clarifies that the proposed project activity does not cause any negative impact on environment; hence leading to environmental well-being.

- **Economic well-being:**

Being a Greenfield power plant, the project activity generates direct and indirect employment opportunities in terms of skilled and semi-skilled manpower during construction and operation phase of the project. Apart from this business opportunities would be generated in terms of supply of equipment's and services at the project site, import and transport of equipment's etc. This will help towards the economic well-being of local area surrounding project activity as well as nation as whole.

- **Technological well-being**:

Power generation through solar PV technology is environmentally safe and sound technology. Also, there are no harmful emissions while operation of the plant. Hence this technology is amongst the cleanest sources of power generation among the other power generation technologies available in the country. In this scenario, the share of power generation through solar is very small in India. Thus, project activity would help in diffusion of the cleaner technology in the country for power generation. This will lead to technological well-being in power generation sector in India.

1.16.5 Sustainable Development Contributions Activity Monitoring

Contribution to sustainable development:

The project activity has beneficial effect on the local environment and employment in the nearby region. Clean Electricity generation through Hydro Project result in avoidance of consumption of fossil fuels which results in contribution to SDG 7. The emission avoidance through these activities results in contribution to SDG 13. All the workers at site are trained which results in increase of skills, which contributes to SDG 4. Detailed indicators are mentioned in table 1. This is a voluntary project activity doesn't contribute to achieving any nationally stated sustainable development priorities. Project officials has taken decision to keep all the employees on permanent basis working at the project activity. There is no compliance for monitoring and reporting the emission reduction and SDG contribution from the project activity.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	About 1,31,576.25 MWh renewable electricity has supplied to Indian grid during the crediting period that helps to increase the renewable energy share in the energy mix.	The project has increased the 65 participants' total daily income from 1.20 USD/day to 2.57 USD/day, bringing them above the international poverty line
2)	8.0	Employment of local men and women	Implemented activities to increase	The project proponent has targeted to employ 25 persons by the year 2028 and minimum 1 person per annum after 2021	It is estimated to employ at least 12 persons over the entire crediting period
3)	13.0	Total greenhouse gas emissions avoided or removed	Implemented activities to avoid	By supplying 1,31.576.94 MWh clean electricity (generated through Hydro project) to Indian grid, the project avoided release of 38,222 tCO_2e in to the atmosphere during the crediting period.	Prevented the release of 750 thousand tonnes of carbon into the atmosphere

1.17 Additional Information Relevant to the Project

Leakage Management

Not Applicable

Commercially Sensitive Information

Not Applicable

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project activity does not cause any harm to the local ecology. It primarily requires the installation of the Solar PV project, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories. As per the Schedule 1 of Ministry of Environment, Forests and Climate Change (Government of Nepal) notification dated September 14, 2006, solar power projects do not require an Environmental Impact Assessment.

The report on "Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects" prepared by MNRE dated September 2013 clearly mentioned that solar project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same.

However, there are no negative impacts on air, water; soil quality and ambience are envisaged due to the project activity.

2.2 Local Stakeholder Consultation

The details of the Stakeholder Meetings are as follows:

		Date of Invitation	Date of Meeting	
Project Name	**Capacity in MW**	**In AD**	**In AD**	**Location of Meeting**
Kabeli B1 Cascade	9.94	28th May 2017	02-Jun-17	Hilihang VDC & Amarpur VDC, Panchthar District. Yangwarak VDC Taplejung District

Upper ingwa	9.70	25th Feb 2022	4th March 2022	Powerhouse of Project, Ambot, Yangwarak R. Municipality, Panchthar
Dahlkebar Solar	1.00	22nd Aug 2018	27th Aug 2018	Dhalkebar, Mithila Municipality, Dhanusa district
Chandranighapur Solar	4.00	10th Aug 2018	22nd Aug 2018	Chandrapur Municipality Ward No. 5 Rautahat
Simara Solar	1.00	22nd Aug 2018	27th Aug 2018	Simara district

In the introductory speech, the representative of RIDI Power Limited (Project Investor), welcomed the gathering and given a brief about the climate mitigation project activity. Subsequent to the introductory speech, stakeholders were explained about the electricity generation from Hydro & Solar projects is an environmental friendly power generation technology contributing to reduction in GHG emissions. They were also explained about the benefits of the Hydro & Solar power projects like, increasing energy availability and improving quality of power and its assistance to the local population by providing employment opportunities to both skilled & unskilled labours.

The Minutes of meeting with commenting sheet from LSH, invitation letter receipt copy are to be submitted to the DOE during validation. For more details refer appendix 2.

Meeting started with opening speech by representative of project participant. He introduced all guests on dais. The representative of project participant explained Technical aspects of project to stakeholders. He also explained about social, environmental & economic benefits of the project. He also elaborated about carbon mechanism & its requirement for the current project. After the detailed discussions, the session was open for questions from stakeholders.

2.3 Environmental Impact

Solar PV is one of the cleanest sources of renewable energy, with no associated emissions and waste products. In Nepal, Environmental Impact Assessment (EIA) of solar power project is not an essential regulatory requirement. The Schedule-1 of Environment Impact Assessment (EIA) Notification 1994 and 2006 have covered 30 and 8 sectors respectively which are required to conduct EIA. However solar PV projects are not covered under the Schedule 1. Moreover, the project activity affects the environment in favorable manner by generating a clean energy.

Therein, EIA is not required for the project activity under consideration.

The environmental impacts associated with the Hydro project activity are as follows:
Air and Noise environment: The air quality and noise levels were assessed at different stations All stations recorded SPM concentration below the central pollution board standard. The levels

of gaseous air pollutants, viz. SO2 and NO2 were below the detectable limit of 6 µg/m3. The noise levels for the residential area were in the range of 40 to 50 dBA and in sensitive areas i.e.

Water environment: The water quality of Kabeli River for physical, chemical and heavy metal concentration is within permissible limits as the selected analytical parameter for assessment of water quality, there is no organic pollution as no major sources of domestic or industrial discharge in the river. Bacteriological quality of ground water sources does not show faecal contamination. Schools and hospitals were in the range of 40 to 45 dBA and are well within the Central Pollution Control Board standards for residential and sensitive areas.

Biological environment: The project activity does not cause any significant disturbance to the ecosystem. The plant species of the project area are neither endemic nor rare and endangered. There are no any significant adverse impacts of the project activity on wildlife, mammals, reptiles and migratory birds in the project area.

Socio-economic environment: The impact of construction on local labor force availability is highly significant. Increased income resulted in increased imports of laborers to the area and further income was generated by servicing the workforce. The construction of the power project triggers an all-round increase in development activities such as housing, transport and education and those have significant positive impact on the life style of the population. In sum the overall impact of the project on the socio-economic environment is expected too highly beneficial and positive.

2.4 Public Comments

The details will be provided at the time of validation.

2.5 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The approved baseline and monitoring methodology is used for the project. The details of the methodology are as follows:

Methodology: AMS.I.D

Project Type: Type-I: Renewable Energy Projects

Title: Grid connected renewable electricity generation

Version No.: Version 18; EB 81[1]

Reference: Appendix B of the simplified modalities and procedures for small-scale CDM project activities i.e. "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories"

The methodology refers to following CDM Tools:

- Tool to calculate emission factor for an electricity system (Version 07.0.0)
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 3)

Methodology Criteria	Project Activity Parameters
This methodology comprises Renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: (a) Supplying electricity to a national or a Nepal electricity grid; or (b) Supplying electricity to an identified consumerfacility via national/ a Nepal electricity grid through a contractual arrangement such as wheeling.	The proposed project activity is a Renewable electricity generation unit based on solar photovoltaic technology. And the project activity supplies electricity to the national grid. Hence this applicability condition is fulfilledby the project activity.
Illustration of respective situations under which each of the methodology (i.e. AMS-I. D, AMS-I. F and AMS-I. A) applies is included in Table 2.	Table 2 of AMS-I. D, Version 18 further substantiates that the project which generates and supplies electricity to a national grid falls under AMS-I.D.
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The proposed project activity is the installation of a new solar photovoltaic (PV) power plant at project site where there was no renewable energy power plant operating prior to the implementation of this project activity. Thus, the project activity under consideration is a Greenfield plant. Hence this condition is fulfilled by theproject activity.

[1] https://cdm.unfccc.int/UserManagement/FileStorage/2P7FS6ZQAR84LG3NMKYUH50WI9ODBC

Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • 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/m2; • 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/m2.	The proposed project activity is solar PV power plant, not a Hydro power plant, therein; measure is not applicable to project activity under consideration.
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.	There is no non-renewable component added to the proposed project activity. However, the capacity of the said project activity itself shall not exceed 15 MW.
Combined heat and power (co-generation) systems are not eligible under this category.	Such systems are not present within proposed project activity. Hence this condition is fulfilled by the project activity.

In the case of project activities that involve the 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 distinct from the existing units.	The proposed project activity is a greenfield plant that does not involve any addition of renewable energy generation unit.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The proposed project activity is not a retrofit or replacement unit of an existing facility.
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant 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.	There is no landfill gas, waste gas, wastewater treatment and agro- industries projects recovered methane emissions in this proposed project activity. Hence not applicable
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	There is no biomass is sourced from dedicated plantations in this proposed project activity. Hence Not Applicable

The applicability conditions of tools applicable under the methodology AMS.I. D; are explained as follows:

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"- In accordance with applicable approved methodology AMS I. D. version 18, the proposed project activity does not involve the project emissions, thus the said tool has not been used for the project activity under consideration.
- Tool to calculate the emission factor for an electricity system", (Version 07.0.0), EB 100 Report, Annex 4: The proposed project activity replaces fossil fuel dominated grid electricity by renewable electricity. Accordingly, this tool has been used to determine the grid emission factor which is used to estimate the amount of baseline emissions. The Central Electricity Authority compiled CO_2 baseline database for the Nepal Power Sector. CO_2 baseline database Version 18.0[2] has been used as reference for the emission factor. This CO_2 database has been compiled in conjunction with the "Tool to calculate the emission factor for an electricity system".

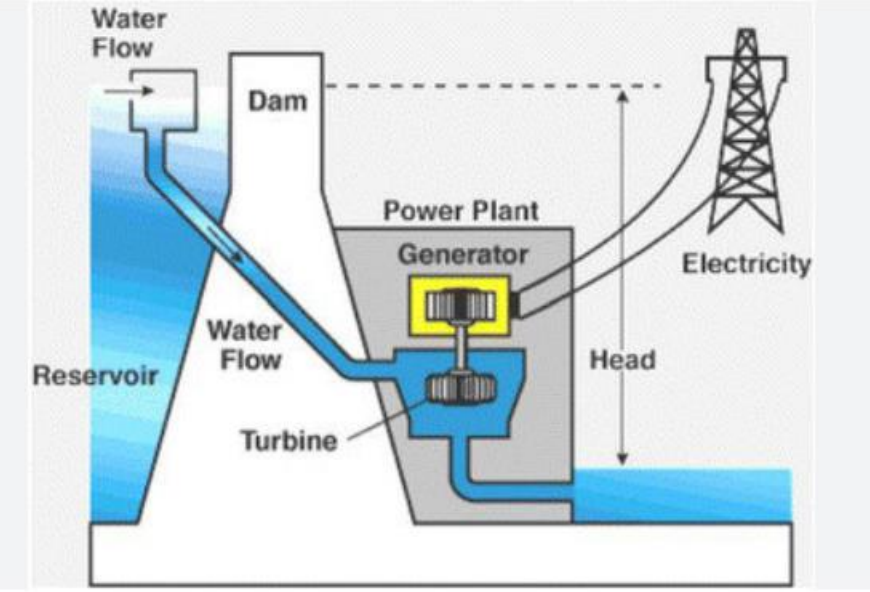
3.2 Project Boundary

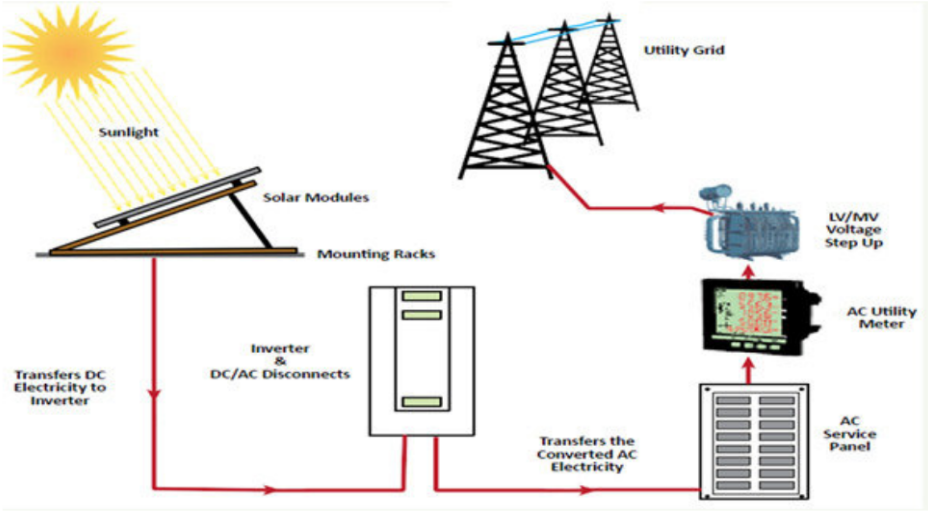
As per paragraph 18 of applicable approved methodology AMS- I.D, Version 18, "the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to". Thus, the project boundary for the proposed VCS project activity consists of PV installation, connected substations, metering equipment's and NEA.

The project boundary for the proposed project activity can be diagrammatically represented as follows:

As per AMS -1D version 18.0 - "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 Nepal grid.

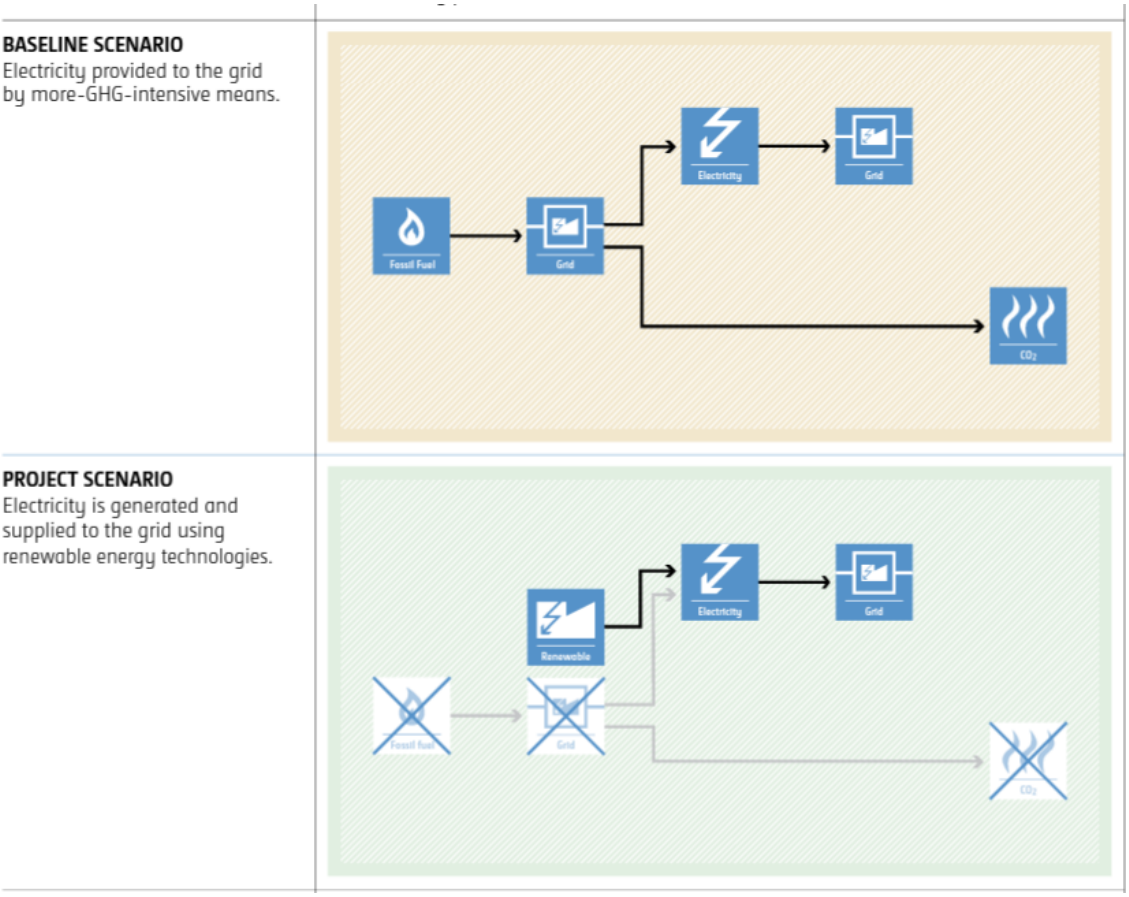
[2] https://cea.nic.in/cdm-co2-baseline-database/?lang=en





Schematic diagram of a grid connected PV power plant

The project boundary includes the Solar PV Plant and Hydro plants, sub-stations, grid and all power plants connected to grid. The proposed project activity will evacuate power to the Indian grid. Therefore the entire Indian grid and all connected power plants have been considered in the project boundary for the proposed project activity. Comparison between baseline scenario and post project installation flow diagram as follows.



Source		Gas	Included?	Justification/Explanation
Baseline	Fossil fuel fired power plants connected to integrated NEA frid	CO_2	Yes	Main Emission Source
		CH_4	No	Excluded for simplification. This isconservative
		N_2O	No	Excluded for simplification. This isconservative
		Other	Not Applicable	Not Applicable
Project	Not Applicable	CO_2	No	In line with paragraph 20 of applicable approved methodology AMS-I.D Version 18, there will be no project emissions due to project activity
		CH_4	No	
		N_2O	No	
		Other	No	

3.3 Baseline Scenario

Project activity under consideration involves the installation of new solar PV power project of capacity 6 MW and new Hydro power plant 19.4 MW in Nepal. As per the paragraph 19 of applicable approved methodology AMS-I.D Version 18, "The Baseline scenario is that the electricity delivered to the grid by the project activity that 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 is located in Nepal and connected to grid. The baseline to the proposed project activity is the electricity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

3.4 Additionality

"Attachment A of Appendix B of the Simplified Modalities and Procedures for Small Scale CDM project activities, Version 10.0, EB 116, Annex 24[3] refers to demonstrate that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions

c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

d) Other barriers: Without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Further, in line with paragraph 11 of EB 116, Annex 24, "The positive list of grid-connected renewable electricity generation technologies that are automatically defined as additional, without further documentation of barriers, consists of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW:

a) Solar technologies (photovoltaic and solar thermal electricity generation);

b) Off-shore wind technologies;

c) Marine technologies (wave, tidal).

3.5 Methodology Deviations

There are no methodology deviations applied during this monitoring period.

[3] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v1.pdf

3.6 Implementation Status of the Project Activity

For Solar Project

It is envisaged that the project will have the below mentioned phase of activities. These phases are not mutually exclusive; to implement the project on FastTrack basis some degree of overlapping is envisaged.

- Project Development
- Finalization of the Equipment and Contracts
- Procurement and Construction
- Plant Commissioning and performance testing

Project Development

In a power project, development of the project plays an important role. The below listed tasks will be under project development:

1) Preparation of Detailed Project Report (DPR)

2) In Principle clearances

3) Agreement b/w EPC Contractor and APCL

4) Financial closure

Finalization of the Equipment's and Contracts

For Solar PV plants, PV modules, inverters and transformers are long lead items and the planning schedule for the project implementation should provide adequate time period for the installation of these equipment. The specifications for major equipment like the Modules, Invertors and Transformer design shall be drawn up at an early stage of the project. Program of design information, from the equipment suppliers, that satisfies the overall project schedule shall be drawn up.

Since, the project execution calls for close coordination among the company and the EPC contractors, proper contract co-ordination and monitoring procedures shall be made to plan and monitor the project progress.

Procurement and Construction

The procurement is an important function of the implementation of the project. Once the purchase order is placed, the project team follows up regularly to ensure smooth and timely execution of the contract and for obtaining technical information for the engineering. The engineering activity includes review of drawings, expediting, stage and final pre-delivery inspection, supervision of installation and commissioning.

To expedite supplies from the manufacturers, regular visits to the supplier's works will have to be undertaken by the EPC Contractor to ensure adherence to the manufacturing program and quality plans finalized at the time of award of contract. Regular reports shall be prepared indicating the schedule variations, if any, their likely impact on the delivery schedule, and the recommendations to meet with the schedules.

Erection and Commissioning Phase

The commissioning phase in a project is one where design, manufacturing, erection and quality assurance expertise are put to test. The commissioning team will be from EPC Contractor, manufacturer of the equipment and the company. As discussed in the earlier section, staff identified to operate the plant will be involved in the commissioning phase of the project itself.

When construction phase is complete, thorough check listing shall be carried out to ensure that the plant has been properly installed with appropriate safety measures. The plant shall be subjected to a performance test, and subsequent to the successful completion of the performance test of the plant; the plant will be taken over by the company.

It is responsibility of the company to ensure that major civil work shall have to be planned in the n onm on soon period. All the statutory clearances shall be obtained much before of the start of the project commissioning.

ISSPL will be developing and implementing the 1 MW solar PV project through a turnkey engineering, procurement and construction (EPC) contract. ISSPL will soon appoint an EPC contractor.

We assume the overall project should be completed in 150 days from the date of award of the EPC Contractor. Project schedule, activities and tentative implementation plan are shown in table below

1	Entire Solar Power Plant	01-Jul-17	150	28-Nov-17
2	Basic Design Submission and Lay out Approvals	01-Jul-17	10	11-Jul-17
3	Site Mobilization	08-Jul-17	7	15-Jul-17
4	Site Preparation and Development	11-Jul-17	40	20-Aug-17
5	Detailed Project Design and BOQ Preparation	11-Jul-17	12	23-Jul-17
6	Invitation/Evaluation of Bids for Supply of Materials	11-Jul-17	12	23-Jul-17
7	Contract Finalization and Release of Advance	21-Jul-17	32	22-Aug-17
8	Material Dispatch	05-Aug-17	75	19-Oct-17
9	Construction	15-Aug-17	94	17-Nov-17
10	Installation of Mounting Structure	15-Aug-17	57	11-Oct-17
11	Module Erection	14-Sep-17	31	15-Oct-17
12	DC Cabling Works	30-Aug-17	27	26-Sep-17
13	DC Combiner Box Mounting	30-Aug-17	27	26-Sep-17
14	Inverter Station	15-Aug-17	40	24-Sep-17

15	Inverter Cabling Works	07-Sep-17	12.5	19-Sep-17
16	Substation33kV	15-Aug-17	75	29-Oct-17
17	Transmission Line	15-Aug-17	75	29-Oct-17
18	Commissioning	14-Oct-17	19	02-Nov-17
19	Stabilization and Handover	29-Oct-17	30	28-Nov-17

For Hydro Power Plant

Stages of Project Implementation

Project implementation shall be done in four different stages of activities as follows:

- Development Stage
- Pre-Bid Stage
- Implementation Stage
- Operation Stage

Development Stage

The development stage includes all the development works starting from identification of project, acquiring licenses, Pre-Feasibility study, Feasibility Study, Investigations, Detail Project Report, Project Appraisal, Financial management, Detail Design, Project estimation to identify the quantum of cost required for the project, etc. This stage has been completed and project has completed PPA, acquired generation license.

Pre-Bid Stage

The Pre-Bid stage of the project is mainly focus on the bidding process it includes the preparation of solicitation Documents like Invitation to Bid (ITB), Request for Proposal (RFP) and specifications. Company shall arrange a Pre-Bid meeting after request for proposal. The pre-bid meeting can reduce the claims and dispute during implementation of the project. Some key activities during Pre-Bid are;

- Bidding Strategy/Methods and Procurement Plan
- Pre-qualification/Post Qualification
- Invitation to bids
- Make Site Visit (optional)
- Hold pre-bid meeting
- Issue addenda

At the same time the Employer shall manage all the preparatory works to be done before the physical construction work is started in field. The arrangement of camping and infrastructure facilities has already been started so the project is ready to start implementation stage.

Implementation Stage

Construction stage involves physical construction works of the project after site mobilization till project commissioning. This stage comprises the following to be completed within 2 years from date of contractor's mobilization:

- Contractors' mobilization
- LC Opening for metal sheets and machines and other equipment
- Construction management and supervision
- Quality Control plan
- Claim and Dispute management
- Issue of approval and work order
- Progress monitoring and reporting
- Design verification and change if required
- Measurement, verification, payment and disbursements
- Finalization of testing format
- Testing and commissioning
- Collection of test certificate and warrantee certificate
- Collection of operation and maintenance manuals
- Finalization of operation procedures and codes
- Commercial Operation

Operation Stage

This stage involves contractors' demobilization, operation and maintenance during defects liability period (DLP), handover process, etc. The total process takes time and comes to an end only after the handover is completed. Following activities are included in this stage.

- Commercial operation and billing procedures
- Staff training and regulations
- Defect liability maintenance and clearance

- Adjustments and provisions
- Initial operations and spare parts management
- Availability declaration
- Schedule and breakdown maintenance provisions.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to paragraph 22 of CDM Methodology AMS.I. D (Version 18), the baseline emissions are calculated as follows:

The baseline emissions are the product of electrical energy baseline $EG_{pj,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$BE_y = EG_{PJ,y} * EF_{,grid,y}$

Where:

BE_y Baseline Emissions in year y (t CO_2)

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

$EF_{grid,y}$ CO_2 emission factor of the grid in year y (t CO_2/MWh)

Determination of CO2 emission factor of grid ($EF_{grid,y}$):

Option (a) under paragraph 23 of the methodology document is chosen to calculate the CO_2 emission factor of grid. The option (a) under paragraph 23 of the methodology document states as follows:

A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system"

Hence, the emission factor is calculated according to the CDM methodological tool - "Tool to calculate emission factor for an electricity system" (Version 07.0.0)

Applicability of the tool: The tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e., 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 activity supplies electricity to a Nepal electricity grid of Nepal Electricity system. Hence this tool is applicable in case of project activity.

In accordance with the tool, CO_2 emission factor of grid is calculated in stepwise manner as follows:

Step 1: Identify the relevant electric power system

For the purpose of determining the electricity emission factors, a project electricity system and connected electricity systems are to be defined. The Nepal power system is divided into two independent Nepal Grid. Each grid covers several states. Power generation and supply within the Nepal grid is managed by Regional Load Dispatch Centre (RLDC). The Regional Power Committees (RPCs) provide a common platform for discussion and solution to the regional

Source: CO_2 Baseline Database for the India Power Sector, User Guide (Version 18; December 2022)[4]

The Nepal Electricity grid own power generating stations as well as centrally shared power-generating stations. While the power generated by own generating stations is fully owned and

consumed through the respective state's grid systems, the power generated by central generating stations is shared by more than one state depending on their allocated share. Presently the share from central generating stations is a small portion of their own generation.

Since the project activity would be supplying electricity to the grid, it is preferable to take this grid as the project boundary rather than the state boundary. It also minimizes the effect of interstate power transactions, which are dynamic and vary widely. Considering free flow of electricity among the member states and the union territory, the entire Nepal electricity grid is considered as a single entity for estimation of baseline.

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

Project participants may choose between the following 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.

The project participant has chosen Option I for the calculation of the operating and build margin emission factor i.e., off-grid power plants are not being included in the calculation.

Step 3: Select an operating margin (OM) method

[4] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

a) Simple OM, or

b) Simple adjusted OM, or

c) Dispatch data analysis OM, or

d) Average OM.

As per the tool, any of the four methods can be used. For the proposed project activity, simple OM method has been chosen to calculate the operating margin emission factor ($EF_{grid, OM, y}$). However, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. The low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

Share of Low Cost / Must-Run (% of Net Generation)

	2017-18	2018-19	2019-20	2020-21	2021-22	Average
Nepal Electricity board	14.3%	14.5%	17.0%	16.5%	15.80%	15.64%

Source: CO_2 Baseline Database for the Nepal Power Sector, User Guide (Version 18; December 2022)[5]

The table above indicates that the percentage of low-cost/must-run resources is 18.9% as an average of past five year's generation percentage; this percentage is less than 50% of the total grid generation. Hence the use of simple OM method in the project activity is justified.

The Simple OM emission factor can be calculated using either of the two following data vintages for years(s) y:

Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of this document to the validator for validation, without requirement to monitor and recalculate the emissions factor during the crediting period,

or

Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the

[5] https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission__2021_22.pdf

emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

The project proponents choose the Ex-ante option for estimating the simple OM emission factor wherein as described above a 3-year generation-weighted average, based on the most recent data available at the time of submission of the VCS PD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period will be undertaken.

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

The simple OM method has been selected as justified above. The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units using the following formula:

$$EF_{grid,OM,simple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

$EF_{grid,OM,simple,,y}$	:	Simple operating margin CO_2 emission factor of in year y (tCO_2/MWh)
$FC_{i,m,y}$	:	Amount of fossil fuel type i consumed by power unit m 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)
$EG_{m,y}$	:	Net electricity generated and delivered to the grid by power unit m inyear y (MWh)
m	:	All power units serving the grid in year y except low-cost / must-run power units
I	:	All fossil fuel types combusted in power plant / unit m in year y
Y	:	Either the three most recent years for which data is available at the time of submission of this document to the validator for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

In India, the Central Electricity Authority (CEA) has estimated the baseline emission factor for the power sector. This data is considered to be the most authentic information available in the public domain for power sector in India. The details of same can be found on CEA website at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of project description document submission to the validator for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the validator. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units

built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The project proponents wish to choose option 1

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

a) Identify the set of five power units, excluding power units registered as CDM project activities that started to supply electricity to the grid most recently (SET5-units) and determine their annual electricity generation (AEGSET-5-units, in MWh);

b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET≥20%) and determine their annual electricity generation (AEGSET-≥20%, in MWh);

c) From SET5-units and SET≥20% select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

In India, the installed capacity and corresponding annual generation from power plants is quite high. The Central Electricity Authority (CEA) has estimated the annual electricity generation from SET≥20% to be larger than the generation from SET5-units. The details of same can be found on CEA website at http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

Further, none of the power units in SET≥20% started to supply electricity to the grid more than 10 years ago.

Therefore, SET_{sample} is selected as SET≥20% for the estimation of build margin.

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2 / MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2 / MWh)

m = Power units included in the build margin

y = Most recent historical year for which electricity generation data is available

Calculations for the Build Margin emission factor $EF_{grid,BM,y}$ is based on the most recent information available on the plants already built for sample group m at the time of project description document submission. The sample group m consists of the power plant capacity additions in the electricity system that comprise 20 % of the system generation and that have been built most recently ($SET_{\geq 20\%}$).

Step 6. Calculate the combined margin emissions factor

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.

The weighted average CM method (option A) should be used as the preferred option. The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

W_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

Wind and solar power generation project activities: w_{OM} = 0.5 and w_{BM} = 0.5 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.5 and w_{BM} = 0.5 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

As mentioned before, the baseline emission factors have been calculated as per CEA sourced data for various a Nepal electricity grid in Nepal according to the formulas specified above. As this is the most authentic information available in the public domain, the baseline emission factor used in the calculation of baseline emissions for the proposed project activity is being referred from the same for transparency and conservativeness[6]

4.2 Project Emissions

As per para 20 of CDM Methodology AMS.I. D, (Version 18), since the proposed project activity is electricity generation based on solar photovoltaic technology, there will be no fossil fuel combustion during the project activity and hence there will be no project emissions.

Therefore, the project emissions, PE_y = 0.

[6] http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

4.3 Leakage

According to CDM Methodology AMS.I. D, (Version 18), paragraph 22, if the energy generating equipment is transferred from another activity, leakage is to be considered. Since this is not the case in the proposed project activity, no leakage emissions are to be considered.

Therefore, $LE_y = 0$.

4.4 Estimated Net GHG Emission Reductions and Removals

Emission reductions are calculated (as per para 23 and Equation 10 of AMS.I.D Version 18):

$ER_Y = BE_Y - PE_Y - LE_Y$

Where:

ER_y = Emission reductions in year y (t CO_2/y)

BE_y = Baseline emissions in year y (t CO_2/y)

PE_y = Project emissions in year y (t CO_2/y)

LE_y = Leakage emissions in year y (t CO_2/y)

Ex-ante Emission Reductions Calculations:

Project Emissions are calculated using the formulae provided in the earlier sections of this document. The emissions are as follows;

Description	Unit	Parameter/Equation	Value
Rated power generation of project activity	kW	$EG_{PJ,rated}$	9700
Capacity Utilization Factor	%	CUF[7]	77.36%
No. of days in operation in a year			365
No of operating hours in a day			24
Quantity of net Electricity Supplied to the grid as a result of the implementation of the CDM project activity in year y	MWh	$EG_{PJ,y} = (EG_{PJ,rated} * CUF * 8760 / 1000)$	65734

Description	Unit	Parameter/Equation	Value
Rated power generation of project activity	kW	$EG_{PJ,rated}$	9700

[7] CUF for location Jodhpur which is nearest location for project activity. This is as provided in a report publishedby CERC - available at http://www.cercind.gov.in/2011/Whats-New/PERFORMANCE%20OF%20SOLAR%20POWER%20PLANTS.pdf

Capacity Utilization Factor	%	**CUF**[8]	65.40%
No. of days in operation in a year			365
No of operating hours in a day			24
Quantity of net Electricity Supplied to the grid as a result of the implementation of the CDM project activity in year y	MWh	$EG_{PJ,y}$ = ($EG_{PJ,rated}$ * CUF * 8760 / 1000)	55572

Description	Unit	Parameter/Equation	Value
Rated power generation of project activity	kW	$EG_{PJ,rated}$	4000
Capacity Utilization Factor	%	**CUF**[9]	19.77%
No. of days in operation in a year			365
No of operating hours in a day			24
Quantity of net Electricity Supplied to the grid as a result of the implementation of the CDM project activity in year y	MWh	$EG_{PJ,y}$ = ($EG_{PJ,rated}$ * CUF * 8760 / 1000)	6927

Description	Unit	Parameter/Equation	Value
Rated power generation of project activity	kW	$EG_{PJ,rated}$	1000
Capacity Utilization Factor	%	**CUF**[10]	19.45%
No. of days in operation in a year			365
No of operating hours in a day			24
Quantity of net Electricity Supplied to the grid as a result of the implementation of the CDM project activity in year y	MWh	$EG_{PJ,y}$ = ($EG_{PJ,rated}$ * CUF * 8760 / 1000)	1704

Description	Unit	Parameter/Equation	Value
Rated power generation of project activity	kW	$EG_{PJ,rated}$	1000
Capacity Utilization Factor	%	**CUF**[11]	18.71%
No. of days in operation in a year			365
No of operating hours in a day			24

[8] CUF for location Jodhpur which is nearest location for project activity. This is as provided in a report publishedby CERC - available at http://www.cercind.gov.in/2011/Whats-New/PERFORMANCE%20OF%20SOLAR%20POWER%20PLANTS.pdf

Quantity of net Electricity Supplied to the grid as a result of the implementation of the CDM project activity in year y	MWh	**$EG_{PJ,y}$ =** ($EG_{PJ,rated}$ * CUF * 8760 / 1000)	1639
Calculation of emission factor			
Simple Operating Margin emission factor for Nepal	tCO_2/MWh	$EF_{Grid,OM,y}$	0.9564
Build Margin emission factor for Nepal	tCO_2/MWh	$EF_{Grid,BM,y}$	0.8690
Combined Margin emission factor for Nepal	tCO_2/MWh	$EF_{cm,Nepal,y}$	0.0000
Combined Margin Emission Factor	tCO_2/MWh	$EF_{cm,india,y}$	0.9126
Nepal Generation[12]	MWh	EG_{Nepal}	6052000
Power Purchase from India	MWh	$EG_{fromIndia}$	2826000
Connected system weighted average combined Emission Factor	tCO_2/MWh	**EF_{CO2} = $EF_{Grid,CM,y}$ =** (EG_{Nepal} * $EF_{cm,Nepal\ y}$)+ ($EF_{Grid,\ M,y}$ * $EF_{cm,india,y}$)/ EG_{Nepal}+ $EG_{fromIndia}$	0.2905
Calculation for emission reduction due to project activity			
Baseline emission	tCO_2/yr	**BE_y =** $EG_{BL,y}$ * $EFCO_2$	38,222
Project emission	tCO_2/yr	PE_y	0
Leakage emission	tCO_2/yr	LE_y	0
Emission reduction	tCO_2/yr	**ER_y =** BE_y -PE_y - LE_y	**38,222**

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
22-August-2021 To 21-August-2022	**38,222**	0	0	**38,222**
22-August-2022 To 21-August-2023	**38,222**	0	0	**38,222**

[12] https://www.nea.org.np/#

22-August-2023 To 21-August-2024	**38,222**	0	0	**38,222**
22-August-2024 To 21-August-2025	**38,222**	0	0	**38,222**
22-August-2025 To 21-August-2026	**38,222**	0	0	**38,222**
22-August-2026 To 21-August-2027	**38,222**	0	0	**38,222**
22-August-2027 To 21-August-2028	**38,222**	0	0	**38,222**
Total	**2,67,554**			**2,67,554**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{Grid, CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin Grid emission factor for the project activity
Source of data	Calculated from CEA database, Version 12, May 2017[13]
Value applied:	0.2905
Justification of choice of data or description of	The data are obtained from "CO_2 Baseline Database for Nepal Power Sector" version 12.0, published by the Central Electricity Authority, Ministry of Power, Government of India.

[13] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$= Build margin CO_2 emission factor in year y (tCO_j/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year y (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 25% W_{BM} = Weighting of build margin emissions factor (%) = 75% The above weighing is as per "Tool to calculate the emission factor for an electricity system", version 06.0.0 for other projects (hydro in this case) and for second crediting period
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	W_{OM}
Data unit	Fraction
Description	Weight of Operating Margin Emission Factor in the emission factor used for the proposed project activity
Source of data	Tool to calculate the emission factor for an electricity system, Version 07.0.0, as per Annex 22 of EB 70.
Value applied:	0.5
Justification of choice of data or description of measurement methods and procedures applied	This is in accordance with the applicable approved methodology AMS-I.D. version 18 – "Grid ConnectedRenewable Electricity Generation"
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	W_{BM}

Data unit	Fraction
Description	Weight of Built Margin Emission Factor in the emission factor used for the proposed project activity
Source of data	Tool to calculate the emission factor for an electricity system, Version 07.0.0, as per Annex 22
Value applied:	0.5
Justification of choice of data or description of measurement methods and procedures applied	This is in accordance with the applicable approved methodology AMS-I.D. version 18 – "Grid ConnectedRenewable Electricity Generation"
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{BM,y}$
Data unit	tCO_2/MWh
Description	Build Margin Emission Factor for Nepal in year y
Source of data	"CO_2 Baseline Database for the Nepal Power Sector",User Guide, Version 18.0 dated December 2022, released by the Central Electricity Authority, Ministry of Power,Government of India
Value applied:	0.8690
Justification of choice of data or description of measurement methods and procedures applied	The "CO_2 Baseline Database for the Nepal Power Sector", User Guide, Version 18.0 dated December 2022, released by the Central Electricity Authority, Ministry of Power, Government of India, is the official database for statistics on the power sector in India in the variousgrids. It has been specially created to meet the data requirements for emission factors for the CDM project activities in the country. The database is used in accordance with the requirements in the applicable methodology stated as, "Calculations must be based on data from an official source and made publicly available"
Purpose of Data	Calculation of baseline emissions

Comments	-

Data / Parameter	$EF_{grid,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for gridconnected power generation in year y has calculated using the "Tool to calculate the emission factor for an electricity system – Version 07.0.0" as follows: $EF_{CO2,grid,y} = W_{OM} * EF_{OM,y} + W_{BM} * EF_{BM,y}$ $EF_{CO2,grid,y} = 0.5 * 0.9680 + 0.5 * 0.8690 = 0.2905$
Source of data	"CO_2 Baseline Database for the Nepal Power Sector",User Guide, Version 18.0 dated December 2022, released by the Central Electricity Authority, Ministry of Power,Government of India
Value applied:	0.9126
Justification of choice of data or description of measurement methods and procedures applied	The "CO_2 Baseline Database for the India Power Sector", User Guide, Version 18.0 dated December 2022, released by the Central Electricity Authority, Ministry of Power, Government of India, is the official database for statistics on the power sector in India in the variousgrids. It has been specially created to meet the data requirements for emission factors for the CDM project activities in the country. The database is used in accordance with the requirements in the applicable methodology stated as, "Calculations must be based on data from an official source and made publicly available"
Purpose of Data	-
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,facility,y}$
Data unit	MWh

Description	Quantity of net electricity supplied (MWh) to the grid as a result of the implementation of the project activity instances in year y
Source of data	Credit Report /JMR as per Monthly Generation Report
Description of measurement methods and procedures applied	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: One in five years9 Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. The Net electricity supplied to the grid by the project activity will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by state electricity board as per below equation: $EG_{facility,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and state electricity board personnel. The calculations/measurement of net electricity supplied to grid is under purview of state electricity board and the PP/Project activity Instance owner has no role on it. PP/Project activity Instance owner will get value of net electricity supplied to grid and hence this parameter is mentioned as a part of monitoring plan. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the PP to the State Electricity Board or invoices with third party.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value applied:	
Monitoring equipment	Monitoring equipment will be energy meter installed at each of the project activity instance site. Readings will be cross checked with back up meter. The accuracy class of meters, calibration frequency of meters is totally under purview of state electricity board and PP do not have any control on it. Thus, deviation against the accuracy class, calibration frequency, metering arrangement etc is acceptable for future period.
QA/QC procedures applied	The calibration of all the meters will be undertaken at required intervals and faulty meters will be duly replaced immediately. The meters will be of accuracy class 0.2 or 0.5. The meter accuracy class and calibration interval is under purview of state electricity board and PP/Project Activity Instances owner do not have any control on it. It is also noted that apportioning procedure (if applicable for project activity instances) is under control of state electricity board and PP do not have any control on it. The available parameter to PP/project activity instance owner is the net electricity supplied to grid and same parameter is mentioned as monitoring parameter

Purpose of data	The Data/Parameter is required to calculate the baseline emission
Calculation method	The parameter is measured and if any calculation is required, the calculation is based on measured parameters.
Comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period

5.3 Monitoring Plan

Monitoring system for 1 MW Solar power plant would require state of the art technology to allow for regular real time monitoring and analysis. Some of these requirements are lined out below:

- Monitors the performance of the entire power plant (string wise monitoring, junction boxes, inverters, etc.)
- Evaluates (strings, power produced, inverter, nominal/actual value), quantity of DC Power & AC
- Measures instantaneous irradiation level and temperature at site along with module back surface temperature.
- Alerts in case of error (discrepancy in normal operation of components, like module string/ diodes/ inverter/ junction box / loose contacts/ etc.) to facilitate recognition and correction of the fault with minimum downtime.
- Visualizes nominal status of the connected components via Control Centre PC Software (diagnosis on site or remote)
- Logs system data and error messages for further processing or storing
- Stores and visualizes energy yield data (for life of the plant) in the Portal from where the data can be accessed remotely.

The DC electricity generated by modules is converted to AC in inverters. ISSPL has proposed to go for ABB PVS800-57-1000kW-C inverters having capacities of a 1000 kW for 1 MW solar PV plant. In view of the current boom in the global solar PV market and short project implementation period, timely deliveries of the inverters have been a major concern for project development. These factors have

been considered while selecting ABB inverters for the project. ABB is one of the very few companies that can offer assurance that spare parts, service and technical support will be continually available over the 20+ years life of a solar installation.

ABB central inverters are ideal for large PV power plants but are also suitable for large-sized power plants installed in commercial or industrial buildings. ABB inverters are designed for fast

and easy installation. The industrial design and modular platform provide a wide range of options like remote monitoring, fieldbus connection and modular and flexible DC input cabinet.

The ABB Central 1000 kW AC inverter, selected for the Project. With peak efficiency above 98.60 %, it is amongst the most efficient central inverter in the market and can be used with both crystalline and thin-film modules. The main technical characteristics of these inverters are illustrated.

For Hydro Power Plant

The following instruments will be installed along with the powerhouse mechanical equipment so as to monitor the functions of them during the operation:

- Necessary numbers of pressure taps will be installed in the non-embedded parts of penstock to measure the penstock pressure. Such taps will also be provided in the inlet conduit pipe of the inlet valve.
- A transducer will be provided to indicate wicket gate opening status of the turbine.
- Servomotor locking device switches will be provided. Limit switch on each servomotor will indicate the fully open and closed position of the locking device.
- Instruments for measuring bearing pads temperatures, oil tank levels, oil temperatures, cooling water flows, cooling water pressures etc. will be installed.
- Proximity sensors will be installed for detection of speed, through which speeds ranging from zero to 140% of nominal speed can be measured and detected.
- A number of vibration probes and vibration proximity transducers will be installed to detect and measure vibrations in turbine.
- Filter high and low differential pressure, inlet and outlet water flow etc. will be monitored through instrumentation.

6 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	BE_y
Data unit	(t CO2)
Description	Emission reductions in year y (t CO2)

Value applied:	-
Comments	-

6.2 Baseline Emissions

According to paragraph 22 of CDM Methodology AMS.I.D (Version 18), the baseline emissions are calculated as follows:

The baseline emissions are the product of net electricity export to the grid $EG_{BL, y}$ expressed in MWh produced by the renewable generating unit multiplied by the Combined Margin grid emission factor.

$BE_y = EG_{PJ, y} * EF_{grid, y}$

Where: BE_y: Baseline Emissions in year y ($t CO_2$)

$EG_{PJ, y}$: Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid, y}$ = Combined Margin Emission factor for the project activity = 0.9310 tCO_2e/MWh Baseline emissions calculations are provided below Thus,

$BE_y = EG_{PJ, y} * EF_{grid, y}$

Baseline Emission for the monitoring period is

= 1,31,576 MWh * 0.2905 tCO_2e/MWh

= 38,222 tCO_2e (rounded down)

6.3 Project Emissions

As per paragraph 39 of CDM Methodology AMS.I. D, (Version 18), since the project activity is electricity generation based on solar photovoltaic technology, there is no fossil fuel combustion during the project activity and hence there is no project emissions. Therefore, the project emissions,

PE y = 0 tCO_2e

6.4 Net GHG Emission Reductions and Removals

Formula used to calculate the net emission reduction for the project activity is

$ER_Y = BE_Y – PE_Y – LE_Y$

Where,

ER_Y = Emission Reduction in tCO_2/year

BE_Y = Baseline emission in tCO_2/year

PE_Y = Project emissions in tCO_2/year

LE_Y = Leakage Emissions in tCO_2/year

APPENDIX 1: METER AND CALIBRATION DETAILS

Will provide the details at the time of validation.

APPENDIX 2: LOCAL STAKEHOLDER CONSULTATION DETAILS

आर्थिक अभियान

हरेक दृष्टि, आर्थिक कोण

Tuesday, 14 August 2018

धितोपत्र सूचीकरण विनियमावली संशोधनका लागि बोर्डले दियो स्वीकृति

रौतहट जिल्ला, चन्द्रपुर नगरपालिकामा ४ मेगावाटको ग्रिडमा आबद्ध सौर्य उर्जा आयोजना निर्माण तथा संचालन गर्ने सिलसिलामा प्रारम्भिक वातावरणीय परीक्षण (IEE) अध्ययनका लागि रायसुझाव संकलन गर्ने सम्बन्धमा सार्वजनिक सूचना

(प्रकाशित मिति २०७५/०४/२८)

रौतहट जिल्लाको चन्द्रपुर नगरपालिका, वडा नं ५ मा ४ मेगावाट क्षमताको ग्रिडमा आबद्ध सौर्य उर्जा आयोजना निर्माण गरिनेछ । यो आयोजना ८.१ हेक्टर खाली जमीनमा ३१५-३३० वाट क्षमताका १५,२३८-१४,४४५ मोड्युलहरु जडान गरेर १,००० किलोवाटका ४ वटा इन्भर्टर मार्फत ४ मेगावाट विद्युत उत्पादन गरिनेछ र उक्त विद्युत २.४ कि.मि. लामो ३३ के.भि. प्रसारण लाइन मार्फत् नेपाल विद्युत प्राधिकरणको चन्द्रनिगाहपुर सवस्टेशनमा लगेर जोडिनेछ ।

प्रस्तावको नाम : ग्रिडमा आबद्ध सौर्य उर्जा आयोजना (४ मेगावाट), चन्द्रनिगाहपुर

प्रस्तावकको नाम : अपि पावर कम्पनी लिमिटेड, धापाथली, काठमाडौं

प्रस्ताव कार्यान्वयन हुने स्थान : रौतहट जिल्लाको चन्द्रपुर नगरपालिका, वडा नं ५

वातावरण संरक्षण नियमावली, २०५४ को अनुसूचि १ मा परेको प्रस्तावित ग्रिडमा आबद्ध सौर्य उर्जा आयोजना (४ मेगावाट), चन्द्रपुर नगरपालिकाको प्रारम्भिक वातावरणीय परिक्षण (IEE) अध्ययनको सिलसिलामा निम्न क्षेत्रमा सम्बन्धित सवालहरुका बारेमा प्रस्ताव कार्यान्वयन हुने क्षेत्रका सरोकारवाला व्यक्ति वा संस्थाको लिखित राय सुझाव लिनुपर्ने भएकोले सोही नियमावलीको नियम ४ अनुसार यो सार्वजनिक सूचना प्रकाशित गरिएको छ । उक्त प्रस्ताव कार्यान्वयनबाट प्रभाव पर्नसक्ने नगरपालिका तथा त्यस क्षेत्रका विद्यालय, अस्पताल, स्वास्थ्य चौकी तथा सरोकारवाला व्यक्ति वा संस्थाले यो सूचना प्रकाशित भएको मितिले १५ (पन्ध्र) दिनभित्र निम्न ठेगानामा आइपुग्ने गरी रायसुझाव उपलब्ध गराइदिनुहुन अनुरोध गरिन्छ ।

राय सुझाव पठाउन सकिने ठेगाना :

प्रस्तावक :	परामर्शदाता :
अपि पावर कम्पनी लिमिटेड,	Environmental Services Nepal Pvt. Ltd. (ESN)
ट्रेड टावर, धापाथली, काठमाडौं,	सेन्ट्रल बिजनेस पार्क, दोस्रो तल्ला, धापाथली,
फोन : ०१-५१११०९३,	पोष्ट बक्स नं.: ११६०५, काठमाडौं, फोन : ०१-४१०१६९५
E-mail: info@sae.com.np	E-mail: info@esn.com.np,
Url: www.apihydro.com.np	Url: www.esn.com.np

अपि पावर कम्पनी लिमिटेड, ट्रेड टावर, बाँपाधसी, काठमाडौं प्रस्तावक रही रौतहट जिल्ला, चन्द्रपुर नगरपालिकाको वडा नं ५ मा निर्माण तथा संचालन गरिने ४ मेगावाटको खिड्मा आबद्ध सौर्य विद्युत आयोजनाको प्रारम्भिक वातावरणीय परीक्षण अध्ययन सम्बन्धि मिति २०७९/०४/२९ को 'आर्थिक अभियान नेपाली राष्ट्रिय दैनिकमा प्रकाशित सार्वजनिक सूचना अनुसार सार्वजनिक परामर्श गर्ने सिलसिलामा सम्बन्धित वातावरणीय सवालहरुका बारेमा प्रस्ताव कार्यान्वयन हुने क्षेत्रका सरोकारवाला व्यक्ति, संस्थाको लिखित राय सुझाव लिन देहायका स्थान र मितिमा सार्वजनिक बैठक आयोजना गरि छलफल गर्ने तथा रायसुझावहरु लिने कार्य सम्पन्न भयो ।

स्थान: चन्द्रपुर नगरपालिका प्रतिक्षालय (बिश्राम घर) (चन्द्रपुर-४)

मिति: २०७९/०४/०५.

क्र सं	नाम, थर	सम्बन्धित कार्यालय, पेशा	ठेगाना	हस्ताक्षर
१	संजय कुमार कार्की	वडा अध्यक्ष	चन्द्रपुर-४	
२	प्रावन रानिचा	व्यापार	" "	
३	ध्रुव राज ज्ञवाली	व्यवसायी	" "	
४	जगत खापकोटा	शिक्षक	" "	
५	राजन पौडेल	शिक्षक	" "	
६	नेत्रराज दहाल	कृषी	" "	
७	दीपक मैनाली	"	" "	
८	अतुल कार्की	"	" "	
९	केशव दहाल	"	" "	
१०	अमृत प्रसाद तुमखाई	"	" "	
११	नेत्रराज दहाल	शिक्षक	" "	
१२	सुरज शर्मा	स्वनिर्देश	चन्द्रपुर-४	

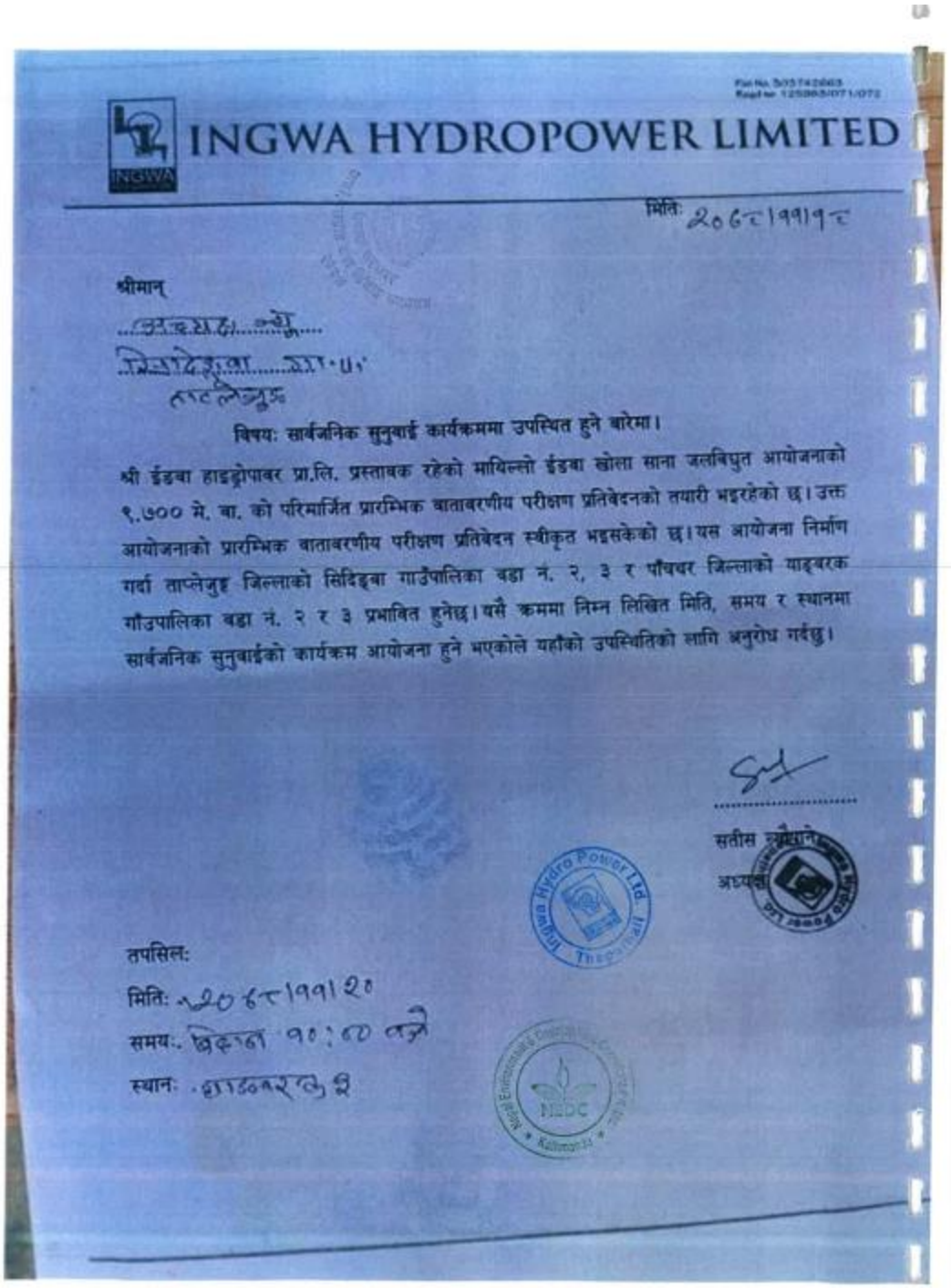
अपि पावर कम्पनी लिमिटेड, ट्रेड टावर, थापाथली, काठमाडौं प्रस्तावक रही रौतहट जिल्ला, चन्द्रपुर नगरपालिकाको वडा नं ५ मा निर्माण तथा संचालन गरिने ४ मेगावाटको ग्रिडमा आबद्ध सौर्य विद्युत आयोजनाको प्रारम्भिक वातावरणीय परीक्षण अध्ययन सम्बन्धि मिति २०७५/०४/२९ को 'आर्थिक अभियान' नेपाली राष्ट्रिय दैनिकमा प्रकाशित सार्वजनिक सूचना अनुसार सार्वजनिक परामर्श गर्ने सिलसिलामा सम्बन्धित वातावरणीय सवालहरूका बारेमा प्रस्ताव कार्यान्वयन हुने क्षेत्रका सरोकारवाला व्यक्ति, संस्थाको लिखित राय सुझाव लिन देहायका स्थान र मितिमा सार्वजनिक बैठक आयोजना गरि छलफल गर्ने तथा रायसुझावहरु लिने कार्य सम्पन्न भयो ।

स्थान: जुडिबेला जन हेल्थको प्रतिक्षालय (चन्द्रपुर-२)
मिति: २०७५/०४/०६

क्र सं	नाम, थर	सम्बन्धित कार्यालय, पेशा	ठेगाना	हस्ताक्षर
१	नर बहादुर घिसिङ ९८४४२४२३९८	कृषी	चन्द्रपुर-२	[signature]
२	साजन परियार ९८०११७६४०५	ड्राईभर	" "	[signature]
३	सुशाल तामाङ ९८६४१६९१९५	"	" "	[signature]
४	रुद्र नारायण श्रेष्ठ ९८४५८९५०१७	ड्राईभर	" "	[signature]
५	सिकेन्द्र दास ९८६०५३२४३६	"	" "	[signature]
६	लालबिर परियार	जागिरे (पिन्सन)	" "	[signature]
७	धर्मे पाखिन	कृषी	" "	
८	अर्जुन सिंह	जागिरे	" "	[signature]
९	[illegible]	कृषी	" "	[signature]
१०	खुस बहादुर तामाङ ९८६४२६७२३५	कृषी	" "	[signature]
११				
१२				

नेपाल सरकार ... तथा ... २०७४

तस्वीर १३: आयोजना क्षेत्रमा गरिएको सार्वजनिक सुनुवाई कार्यक्रम



INGWA HYDROPOWER LIMITED

मिति: २०८२।१११९२

श्रीमान्

.....वडाध्यक्ष ज्यू.....

सिदिङ्वा.....गा.पा.

ताप्लेजुङ

विषय: सार्वजनिक सुनुवाई कार्यक्रममा उपस्थित हुने बारेमा।

श्री ईङ्वा हाइड्रोपावर प्रा.लि. प्रस्तावक रहेको माथिल्लो ईङ्वा खोला साना जलविद्युत आयोजनाको ९.७०० मे. वा. को परिमार्जित प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदनको तयारी भइरहेको छ। उक्त आयोजनाको प्रारम्भिक वातावरणीय परीक्षण प्रतिवेदन स्वीकृत भइसकेको छ। यस आयोजना निर्माण गर्दा ताप्लेजुङ जिल्लाको सिदिङ्वा गाउँपालिका वडा नं. २, ३ र पाँचथर जिल्लाको याङ्वरक गाउँपालिका वडा नं. २ र ३ प्रभावित हुनेछ। यसै क्रममा निम्न लिखित मिति, समय र स्थानमा सार्वजनिक सुनुवाईको कार्यक्रम आयोजना हुने भएकोले यहाँको उपस्थितिको लागि अनुरोध गर्दछु।

सतीस [illegible]
अध्यक्ष

तपसिल:

मिति: २०८२।१११२०

समय: बिहान १०:०० बजे

स्थान: हाउजरबुङ