

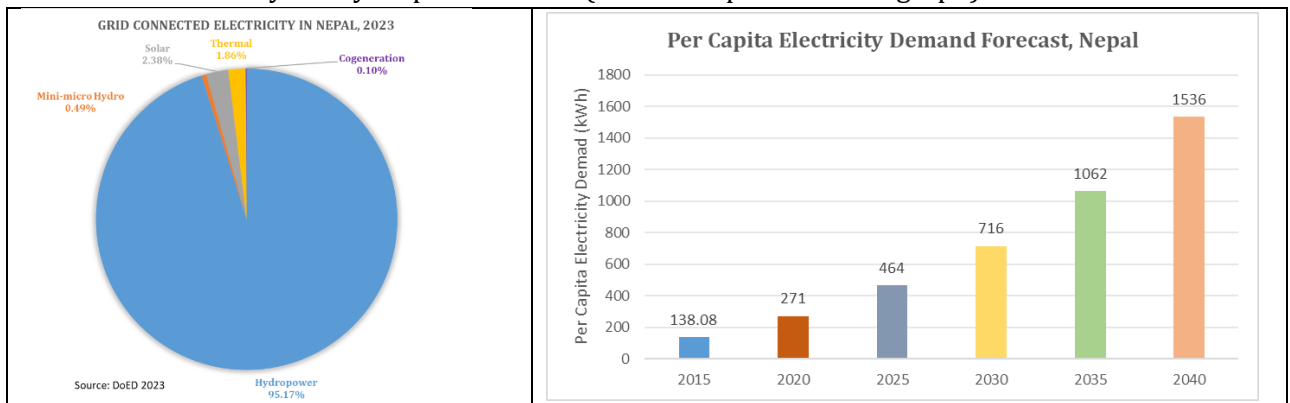
Country Assessment Report - Nepal: Nepal

Nepal is in the Himalayas and includes the Earth's highest point – Mount Everest. The Federal Democratic Republic is landlocked by its neighbouring countries, China and India. Nepal has a population of roughly 29.1 million people (as per Census 2021) and a total land size of 147,516 sq km. The capital city, Kathmandu, is the most densely populated district, housing around 7% of the total population. Grid-connected electricity access has reached 95.03% (NEA Annual Report FY 2022/23) of the population in the country from last fiscal year, mainly powered by hydro.

Generation and demand: (type, MW, TWh)

Generation.

Nepal is a developing country with a total installed capacity of 2875.4 MW in FY 2022-23. Around 96% is contributed by the hydropower sector (see below pie chart and graph).



Demand. The per capita electricity demand in 2015 was 138.08 kWh and 2020 was 271 kWh. The projected per capita electricity demand is presented in the bar graph above.

RE Market Potential:

Nepal has a vast potential to generate clean, green, sustainable and climate-resilient renewable energy from diverse sources. By 2030, the country plans to increase clean energy generation to 15,000 MW, with 5-10% coming from mini and micro-hydropower plants, solar, wind, and bioenergy, ensuring 15% of total energy demand is met by clean energy sources. This is a vital pathway to moving towards 100% renewable energy by 2050.

Nepal submitted its second NDC in December 2020 to the UNFCCC secretariat. Which includes following key goals:

1. Reaching 5,000 megawatts (MW) of installed capacity in five years and 15,000 MW of installed capacity in renewable energy in 10 years.
2. Achieve 90% sales of e-vehicles in the private passenger vehicle sector.
3. Expanding access to electricity and clean cooking to 100% of the population in five years; and
4. Increasing the per capita consumption of electricity to 1,500 kilowatts per hour (kWh) in 10 years.

The National Planning Commission (NPC) has prepared Sustainable Development Goals Status and Roadmap 2016-2030, which aims to achieve Nepal's Sustainable Development Goals (SDGs) by 2030. This roadmap aims to achieve the targets as follows.

- Increase access to electricity in 99% of households
- Limit usage of LPG to less than 40% by promoting electric cooking.
- Increase per capita consumption of electricity to 1500 kWh
- Generate 15,000 MW of installed capacity to meet the rising demand

Nepal's Energy Sector vision 2050 A.D. focuses on reducing dependency on imported petroleum products by utilizing indigenous hydropower and other renewable energy sources. This vision highlights hydropower as the primary resource to meet long-term energy needs, with power capacity targets of 11,500 MW and 31,000 MW by 2030 and 2050 respectively.

<https://lib.icimod.org/record/35780#:~:text=Nepal%20aims%20to%20achieve%20that,forests%20cover%3B%20and%20enhancing%20international>

Electrical interconnection and import/export:

Nepal imported 384 GWh of electricity from India in 2021/22 and exported 40 GWh of electricity to India. Nepal's imports of electricity from India typically peak during the dry season (October to May) when domestic hydropower generation is lower. India - Nepal Cross Border Energy Trading current capacity is 600 - 865 MW from the following transmission links:

- **Dhalkebar-Muzaffarpur (400 kV)**
- **Ramnagar-Kathmandu (132 kV)**
- **Raxaul-Parwanipur (132 kV)**
- **Dhuhabi-Sauraha (132 kV)**

Nepal is also developing two new cross-border transmission lines with India:

- Butwal-Gorakhpur (400 kV)
- New Butwal-Gorakhpur (400 kV)

Once these transmission lines are completed, Nepal's cross-border transmission capacity with India will increase to 2,900 MW. In addition to India, Nepal is also exploring the possibility of grid interconnection with Bangladesh and China. Nepal and Bangladesh signed an MoU in 2018 to construct a 400 kV cross-border transmission line. Nepal is also in talks with China to construct a cross-border transmission line, but no concrete agreements have been reached yet. Cross-border grid connections with other countries are still in their early stages but can play an important role in meeting Nepal's growing electricity demand and exporting surplus electricity to its neighbours.

Historical support or development of renewables in the country/region:

In the early 1990s, the Government of Nepal introduced several financial and regulatory incentives to promote the development of renewable energy as follows.

- A 100% tax holiday for renewable energy projects
- A 50% subsidy on the import of renewable energy equipment

- A net metering system for renewable energy projects

In 2001, the government introduced the Renewable Energy Subsidy Policy, which provided subsidies for the development of renewable energy projects. The policy was revised in 2008 and 2012 to increase the subsidies and expand the range of renewable energy technologies covered by the policy.

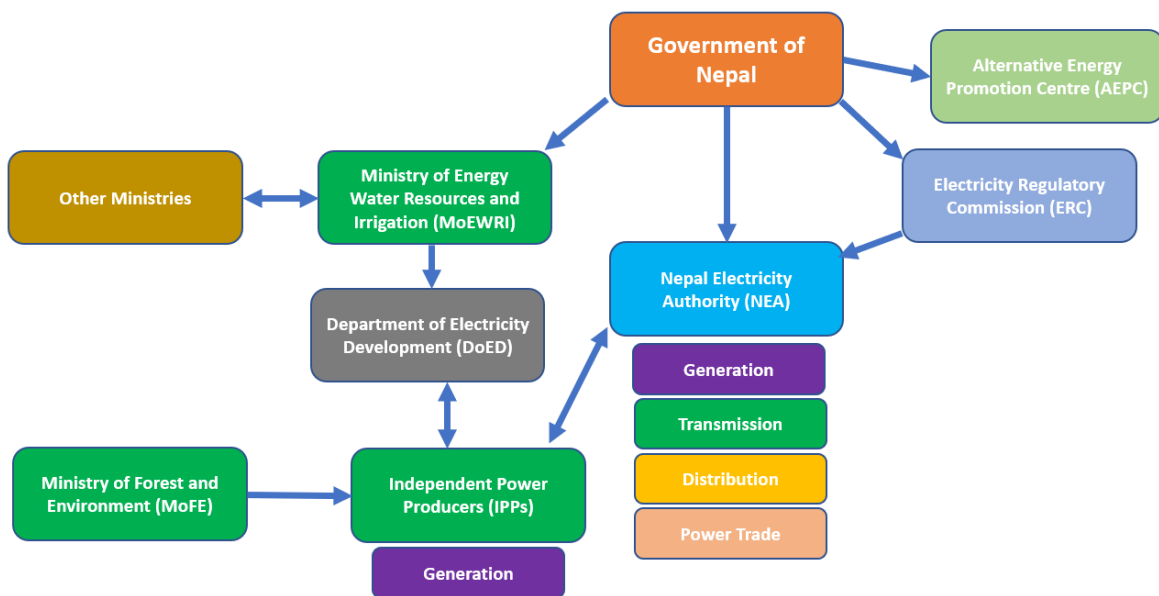
Nepal Electricity Authority (NEA) is sole entity to purchase the electricity and the IPPs sign Power Purchase Agreement (PPA) with NEA. NEA has set PPA rates based on type of project, dry and wet energy, RoR and PRoR scheme. In addition to this NEA provides 3% simple escalation in energy rate for 8 years for the project having capacity below 100 MW. The Government of Nepal is currently working on developing a new Renewable Energy Policy, which is expected to further streamline and improve the financial and regulatory support for renewable and hydroelectricity.

The NEA provides standard Feed-in-Tariff (FIT) rates to the developers. The FIT ranges from 3.6 US Cent per unit for Run-of-River type of projects, 3.6 to 6.3 US Cent per unit for Peaking Run of River types of projects and 9 US Cent per unit for Storage (Reservoir) type of projects. Currently, there is no provisions for Feed-in-Premiums (FIP) for Nepali developers. However, for some projects being developed by Foreign Developers in Nepal through Project Development Agreement (PDA) or similar mechanism, there is provisions of PPA where the rates are fixed at US Dollar.

Electricity market structure:

Nepal has a vertically integrated power sector, with all energy purchased and distributed by NEA. The Ministry of Energy, Water Resources and Irrigation (MoEWRI) is the line ministry with primary jurisdiction and authority for the energy sector, with implementation and regulatory functions devolved to departments and the regulator.

Institutional Setup of Energy Sector in Nepal



National oversight. MoEWRI is the main government body which formulate and implement policies and legislation for energy. The Department of Electricity Development (DoED) under MoEWRI is responsible for issuing survey and generation license for hydropower and solar projects. Electricity Regulatory Commission (ERC) is responsible for fixing electricity tariff. NEA acts as the main regulator and off-taker. It is responsible for electricity generation, transmission, distribution, power purchase and cross-border power trade.

Generation and distribution. Independent Power Producers (IPP) develop projects and sell the generated electricity to NEA. IPPs play a significant role in hydropower development in Nepal, contributing around two-thirds of the total installed capacity. The NEA owns some hydropower projects and has the infrastructure for the transmission and distribution of electricity throughout the country. NEA serves more than 5.13 million customers nationwide, has major responsibility for electricity distribution. NEA's domestic customers account for 92.32% of its customer base but only contribute 38.15% of total sales, while its industrial customers account for only 1.31% of its customer base but contribute 38.44% of total sales. NEA is the sole buyer and seller of electricity in Nepal. However, the government is planning to open the power trade market to competition. This will allow IPPs to sell electricity directly to consumers and consumers to choose their electricity supplier.

Customer Category	Percent of Total Consumers (%)	Sales (%)	Revenue (%)
Domestic	92.32	41.58	38.15
Non-Commercial	0.70	2.95	4.30
Commercial	0.76	7.87	11.43
Industrial	1.31	38.31	38.44
Others	4.91	9.29	7.68

Institutional Support and Stakeholders. The institutional setup of the energy sector in Nepal is complex and evolving. The government is working to improve the regulatory environment and attract private sector investment to develop the sector. The goal is to increase access to affordable and reliable electricity for all Nepalis. Several entities and programs have been introduced in recent years to improve sector organization and facilitate efficient permitting and deployment of renewable generation assets: These include:

- **Department of Electricity Development (DoED):** single point of contact for obtaining licence for renewable energy projects, such as hydro and solar.
- **Electricity Regulatory Commission (ERC):** fix and revise tariffs
- **Alternative Energy Promotion Center (AEPC):** a government agency that is responsible for promoting the development of renewable energy in Nepal. AEPC provides technical and financial support to renewable energy projects.
- **Nepal Renewable Energy Programme (NREP):** NREP is a government program that is designed to increase private sector investment in the renewable energy sector. NREP provides financial and technical support to renewable energy projects and helps to develop the capacity of the renewable energy sector.

Ancillary actors relevant to the power sector. In addition to the institutions described above, there are several other government agencies and ministries that play a role in the energy sector, such as the Ministry of Finance, the Ministry of Industry, Commerce and Supplies, and the Investment Board Nepal (IBN), which is responsible for facilitating and promoting foreign direct investment (FDI). These entities provide both structures under which new renewables are financed, as well serve core roles in attracting multinational actors that may benefit from clean electricity and certificate markets.

Description of renewables support mechanism:

The renewable energy support system in Nepal is a combination of financial, regulatory, and institutional measures that are designed to promote the development and deployment of renewable energy technologies. **Departments and programs such as DoED, AEPC, and NREP provide institutional support by facilitating new generation and investment into the sector.** With respect to concrete domestic measures, the Government of Nepal provides financial support for renewable energy through a variety of mechanisms as follows.

- Providing TAX holidays for projects meeting set production deadlines.
- 100 % VAT exempt on material and equipment to be imported.
- Only 1% custom duty on material and equipment to be imported.
- Subsidy and viability gap funding on mini-micro hydropower below 1 MW via AEPC.
- Provision of compulsory loan investment at least 10% of total loans from banks.

In addition to national mechanisms, the development community plays an important role in delivering technical assistance and supporting the renewable energy sector in Nepal. These include the multilateral actors such as the Asian Development Bank (ADB), European Investment Bank, and World Bank, as well as bilateral partners such as USAID, UKAID, NORAD, GIZ, and JAICA, among others.

Responsible government department: (include key contacts):

- **Ministry of Energy Water Resources and Irrigation (MoEWRI):** Power sector policy formulation, water resource development, oversight and regulation of the NEA and private power development
- **Department of Electricity Development (DoED):** Implementation and promotion of the government’s private power policy, management of bidding process for IPPs, issuance of survey licenses, provision of guidance to private investors and technical support to the ETFC.
- **Electricity Regulatory Commission (ERC):** Responsible for setting up tariffs.
- **National Planning Commission (NPC):** Coordination and development of the government’s 5-year multisector investment program
- **Water and Energy Commission Secretariat (WECS):** Policy advice on technical, legal, environmental, financial, and institutional matters related to water resource planning/development
- **Water Resources Research and Development Centre (WRRDC):** Government guidance on strategic issues and policy regarding integrated water resource development
- **Environment Protection Council:** Policy development and preparation of environmental regulations and environmental protection guidelines for environmental assessments, permits, licensing, inspection, and monitoring of environmental licenses

- **Climate Change Management Division (CCMD):** CCMD is a division under Ministry of Forest and Environment (MoFE), led by Joint Secretary, whose main role is to facilitate formulation of climate change policies and programs, take lead in developing climate action plans for both adaptation and mitigation and facilitate the management of climate financing. One of the key responsibilities is to facilitate mitigation measures and carbon trade. This is the key agency in Nepal working in the climate change sector.
- **Independent Power Producers of Nepal (IPPAN):** lobbying association of IPPs
- **NEA:** Responsible for power purchase, generation, transmission, and distribution throughout Nepal; and power trade with India.
- **Alternative Energy Promotion Centre (AEP):** It functions independently and has an eleven-member board with representatives from the government sector, industry sector and non-governmental organizations. Responsible for hydropower less than 1 MW and other renewable energy sources such as solar, biogas and wind energy. Under APECP, there is a Climate and Carbon Unit (CCU), which acts as a knowledge center for climate change mitigation and adaptation. CCU has been successful in registering eight Clean Development Mechanism (CDM) projects in CDM registry which includes Biogas Support Program Activities (Activities 1 to 4), Micro-hydro Promotions, Promotion of Improved Cooking Stove (ICS) and Promotion of Improved Water Mills (IWM).
- **Hydroelectricity Investment and Development Company Limited (HIDCL):** Engaged in a mission to mobilize funds from domestic and international resource base to cater to the needs of investments in middle to mega hydroelectricity generation, transmission and distribution projects, offering timely and quality services to our customers and partners with integrity and professionalism, and creating value to our shareholders, HIDCL envisages to become the top hydropower investment company of the country.
- **Independent Power Producers (IPPs):** The private sector hydropower developers who develop the projects. Currently, IPPs contribute to around two-third of the total installed capacity of Nepal. Butawal Power Company, Urja Developers, Sanima Hydro and Bizbell are some of the examples of the IPPs. The IPPs come together as an association called the Independent Power Producers Association of Nepal (IPPAN).
- **Hydropower Sustainability Alliance (HSA):** HSA is the global multistakeholder standard-setting organization that oversees the Hydropower Sustainability (HS) Standard and its Certification System. HSA has been working in Nepal for the last three years to improve the sustainability performance of Nepal's hydropower. They work closely with NEA and IPPAN to build capacity within their institutions in ESG and sustainability and have already certified three projects. RECs issued from HSA certified projects will be sold at a price premium in regional markets. HAS helps brings trust and credibility to Nepal's hydropower sector.

Existing/Planned energy legislation:

In July 2018, MoWRI released a **White Paper** which sets the objectives for hydropower and renewable energy generation in ten years. This includes identification of specific issues in hydropower development and set plans to mitigate hinderance in the sustainable hydropower development in Nepal.

Ministry of Population and Environment (MoPE) has formulated a comprehensive **Low Carbon Economic Development Strategy (LCEDS)** to propel Nepal towards becoming a developing nation through low-carbon green economic growth. LCEDS serves as a roadmap for attaining sustainable development by prioritizing sector-specific implementation plans that target low GHG emissions.

In December 2020, Government of Nepal submitted its enhanced **NDC** for the period of 2021-2030 under Paris Agreement. The key target includes increasing energy generation from 1400 MW to 15,000 MW, achieve 90% sales of e-vehicles in the private passenger vehicle sector, raising electric cookstove usage to 25% of households by 2025, installing improved cookstoves in rural areas, and promoting household and institutional biogas plants.

Sustainable Development Goals Status and Roadmap (2016-2030) is a roadmap to achieve Nepal's Sustainable Development Goals by 2030 and aims to lift Nepal out of the least Developed Countries (LDC) by achieving rapid economic growth.

Nepal Electricity Regulatory Commission Act 2017 was promulgated to establish a transparent regulatory body responsible for overseeing electricity production, transmission, distribution, trading and management. Under this act, the Electricity Regulatory Commission (ERC) was formed.

Nepal's Energy Sector Vision 2050 was formulated in 2013 to meet Nepal's energy demand by sustainable use of potential energy resources. It focuses on reducing dependency on imported petroleum products by utilizing indigenous hydropower and other renewable energy resources.

Nepal's 20-year Renewable Energy Perspective Plan 2000-2020 aims to accelerate development of renewable energy in Nepal to meet the growing energy demands.

National Energy Strategy of Nepal, 2013, provided a comprehensive framework for energy policy, addressing various issues such as poverty, electricity access, clean energy, hydropower generation, environmental conservation and indoor air pollution.

Nepal's Long-Term Strategy (LTS) for Net-Zero Emission, 2021 aims to achieve net-zero carbon emission from both energy and non-energy sectors by 2045 through rigorous mitigation measures, bold policymaking, social transformation and technological advancements.

Nepal's Fifteenth Five Year Plan (2076/77-2080/81 B.S.) prioritizes the rapid production of hydropower to ensure energy security and promote clean energy availability. The plan focuses on increasing hydropower production, encouraging the consumption of electric energy across various sectors and promoting regional trade of electricity to reduce petroleum product imports.

National Climate Change Policy, 2019 sets out objective for enhancing climate change adaptation, building resilient ecosystem, promoting green economy, mobilizing national and international financial resources for climate change mitigation and adaptation. Another focus of this policy is to distribute financial benefits received from carbon storage through **Reducing Emissions from Deforestation and Forest Degradation (REDD+)** and Clean Development Mechanism (CDM)

Environmental legislation for RE:

Environment Protection Act, 2019 and Environmental Protection Rules, 2020 are the major legislation which dictates the provisions for environment protection and Environmental Impact Assessment (EIA) procedures. Apart from these, followings materials address environmental legislation but are not directly used to oversee the energy sector.

- Forest Act, 2019
- Soil and Watershed Conservation Act, 1982
- Aquatic Animal Protection Act, 1960
- National Parks and Wildlife Conservation Act, 1973
- National Parks and Wildlife Conservation Rules, 1974
- Water Resources Act, 1992
- Renewable Energy Subsidy Policy, 2016
- National Climate Change Policy, 2019

Environmental Protection Act and Regulations requires to mention and quantify the sources of energy required for the development of any projects and its impact on environment and mitigation measures. These rules promote minimizing the and mitigate impact of emission from the projects.

The national Climate Change Policy, 2019 set out the framework for carbon trading and carbon credit. From REDD and CDM, certain projects have been registered for CDM for Certified Carbon Emission (CER) credits via AEPC.

<https://www.aepc.gov.np/pages/carbon-and-climate-change>

Existing/Planned energy certificate systems:

There are no REC systems in place in Nepal, and carbon credit issuance in the renewable energy sector is limited. On the production side, the introduction of I-REC will be useful for hydropower, solar, and biogas, while consumption segments (beyond conventional electricity procurement using RECs) may benefit the electricity mobility and green hydrogen segments. The authors note that based on the 2022 RE100 Technical criteria 2022 (Clause 5.2) the introduction of I-REC(e) can directly address market concerns that indicate passive claims are not credible in markets that have a highly renewable domestic generation mix, but also import significant amounts of electricity, such as Nepal. As such, the introduction of I-REC(e) will not directly or indirectly compete with any REC systems (as the country has none), and at the same time, availability of the instrument will improve the ability of electricity buyers to make more credible consumption claims.

Beyond REC instruments, CDM and Gold Standard are used for Forestry and biogas projects. Standard mitigation measures to avoid double issuance risks will be implemented by the issuer, namely at the contractual layer, by confirming that potential asset registrants are not registered and issuing instruments in parallel.

Extent of engagement with government:

The present authors have strong ties with NEA and other relevant government and financial bodies active in the clean energy sector. Basic discussions with NEA have been hosted and can be scaled up over time. The authors anticipate no objection from national actors to the introduction of I-REC(e) into the market, and at the same time, the authors can provide additional information and capacity support to national actors if domestic interest in market oversight or operation materialize.

Response from the Government in relation to attribute tracking systems:

Preliminary discussions to describe market structures and possible relationships between government and non-profit actors have been generally positive. While domestic understanding of REC market functions is relatively limited, the authors and relevant REC market entities are committed to providing knowledge support, through partnership with entities like the International Tracking Standard Foundation (I-TRACK Foundation) as market adoption scales and interest becomes more pronounced.

Demand-side market potential or strategic nature of market development:

Nepal holds strategic importance to South Asian power markets, due to its geographical placement between China and India, and its proximity to Bangladesh—all core clean energy demand markets linked to RE100 and SBTI members, and their supply chains. Demand is present, currently unmet, and creates challenges for RE100 members seeking to credibly disclose electricity consumption claims.

In 2022, RE100 members reported operations in 189 markets, and 5 of these members reported operations in Nepal, for electricity consumption of 10 GWh. Although the grid is primarily powered by hydro, end consumers in Nepal will benefit from increased choice and tracking potential associated with both the introduction of I-REC(E) and associated labels. The RE100 Technical Criteria (12 Dec 2022, Clause 5.2) indicate that default delivered renewable electricity from the grid in a market with at least a 95% renewable generation mix and where there is no mechanism for specifically allocating renewable electricity. Passive claims are not credible in markets that have a highly renewable domestic generation mix, but also import significant amounts of electricity, like Nepal. The introduction of I-REC(E) will directly enable electricity buyers to make more targeted and transparent claims to the sources of their generation, while the introduction of adjacent labels (to be layered on top of I-REC(e)) will improve the ability of domestic actors to identify when clean power is sourced from sustainable sources of generation. Domestic demand is likely to scale atop the introduction of FDI beyond the power sector, and at the same time, cross-border projects with regional neighbors may increase the logic for REC transactions in the future.

Analysis of political disruptions or market risks:

Nepal has a history of political instability and frequent changes in government, which can impact the power sector. Some potential political disruptions that could affect the sector include Government instability, interference in regulatory processes, market risks, financing challenges and operational challenges. However, political disruption risks specifically to the REC market in Nepal are relatively low, given limited domestic or national engagement in the market, and relatively low anticipated transaction volumes. These risks can be mitigated by political adjustment clauses in issuer and registrant agreements. Further, the renewable sector (and specifically cross-border and renewable energy facilitation initiatives) is getting increased support from development partners. Grant giving and technical assistance activities from actors such as ADB, World Bank, USAID, and UKAID are providing policy and regulatory support to further enhance market and policy stability.

Analysis of regulatory risks including linkages with carbon markets and support systems

Nepal does not have a domestic REC market, and the active carbon credit markets (CDM and Gold Standard) do not focus on the renewable energy sector. As such, direct risks of double issuance are low, and the authors have not identified any contractual or ownership risks associated with FiT

project or other subsidy schemes. Over time, the Foundation in partnership with the present authors may seek to deepen national engagement in market oversight, which would further mitigate regulatory or ownership risks.

Current environmental reporting in energy:

Renewable energy projects must conduct an Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) based on possible environmental impact or footprint. Reporting is focused on physical aspects of projects, rather than carbon impacts or attributes.

Mechanisms in place to support the reliable verification and issuance of I-RECs:

Most electricity is produced by hydropower projects which are under PPA with NEA. The generation data is recorded by energy meters for the purpose of monthly payments installed by the project developer and overseen by NEA. Data is available through NEA and Hydro Power Annual reports at the province and country level are also available. Currently, there is no certification scheme, and the majority of grid is powered by clean energy hydro projects. The energy supply and consumption data are collected by different institutions such as MoFE, MoALD, Department of Forest and Soil Conservation (DoFSC), DoED, Department of Customs (DoC), AEPC, Nepal Oil Corporation (NOC), and NEA.

Local organizations of importance and their opinion on local I-REC market development:

The authors have discussed establishing a potential REC market in Nepal with key government and financial entities listed above. There is general buy-in and excitement around the development of a REC market, especially from IPPs who wish to sell the environmental attributes of their clean hydropower. There is a growing list of eligible projects, mostly in hydropower but also in wind and solar. The market will only expand (given the country’s huge hydropower potential).

At the time of writing, a Local Issuer for Nepal has not been identified, and as a result, the Foundation will propose to its Board of Directors that GCC (the default issuer) be appointed in the market’s early stages. This role can and will be handed over to a national authority (or an actor designated by a national authority) pending expressed interest by national actors.

Bizbell and the Hydropower Sustainability Alliance (the authors of the present report) are deeply engaged with national actors on the provision and qualification of information that can be used to indicate that generation assets are sustainable and can provide support liaising with national actors if necessary.

Any other relevant information on Cross-border electricity trade in the Bangladesh–Bhutan–India–Nepal (BBIN) Region:

Electricity demand in the **Bangladesh–Bhutan–India–Nepal (BBIN) Region** is expected to grow at an average rate of 6% per year the hydropower potential of Nepal, Bhutan, and India is 150 gigawatts (GW), out of which only 17% is currently utilized. The rapid growth of electricity demand in, the availability of complementary generation resources, and the emergence of digital technologies have created increased opportunities for the **Cross Border Electricity & I-REC trade**.

Nepal is doing cross border electricity trade with India. Nepal began its export in 2020-2021 with 33.31 GWh and in 2022-2023 Nepal exported 1332.92 GWh of electricity to India. On June 1, 2023,

India announced intentions to buy 10,000 MW of hydroelectricity from Nepal in next 10 years. There are already cross-border transmission lines in operation between Nepal-India and more are under construction. Similarly, Bangladesh has also shown interest to buy electricity from Nepal and has reached an agreement to sign a 25-year deal for buying the hydroelectricity. Therefore, there is huge potential market for hydropower sector in Nepal for cross border electricity trade.

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