

## Developing a Sustainable and Robust Energy Cooperation in the BBIN Region

Regional co-operation has been flagged as an important solution to equitably meet the growing energy demand in Bangladesh, Bhutan, India, and Nepal (BBIN), ensuring reliable and quality power to the communities.

The Briefing Paper highlights the journey of the BBIN region towards sustainable energy cooperation with an emphasis on renewable power. The energy landscape is quite diverse in the BBIN countries, implying that integration is needed for mutual benefits. While India and Bangladesh are heavily reliant on fossil fuels, Bhutan and Nepal have a strong renewable energy base.

The BBIN countries can strategically unlock the potential renewable energy capacity through efficient energy trade, technology sharing, and investment in energy plants. Recent collaborative efforts for Hydro power development and the expansion of the transmission lines across the borders speak of the evolving renewable energy co-operation in the bright future prospects. However, the pace is slow. It is due to the regulatory challenges.

For the BBIN countries to emerge as a successful regional energy model like that of the Nordic Power Pool, the Southern African Power Pool, and the Central American Electricity Interconnection System, more competitive guidelines and multilateral agreements are required. Also, the amount of energy trade will be significantly influenced by the energy policies of India and the industrial policies in Nepal and Bhutan.

## Introduction

Energy access is a critical component in measuring socio-economic growth. South-Asian countries, particularly in the last two decades, have witnessed a significant rise in socio-economic growth indicators. Still, communities in both urban and rural areas lack access to reliable and quality power, impeding growth aspirations. One of the underlying reasons is the absence of a multilateral approach towards effective resource utilisation. To address energy security issues, regional cooperation has been flagged as an important solution.



South Asia Subregional Economic Co-operation promotes regional cooperation in South Asia for energy security as the member countries are rich in resources but with an uneven distribution. For instance, Bangladesh is a gas-based economy, India heavily relies on coal while Nepal and Bhutan have abundant untapped hydro power. The geographical proximity of these four countries may effectively contribute to resource sharing in the form of Cross Border Energy Trade (CBET), given the aspirations for political will. CBET must be driven by Power Purchase Agreements (PPAs), i.e., long-term agreements between the suppliers and buyers that are formulated within a competitive international regulatory framework.

The BBIN countries have a potential for energy collaboration to optimally utilise the resources to meet energy demands and sustain growth. For India to meet its clean energy targets, the reliance on oil imports must be phased out and compensated with renewable energy sources which are intermittent, and battery storage solutions are not cost-effective. Therefore, energy co-operation could provide a better alternative.

This Briefing Paper delves into the scope of regional integration for energy security in the BBIN region, the role of renewable energy, and future prospects of energy co-operation through regulatory changes, emphasising the most recent initiatives in the renewable energy.

## Energy Consumption Patterns and Cooperation Potential

The energy landscape is quite diverse in the BBIN countries, implying that integration is needed for mutual benefits. While India and Bangladesh are heavily reliant on fossil fuels, Bhutan and Nepal have a strong renewable energy base.

**Table 1: Energy Reserves in the BBIN Region**

Country Name	Coal (million tonnes)	Oil (million barrels)	Natural Gas (trillion cubic feet)	Biomass (million tonnes)
Bangladesh	884	12	8	0
Bhutan	2	0	0	27
India	90,085	5,700	39	139
Nepal	5	0	0	27

Sources: Asian Development Bank. Nepal Department of Mines and Geology.

Note: 0 denotes that potential reserves are not yet known.

A lack of potential fossil fuel reserves in Nepal and Bhutan has historically pushed them towards hydropower for electricity generation (Table 1). However, the hydropower potential is much more than the installed capacity in the two countries (Table 2). By unlocking its full potential, a sustainable and equitable energy consumption can be developed in the BBIN region.

**Table 2: Potential and Installed Capacity of Renewable Energy in the BBIN Region**

Country	Potential Capacity (MW)			Installed Capacity (MW)		
	Hydro Power	Wind Power	Solar Power	Hydro Power	Wind Power	Solar Power
Bangladesh	1,600	1,50,000	2,40,000	230	2.9	968.48
Bhutan	33,000	761	12,000	2,335	0.60	0.26
India	1,45,320	1,164,000	7,48,990	4,6910.17	4,4736.24	73,318.49
Nepal	83,000	3,000	47,628	2,162	0.11	49.76

Sources: Bhutan Energy Data Directory (2022). National Institute of Solar Agency. National Institute of Wind Energy. Ministry of Power. U.S. Agency for International Development. Hossain, Biswas and Uddin (2023). The National Bureau of Asian Research. Neupane et al. (2022). Energy Synopsis Report (2023). Central Electricity Authority. Sustainable and Renewable Energy Development Authority. International Hydropower Association. Nepal Renewable Energy Programme. Department of Energy Bhutan.

The BBIN countries can strategically unlock the potential renewable energy capacity through efficient energy trade, technology sharing, and investment in energy plants. The cooperation will encourage private investors to mobilise capital to tap the potential of renewable resources in Nepal and Bhutan by offering an ensured market for surplus energy. India, a fast-growing country with the aim of becoming a green economy, can easily absorb the surplus renewable energy of Nepal and Bhutan.

**Table 3: The Electricity Generation Mix by Source in the BBIN Region**

Country	Hydro (%)	Wind (%)	Solar (%)	Coal (%)	Oil (%)	Natural Gas (%)	Biofuels (%)
Bangladesh	1	0	0	2	21	76	0
Bhutan	99.971	0.014	0.015	0	0	0	0
India	5.74	2.75	6.07	71.45	0.19	8.32	1.51
Nepal	99.695	0.285	0.020	0	0	0	0

Sources: Thakur, Hesamzadeh, and Wolak (2021). Central Electricity Authority.

Data (Table 3) captures the absence of a healthy energy mix in the BBIN region, particularly for Bhutan and Nepal. The overdependence of these countries on hydropower creates a power shortage during winter due to the decrease in the water flow. The fossil fuel-based energy dependence in Bangladesh and India can be reduced by CBET with Nepal and Bhutan (Institute for Energy Economics and Financial Analysis 2023).

Eventually, the renewable and fossil energy divide in the BBIN region can be reduced gradually and be phased out to develop sustainable electricity markets.

Similar to the energy landscape, the consumption (demand) pattern is also highly diverse in the BBIN region. The seasonal variation in electricity consumption is noteworthy. The energy demand in Bhutan peaks during winter (December-February) months. Nepal has the highest demand in January and February. Conversely, Bangladesh has more energy requirements in the summer (April-June) months than in winter (Thakur, Hesamzadeh, and Wolak 2021, 3-5). In India, some regions have higher demand during June-October and some from January to March (Table 4).

**Table 4: Monthly Demand Pattern of Electricity in BBIN Countries**

Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Bangladesh												
Bhutan												
India North-East												
India North												
India West												
India South												
India East												
Nepal												

Source: United Nations Economic and Social Commission for Asia and the Pacific.

The diversity in the seasonal consumption nature offers scope for complementing each other's energy demands. The cooperation can also defer the cost of utility-scale battery storage systems. The cost of storage is as high as ₹10.18 per kWh in India (Press Information Bureau 2023).

India can export its day-time surplus solar power to Nepal and Bhutan in exchange for hydropower at night. This mechanism will save the cost of storage systems and the diurnal surplus and deficit of energy across BBIN countries can also be balanced simultaneously.

Additionally, Nepal and Bhutan have high hydro potential reserves but only five to 10 percent (Institute for Energy Economics and Financial Analysis 2023) have been harnessed due to technological and financial barriers. In this scenario, India has the advantage of investing and benefits from building hydro bases in the other two BBIN countries.

### Recent Initiatives in Renewable Energy Cooperation

India has recorded a steep increase in energy demand from 136 GW in 2014 to 243 GW in 2023 (Ministry of Power 2023). To align with the Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change, India needs more renewable energy mix in the electricity grid to meet the growing demand. Though the country's progress towards clean energy generation

has been remarkable, the potential is limited to solar and wind. Hydropower can be optimally utilised by India through the India-Bhutan and India-Nepal electricity trade.

India needs to expand on the existing frameworks. India and Nepal have already developed 22 cross-border power transmission facilities. The Dhalkebar-Muzaffarpur 400 kV transmission line between Nepal and India has recently been strengthened to carry an additional capacity of 200 MW. Bangladesh has also signed a Memorandum of Understanding (MoU) with Nepal in 2023 to import hydro energy through India's transmission lines.

Punatsangchhu-I and Punatsangchhu Stage-II, two Hydro projects, funded by the Indian government with an annual average capacity of 5,700 million units and 4,360 million units, respectively, are to be commissioned by 2025 (The Wire 2023). India has assisted in building the Mangdechhu hydroelectric project in Bhutan.



Other India-Bhutan initiatives in hydropower generation include Kholongchhu, in the pre-construction stage, and Chamkharchhu II, in the announced stage. The collaboration in hydropower generation has been further strengthened through the Dorjilung project which is planned as a

trilateral cooperation among India, Bangladesh, and Bhutan. The generated energy will be exported to both India and Bangladesh which will boost the country's renewable energy mix to the total energy composition.

Gorakhpur-Butwal, Dhalkebar-Sitamarhi, Nanpara-Kohalpur and Raxaul-Parwanipur lines between India and Nepal have also been approved (Ministry of Power 2023). Nepal has proposed two more high-energy transmission lines with India, connecting Inaruwa and Purnia and New Lamki and Bareli (The Kathmandu Post 2023).

Nalsyaugad is another significant India-Nepal initiative that is currently in the pre-development stage and construction is likely to start in 2024 (Power Technology 2023). As per a recent hydropower deal in 2024, India will import 10,000 MW of electricity from Nepal for the next 10 years.

As per the MoU, signed in 2010 for cooperation in energy efficiency and grid connectivity between India and Bangladesh, National Thermal Power Corporation will supply 250 MW of power to Bangladesh for 25 years.

At present, Bangladesh receives 1,160 MW of power through Baharampur-Bheramara and Tripura-Comilla cross-border channels from India. North-East India has a high hydropower potential and is capable of a cost-effective power evacuation process when done through Bangladesh in exchange for energy share and relevant charges. The negotiations are ongoing between the two governments.

Bangladesh government has recently given the final approval to a Liquefied Natural Gas (LNG) terminal in Mokes Khali Island which is a joint venture of Bangladesh Power Development Board and Indian Reliance Power.

### **Challenges and Regulatory Needs for BBIN Energy Cooperation**

The regional energy cooperation in the BBIN region is evolving and the sectoral outlook is optimistic. Transmission lines and power plants are being constructed in the region as a result of cooperation. However, the potential for further cooperation



and resource efficiency has a wider scope and requires a suitable regulatory framework.

A lack of harmonic policy and regulatory frameworks puts forth major challenges in the BBIN region. Despite the advancement in regulatory reforms, there is a lack of focus on the competitive market in the national plans and policies of Bangladesh, Nepal, and Bhutan. A lack of uniformity in tariffs for electricity trade across borders and the mandatory agreement between licensees and governments for energy import-export discourage open trade. Inadequate grid discipline in cross-country trade poses serious concerns (Agarwal and Gupta 2014, 48-49).

Political backlashes arising out of tariff fixation add to the neorealist threat perception, injecting mistrust in the region (Nepal Institute for International Co-operation and Engagement 2022). A parliamentary forum with representatives from all the concerned countries is necessary for this scenario to augment peaceful negotiation, competition, and harmonisation (CUTS International 2021).

A more robust transmission network is needed to expand the regional energy trade. Multilateral agreements in this regard have an important role to play. A multilateral regime is beneficial in terms of more trade volume, optimisation of cost, and economies of scale (Panda and Karthik 2020, 20). A cross-border committee with legal authority to manage plans needs to be set up to facilitate such energy dialogues.

To overcome the investment issues, an energy fund for the region can be proposed that will pool resources from Multilateral Development Banks like the World Bank, Asian Development Bank, U.S. International Development Finance Corporation, and private investors (Panda and Karthik 2020, 24).

Also, the BBIN region needs more political zeal like that of the Nordic Power Pool to trade on a sustainable and secure energy path. South Asian Association for Regional Cooperation as a regional institute must push governments for more frequent interactions to review and fast-track the deals.

The absence of a robust power exchange market in the BBIN region points out the need for a reference price in the bilateral trade agreements to overcome pricing issues. The pricing rule that will apply to all generators must ensure reliable and consistent PPA (Hurlbut and Koebrich 2019, 22).

Nepal, Bhutan, and Bangladesh require transit access through India to access the transmission lines of a third country. Therefore, favourable policies regarding third-party access to transmission lines and transit access need to be implemented (Vaidya et al. 2019, 8-9).

## **Conclusion and Future Prospects**

India's efforts in expanding renewable energy through regional co-operation are visible in the form of the Green Day Ahead Market, Green Energy Corridors, and Renewable Energy Management Centres. The Guidelines for Import/Export (Cross Border) of Electricity (2018), which allow an Indian power trader to trade on behalf of neighbouring countries in Indian power exchanges, is a step in the right direction. Bangladesh, Nepal, and Bhutan can currently take part in the open market and spot exchanges in India, implying a move to dynamic and flexible energy cooperation.



However, for the BBIN countries to emerge as a successful regional energy model like that of the Nordic Power Pool, the Southern African Power Pool, and the Central American Electricity Interconnection System, more competitive guidelines and multilateral agreements are required. Also, the amount of energy trade will be significantly influenced by the energy policies of India and the industrial policies in Nepal and Bhutan.

The current cross boundary renewable energy transmission is confined to only Hydro power. India's enormous solar potential needs to be explored for energy cooperation in the region. India's revised clean energy goal of installing 500 GW of renewable power is likely to affect the BBIN energy trade positively which, in turn, will pave the way towards the 'One Sun, One World, One Grid' mission. But Bhutan's efforts to promote energy-intensive domestic industry and to export goods instead of energy to India may dampen the energy exchange to an extent.

Future energy cooperation also depends upon the geopolitical environment of the BBIN region. Decisions regarding domestic renewable energy production and industrialisation should not be taken in isolation. BBIN countries need to carefully consider the geopolitical consequences of any trade-related policies. National interests must follow co-operation to enhance efficiency.

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