



Nepal-India Bilateral Cooperation on Power Sector

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1. Background

Nepal's abundant water resources, coupled with its unique geo-physical characteristics, offers significant potential for hydropower generation. Out of estimated 83,000 megawatts (MW) of total hydropower capacity, around 42,000 MW is currently considered technically and financially feasible.

Nepal is firmly committed to advancing its hydropower sector to ensure the provision of reliable, high-quality, and affordable electricity nationwide, thereby fostering inclusive economic growth. Furthermore, Nepal envisions hydropower as a strategic export commodity—contributing to national revenue, enhancing regional energy cooperation, and strengthening economic integration with neighboring countries.

Given the strategic importance of hydropower in meeting domestic energy needs and unlocking

export potential, Nepal emphasizes the necessity of a clear, consistent, and transparent policy framework that promotes an investment-friendly environment. To advance this objective, the government has adopted the Build-Operate-Own-Transfer (BOOT) model for hydropower project development. By positioning hydropower as a sustainable alternative to biomass and thermal energy, national policy seeks to enhance long-term energy security, attract both domestic and foreign investment, and foster environmentally sustainable economic growth.

2. Evolution of trading /exchange of electricity

Cooperation between Nepal and India in the electricity sector was initiated through power transactions from joint river projects developed under the Koshi and Gandak Agreements, signed in 1954 and 1964 respectively. These projects played a pivotal role in electrifying nearby regions and laid the foundation for long-term collaboration in the energy domain.

The signing of the Mahakali Treaty in 1996 marked a significant milestone in bilateral energy cooperation, ensuring the annual supply of 70 million kilowatt-hours of electricity to Nepal free of cost. This provision has not only supported Nepal's domestic energy needs but also reinforced the spirit of mutual benefit.

The Power Exchange Agreement signed in 1971 enabled both countries to engage in electricity trade based on mutual demand, fostering flexibility and shared resilience in energy management. This agreement has served as a cornerstone for sustained and balanced power exchange between Nepal and India.

At present, electricity transactions of about 1100 MegaWatt between Nepal and India are conducted through 11 cross-border interconnection points at 33 kV and above, including the strategically significant 400 kV Dhalkebar–Muzaffarpur transmission line. And 40 MW with Bangladesh. These connections reflect the growing depth of bilateral cooperation and the commitment of

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both nations to strengthening regional energy security and integration.

3. Bilateral Committees on Nepal-India Power Sector cooperation

Joint Technical Team (JTT) : The Joint Technical Team (JTT) operates under the overall guidance of the Joint Working Group (JWG) and the Joint Steering Committee (JSC) to address detailed technical matters related to cross-border electricity cooperation between Nepal and India. The primary mandate of the JTT includes conducting technical assessments and feasibility studies for cross-border transmission lines, grid interconnections, and power flow scenarios. It is responsible for evaluating the feasibility of proposed hydropower projects and transmission infrastructure. The JTT also coordinates the design and engineering aspects of bilateral projects, including transmission line alignments, substation specifications, and technical standards for grid synchronization and operation.

In addition to technical assessments, the JTT plays a crucial role in operational planning and coordination. It develops and refines energy scheduling frameworks, dispatch protocols, and operational procedures to ensure grid stability, reliability, and safety. The JTT provides vital technical inputs and recommendations to the JWG and JSC to support evidence-based decision-making, and assists in resolving technical issues that may arise during the implementation of bilateral power projects. Furthermore, it facilitates capacity building, knowledge exchange, and

joint training programs between the two countries, enhancing mutual expertise in power system planning and operations.

As of 2025, the JTT has convened sixteen meetings to advance bilateral power sector cooperation. The most recent meeting was held on 21 January 2025, where several significant technical recommendations were made. The JTT proposed enhancing power evacuation capacity through the Dhalkebar–Muzaffarpur (DM) line to 1,000 MW. It also emphasized the need to implement a 220 kV double circuit transmission line from Chamelia (Nepal) to Jauljivi (India) for the evacuation of approximately 350 MW, with a completion target of December 2027. Further interconnection plans include the Inarwa (Nepal)–New Purnia (India) line, targeted for 2028–29, and additional infrastructure for increasing cross-border transfer capability, considering Nepal’s projected surplus of 7,466 MW by FY 2029–30 and 15,950 MW by FY 2034–35.

To evacuate this surplus power, the JTT recommended several key projects: the Sitamarhi (India)–Dhalkebar (Nepal) 400 kV DC (Quad Moose) line by 2025–26; the Gorakhpur (India)–Inarwa (Nepal) 400 kV DC (Quad Moose) line by 2029–30; the Motihari (India)–Nijgadh/Harlaniya (Nepal) 400 kV DC (Quad Moose) line; and the Lucknow (India)–Kohalpur (Nepal) 400 kV DC line by 2034–35. The JTT also recommended the re-conductoring of the existing Muzaffarpur–Dhalkebar 400 kV DC line with High-Temperature Low-Sag (HTLS) conductors equivalent to Quad Moose by 2034–35 to increase its capacity. The committee co-chaired by the Joint Secretary of the Ministry of Energy, Water Resources and Irrigation,

while the Indian delegation is headed by the Chief Engineer of the Central Electricity Authority, Government of India.

Joint Working Group (JWG) on Nepal-India Power Sector Cooperation: The Joint Working Group (JWG) between Nepal and India was established in 2014 as a technical-level institutional mechanism under the framework of the Nepal-India Power Trade Agreement (PTA), which was signed on October 21, 2014. The formation of the JWG aimed to enhance bilateral cooperation in the electricity sector, with a focus on coordinated planning, development, and management of cross-border electricity trade and infrastructure. The JWG operates under the guidance of the Joint Steering Committee (JSC) and comprises senior officials and technical experts from relevant ministries and electricity authorities of both countries.

The primary mandate of the JWG is to identify and recommend priority cross-border electricity projects, including transmission infrastructure and hydropower development, for mutual benefit. It facilitates the implementation of power trade agreements and supports alignment of technical standards, grid codes, and regulatory frameworks to enable seamless cross-border electricity exchange. The JWG also provides technical inputs and recommendations to the JSC, assisting in strategic decision-making. Furthermore, the group explores avenues for regional energy integration and market participation, particularly under platforms such as BBIN and BIMSTEC.

In recent years, the JWG has played a central role in advancing cross-border transmission connectivity. Notable achievements include

the implementation of the Dhalkebar–Muzaffarpur 400 kV transmission line, and finalization of the New Butwal–Gorakhpur 400 kV line, for which an implementation agreement has been signed. These infrastructures are critical for scaling up electricity trade between the two countries. During the monsoon season of 2024, Nepal successfully exported over 1,100 MW of electricity to India, facilitated by the JWG’s technical coordination and policy support. The group also contributed to enabling the Nepal Electricity Authority (NEA) to access India’s Day-Ahead and Real-Time Markets through Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL). Additionally, the JWG has overseen joint technical studies for new interconnections and long-term planning of power exchange frameworks.

To date, twelve meetings of the Joint working group (JWG) on Nepal-India Cooperation in Power sector have been held. The most recent meeting took place on 22 January, 2025. The Nepal side lead the Joint secretary, ministry of Energy water resources and Irrigation, while the Indian side lead by the Joint Secretary, ministry of power, Government of India.

Nepal-India Power Exchange Committee: The Nepal-India Power Exchange Committee was established in 1991 under the bilateral institutional framework of energy cooperation between the Government of Nepal and the Government of India. The committee was formulated through mutual agreement between the Nepal Electricity Authority (NEA) and India’s Central Electricity Authority (CEA) with the objective of facilitating coordinated electricity trade between the two countries. Its primary mandate includes facilitating power

import and export, ensuring the smooth flow of electricity across borders, and supporting the broader bilateral energy cooperation framework. The committee is responsible for negotiating power tariffs and commercial agreements, including Power Purchase Agreements (PPAs) for both short- and long-term electricity trade. It also coordinates the development and operational integration of cross-border transmission lines and ensures grid compatibility between the two nations. Other key responsibilities include aligning energy scheduling and settlement mechanisms, ensuring regulatory compliance with national and regional electricity trade rules, and addressing any operational or technical issues that may arise in day-to-day or strategic coordination.

To date, sixteen meetings of the Nepal-India Power Exchange Committee have been held. The most recent meeting took place on 12 February 2025, with the primary agenda being the revision of power exchange tariffs for electricity import for the fiscal year 2025–2026 and beyond. The Nepali delegation was led by the Managing Director of the Nepal Electricity Authority (NEA), while the Indian side was led by the Member of the Central Electricity Authority (CEA) and ex-officio Additional Secretary to the Government of India.

Joint Hydro Development Committee (JHDC): The Joint Hydro Development Committee (JHDC) was officially announced during the third meeting of the Nepal-India Joint Committee on Water Resources (JCWR) held in New Delhi in January 2011. The primary objective of the JHDC is to identify and facilitate the development of large-scale hydropower projects in Nepal for the mutual

benefit of Nepal and India. The committee is mandated to recommend priority hydropower projects suitable for bilateral or joint development, propose appropriate development frameworks including joint ventures, public-private partnerships, or government-to-government initiatives, and facilitate alignment of regulatory, legal, and environmental procedures between the two countries to support cross-border hydropower development. Furthermore, the JHDC is responsible for recommending equitable benefit-sharing mechanisms concerning power export and import, revenue sharing, and strategic value realization. It also monitors the implementation progress of jointly agreed projects, addresses operational challenges, and supports long-term regional energy cooperation through collaborative hydropower development.

Joint Steering Committee (JSC) on Nepal India Cooperation in power Sector: The Joint Steering Committee (JSC) on Cooperation in the Power Sector between Nepal and India was formally established in 2009 as a high-level bilateral platform to provide strategic guidance and policy oversight for energy cooperation between the two countries. Operating under the respective Ministries of Energy of Nepal and India, the JSC is mandated to facilitate cross-border electricity trade, review the progress of ongoing and planned projects, resolve issues of strategic and operational significance, and promote institutional and investment frameworks to support the long-term development of interconnected power systems.

As of 2025, twelve meetings of the JSC have been convened. The 12th meeting was held in

New Delhi in February 2025 under the co-chairmanship of the Secretary of the Ministry of Energy, Water Resources and Irrigation of Nepal and the Secretary of the Ministry of Power of India. This meeting represented a major milestone in deepening bilateral energy integration and regional infrastructure development.

A key outcome of the meeting was the endorsement of investment and implementation modalities for two priority 400 kV cross-border transmission lines: the Inaruwa (Nepal)–New Purnia (India) and the Dodhara (Nepal)–Bareilly (India) corridors. Both lines will be implemented through joint venture arrangements between the Nepal Electricity Authority (NEA) and the Power Grid Corporation of India Limited (PGCIL). In accordance with the agreed structure, each country will hold a 51% equity stake in the section of the transmission line located within its own territory, and a 49% stake in the segment located in the territory of the counterpart country. It was further agreed that NEA will bear the full transmission charges associated with both lines—an affirmation of Nepal’s proactive approach toward enabling reliable, long-term electricity exports and advancing regional power integration.

The committee also advanced technical collaboration by approving the preparation of Detailed Project Reports (DPRs) for three proposed transmission initiatives: the 400 kV DC Motihari (India)–Nijgad/Harnaiya (Nepal) line, the 400 kV DC Lucknow (India)–Kohalpur (Nepal) line, and the reconductoring of the existing 400 kV Muzaffarpur (India)–Dhalkebar (Nepal) line using High-Temperature Low-Sag (HTLS) conductors. Additionally, the JSC approved the planned

upgrade of the Dhalkebar–Muzaffarpur transmission line’s capacity from 800 MW to 1,000 MW, with implementation targeted for completion by 2030.

These agreements reflect the shared priorities of both governments—Nepal’s ambition to export up to 16,000 MW of electricity by 2035 and India’s plan to import up to 10,000 MW over the next decade. The outcomes of the 12th JSC meeting underscore the depth of Nepal–India energy cooperation and reaffirm both countries’ mutual commitment to fostering sustainable, secure, and forward-looking regional energy connectivity.

4. Power Trade with Bangladesh

A tripartite power sales agreement was signed among Nepal Electricity Authority and Bangladesh Power Development Board and NTPC Vidyut Vyapar Nigam Limited (NVVN) for sale of 40Mw Hydropower from Nepal to Bangladesh using Indian grid on 3rd of October 2024.

Under the terms of the agreement, Nepal shall supply electricity to the Bangladesh Power Development Board (BPDB) sourced from any hydropower plant in Nepal, for a period of five years commencing from the date of signing of the agreement. The supply period will span annually from 15 June to 15 November, with power delivery on a Round-The-Clock (RTC) basis. The contracted quantum of electricity is 40 MW. The injection point into the Indian grid, as designated by the Nepal Electricity Authority (NEA), will be the Muzaffarpur Substation on the 400 kV Dhalkebar–Muzaffarpur cross-border transmission line.

The drawl point for BPDB from the Indian grid will be the Behrampur Substation on the 400 kV Behrampur–Bheramara cross-border transmission line. This arrangement is part of a trilateral power trade mechanism involving Nepal, India, and Bangladesh, aimed at promoting regional energy cooperation and utilization of clean energy resources.

The inaugural export commenced on November 15, 2024, with power sourced from Nepal's Trishuli and Chilime hydropower projects. Nepal Electricity Authority (NEA) sells the electricity to Bangladesh Power Development Board (BPDB) at a rate of 6.4 US cents per kilowatt-hour, with transactions conducted in US dollars, providing Nepal with a new revenue stream in foreign currency. The upcoming export cycle is scheduled to commence on June 15, 2025. This trilateral cooperation not only enhances energy security and economic ties among the participating countries but also sets a precedent for regional collaboration in the South Asian power sector

5. Commitment of India and Nepal for carbon neutral economy

India and Nepal have both committed to achieving net-zero carbon emissions, each setting distinct timelines and strategies reflective of their national contexts and development priorities.

India has pledged to achieve net-zero carbon emissions by 2070, a target announced at the COP26 summit in 2021. Increasing non-fossil energy capacity to 500 GW by 2030.

- Meeting 50% of energy requirements from renewable sources by 2030.
- Reducing total projected carbon emissions by 1 billion tonnes by 2030.
- Lowering the carbon intensity of the economy by 45% compared to 2005 levels by 2030. Nepal aims to achieve net-zero greenhouse gas emissions by 2045, as outlined in its Long-Term Strategy for Net-Zero Emissions. The country also aspires to attain negative emissions by 2050. Key strategies include maximizing clean energy utilization (hydropower, solar, biogas), decarbonizing the transportation sector, promoting sustainable agriculture, and enhancing forest cover.

6. Energy Development Roadmap and Action Plan 2081 BS (2024 AD)

The Government of Nepal has endorsed the Energy Development Roadmap and Action Plan 2081 BS (2024 AD) as a forward-looking strategy to guide the long-term transformation of the country's energy sector. This roadmap underscores Nepal's commitment to harnessing its abundant hydropower resources to achieve domestic energy security, drive economic growth, and strengthen regional energy cooperation. Formulated under the guidance of the Ministry of Energy, Water Resources and Irrigation, the roadmap sets a national target to increase electricity generation capacity to 28,500 megawatts (MW) by 2035, reflecting a balanced ambition of supplying 13,500 MW for

domestic consumption and exporting up to 15,000 MW to India and Bangladesh.

In order to achieve these goals, the plan estimates a total investment requirement of approximately USD 46.5 billion (NPR 6,383 billion) for the development of generation, transmission, and distribution infrastructure.

7. Policy Barriers to Cross-Border Electricity Trade

The Government of India, through a provision in its guidelines, has linked the import and export of electricity to its broader policy considerations. Furthermore, it is stipulated that any cross-border electricity transaction, given its implications for international relations, requires prior concurrence from the Government of India before approval by the designated authority. While these provisions reflect India's sovereign right to align energy trade with national policy objectives, they may introduce uncertainty or delays in the approval process, potentially affecting the continuity of electricity trade with neighboring countries.

The Energy Development Roadmap 2081 reflects Nepal's strategic vision to become a regional energy hub and a reliable partner in South Asia's clean energy future. It also encourages enhanced participation from both domestic and international investors through transparent and predictable policy frameworks.

- Eligibility Criteria under 2021 Guidelines of the Designated Authority:** The procedures issued in 2021 by India's Designated Authority for cross-border electricity trade include specific eligibility criteria. Notably, they restrict the import of electricity by Indian entities from power projects where ownership, control, or funding is traced to entities or individuals from third countries sharing a land border with India, in the absence of a bilateral agreement on power sector cooperation. This provision effectively limits the participation of certain foreign investments in Nepal's hydropower sector in cross-border electricity trade.
- Implications for Projects with International Investment and Contractors:** In connection with the eligibility criteria, questions have been raised regarding the involvement of Chinese contractors and consultants in Nepal's hydropower projects. Several such engagements have taken place through international competitive bidding processes, which are standard practice to ensure transparency and fairness. These projects, despite being legally and competitively awarded, may face challenges in qualifying for electricity export to India, due to the origin of involved entities.
- Challenges Arising from International Competitive Bidding (ICB):** Nepal Electricity Authority (NEA) frequently employs international competitive bidding for the selection of consultants and contractors in hydropower generation and transmission line projects. This open process often results in the participation

of firms from multiple countries, including both India and China. Given the eligibility restrictions tied to the nationality or control of participating entities, there is a risk that such jointly executed projects could be excluded from engaging in cross-border electricity trade, despite adherence to international procurement standards.

8. Missed opportunity

Over the past 7–8 years, the region experienced a missed opportunity to harness approximately 20,000–25,000 megawatts of clean, reliable, and sustainable electricity from Nepal. This not only represented a setback for India’s decarbonization efforts but also impacted Nepal’s ability to realize the full economic and developmental benefits of its hydropower sector—including potential tax revenues, royalties, job creation, and eventual ownership of hydropower assets after the concession period.

The limited progress in cross-border electricity

trade also constrained broader opportunities for regional economic cooperation among BBIN (Bangladesh, Bhutan, India, and Nepal) countries. Facilitating electricity trade from Nepal—including projects developed by third-country investors—could have generated significant mutual benefits, supporting India’s growing demand for clean energy while advancing Nepal’s development goals.

In light of India’s ongoing economic engagement with China in other sectors, (eg China Exports to India was USD 117.68 Billion during 2023, according to the United Nations COMTRADE database on international trade. China exports to India electrical, electronic equipments, value of 37.78 Billion US\$ and Machinery, nuclear reactors, boilers \$22.23 Billions) a balanced reconsideration of policies regarding third-country investment in Nepal’s hydropower sector may merit thoughtful dialogue. Such an approach could reinforce trust, enhance regional energy security, and unlock the full potential of sustainable, cooperative growth.

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