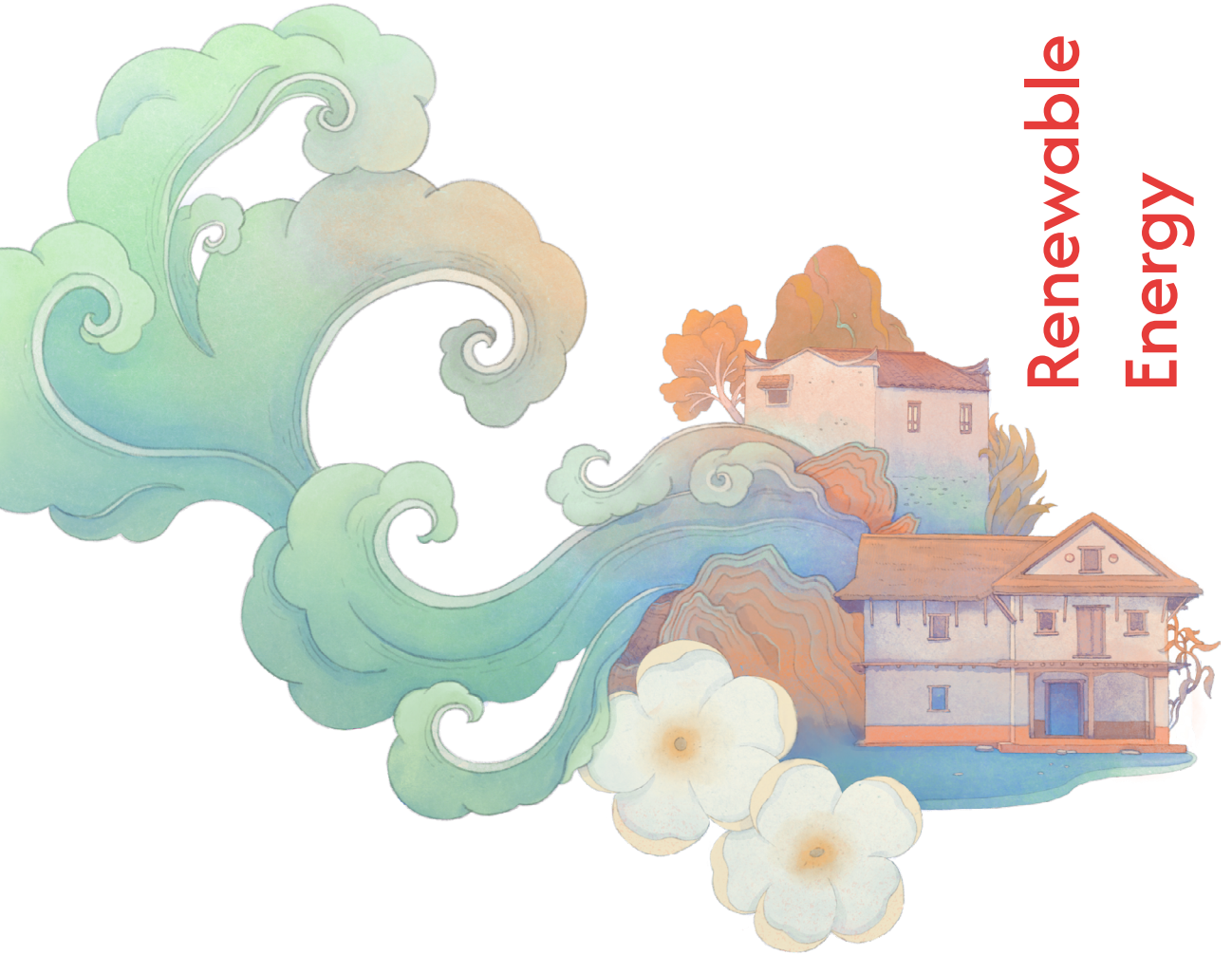

Renewable Energy

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Chapter Overview

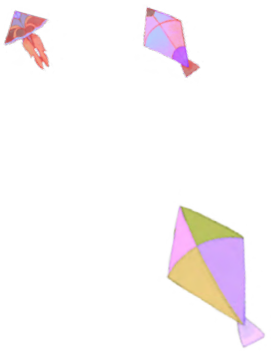
Nepal holds extraordinary hydropower and solar potential; China is the world's dominant renewable energy developer. The commercial complementarity is clear, yet Nepal has no formal power trade agreement with China, has removed Chinese developers from at least six projects under Indian pressure, and is foregoing a price advantage worth approximately 2.5 times its current Indian export rate. This section examines the structural, regulatory, and geopolitical constraints on Nepal-China energy cooperation and sets out a parallel-track strategy for advancing the northern relationship without foreclosing the southern one.

03

Renewable Energy

Nepal's energy transformation over the past decade is one of the more striking development stories in South Asia. A country that endured crippling power cuts of up to 20 hours a day has emerged as a net electricity exporter, driven almost entirely by a fourfold expansion of installed hydropower capacity. Yet this transformation also exposes a deeper fragility: an energy system overwhelmingly dependent on a single source, a single season, and an overwhelmingly concentrated export market. Against a target of 30,000 MW of installed capacity (increased from 28,500 MW in May 2026) and 15,000 MW of electricity exports by 2035, Nepal is running out of time to diversify its energy partnerships.

China is the most consequential energy partner Nepal is not yet fully engaging. China contributed 64% of global renewable energy capacity additions in 2025, holds near-monopoly positions across solar panel manufacturing, wind turbines, and battery storage supply chains, and has accumulated more large-scale hydropower project management experience than any other country. The case for deeper cooperation is not ideological — it is practical. The core constraint is a structural dilemma: India's 2018 Cross-Border Electricity Guidelines effectively bar electricity from projects with Chinese investment or contractors, meaning that deeper cooperation with China directly risks foreclosing Nepal's primary export market. Nepal has no formal power trade agreement with China, and the price differential, approximately RMB 1 (NPR 22) per unit for China versus NPR 8 per unit for Indian exports, represents a revenue advantage Nepal is foregoing entirely.



Global Renewable Energy Landscape: Trends and Strategic Concentration

Over the past few years, the development of renewable energy has accelerated at an unprecedented rate. By the end of 2025, renewables accounted for 49% of global installed power capacity. In that year alone, they contributed 85.6% of global power additions, with a record 692 GW of new capacity added, bringing total installed capacity to approximately 5.1 TW. Solar dominated these additions, continuing a trend of photovoltaic cost reductions making utility-scale deployment commercially viable across developing markets. This growth remained highly uneven: China alone contributed 64% of global additions in 2025, with the United States and European Union accounting for most of the remainder (IRENA, 2026). Thus, amidst accelerated development, developing economies remain largely peripheral to the reshaping of global energy systems.

A major factor behind the accelerated development of the renewable energy sector has been the increasing impact of climate change. To limit global warming to 1.5°C, the International Renewable Energy Agency (IRENA) estimated that global renewable energy capacity must triple to at least 11,000 GW by 2030. This would require countries to double the global average annual rate of energy efficiency improvements from around 2% to over 4% through the end of the decade (COP28 UAE, 2023). In COP28, a significant number of countries pledged to meet this target. However, as of July 2025, nearly two years after the pledge was signed, most countries had yet to align their national targets with this ambition — the global sum of national targets was just 2% higher than at COP28 (Altieri & Jones, 2025). As a result, according to estimations, reaching the COP28 goal requires accelerating annual growth to 16.6% for the remainder of the decade, a target most national plans are not yet aligned with (IRENA, 2025).

The urgency of the transition has been further underscored by geopolitical conflicts affecting global energy supply chains. At the same time, rising electricity demand, driven by data centers, artificial intelligence, and electric vehicles, has increased pressure on energy systems (IEA, 2025). Energy diversification has thus become both an economic strategy and a climate adaptation and energy security imperative.

Nepal's Renewable Energy Sector: Progress, Potential, and Systemic Constraints

Growth and Current Status

Nepal's energy transformation over the past decade has been remarkable. Installed generation capacity grew from approximately 811 MW in 2015 to 3,878 MW by the end of FY 2024/25, with more recent government figures indicating total capacity has now surpassed 4,200 MW, a nearly fivefold increase in a decade (Nepal Electricity Authority, 2025). This growth brought Nepal to a pivotal milestone: a country crippled by power cuts of up to 20 hours a day became a net electricity exporter in FY 2023/24 (Nepal Electricity Authority, 2024). Starting in mid-2025, Nepal also began exporting electricity to Bangladesh through India's grid, following a tripartite agreement signed in October 2024 (Sharma, 2025). Electricity access has also expanded dramatically, with 98% of the population reported to have access to electricity, with 96.7% served by the grid and 13% by off-grid solutions including solar, wind, and micro hydropower, supported by the construction of over 5,742 circuit kilometers of transmission lines (Government of Nepal, 2024).

Several interlocking factors drove this transformation. The 1992 Electricity Act opened the sector to private and foreign investment, laying the legal foundation for Independent Power Producers (IPPs). Revised Power Purchase Agreement (PPA) guidelines in the 2010s, including partial dollar-denomination to improve project bankability, gradually improved the investment climate. The elimination of scheduled load-shedding in 2018 marked a step-change in consumption, improving NEA revenues and enabling further investment. Projects like the 456 MW Upper Tamakoshi Hydropower Station, functioning since 2021, demonstrated that large-scale projects could be delivered.

India's role in Nepal's renewable energy development is essential context. As Nepal's primary export market, India received 2,380 GWh of electricity worth NPR 17.47 billion in FY 2024/25 alone. Bangladesh exports also transit Indian territory. During the dry winter months, Nepal must also import electricity from India. Beyond trade, Indian state-owned enterprises hold construction contracts for some of Nepal's most significant upcoming projects. This dominance has created structural constraints: in 2018, India changed its policies to prevent the purchase of power from projects invested in by countries with which it lacks bilateral power sector cooperation agreements. In practice, multiple Chinese developers were removed from Nepali projects and contracts reallocated to Indian companies.

Hydropower is overwhelmingly dominant in Nepal's generation mix. Of the 3,591 MW of total installed capacity by mid-2024, hydropower accounted for over 90% of supply, with solar contributing the bulk of the remainder alongside minor thermal and co-generation capacity.

Despite this growth, Nepal's energy system is structurally underperforming relative to its potential. The country holds a theoretical hydropower potential of 83,000 MW with 42,000 MW deemed economically feasible, along with growing solar, wind, and biomass potential. A 2024 study supported by Germany's GIZ found that Nepal's solar technical potential stands at 432 GW — ten times its hydroelectric technical potential. Against these figures, the current installed capacity of approximately 3,878 MW represents only 9.2% of economically feasible hydropower potential. On the demand side, there is immense growth potential driven by the rapid rise of electric vehicles: four-wheel EV imports grew at a compounded annual rate exceeding 70% between 2020 and 2025, with EVs accounting for 73–76% of all new four-wheel passenger vehicle imports in FY 2024/25, placing Nepal second in the world for EV market share behind only Norway (Nepal Rastra Bank, 2025).

Institutional and Policy Framework

Nepal's energy sector is governed by the Nepal Electricity Authority (NEA) as the integrated utility, the Electricity Regulatory Commission (ERC) for tariff and licensing oversight, and the Ministry of Energy, Water Resources and Irrigation (MoEWRI) for policy direction and international energy diplomacy. The key planning instrument is the Energy Development Roadmap 2081, targeting 28,500 MW of installed capacity and 15,000 MW of electricity exports by 2035 in line with Nepal's NDC under the Paris Agreement. This target has been raised to 30,000 MW under the new government in May 2026.

Challenges

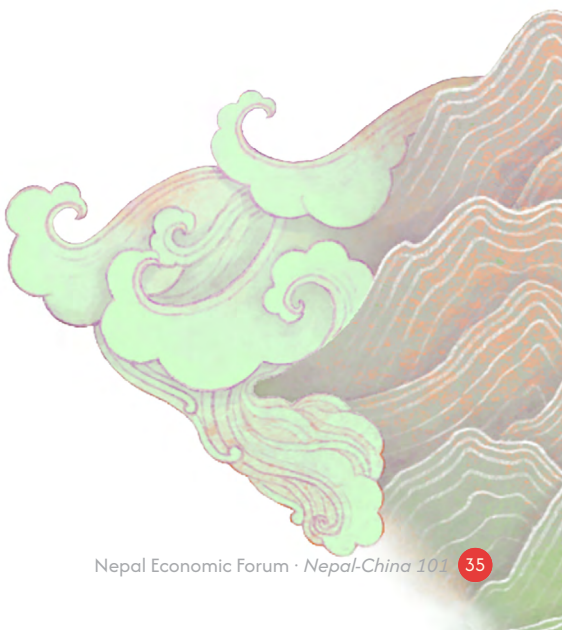
Four structural challenges constrain Nepal's energy sector. First is seasonal imbalance and hydropower dependence. Run-of-river hydropower, the dominant generation model, produces surplus in the monsoon season but requires dry-season imports from India, costing foreign exchange and exposing Nepal's energy security to the reliability of a single bilateral relationship. Without reservoir-based storage to smooth this imbalance, Nepal cannot fully monetize its hydropower assets or achieve genuine energy independence.

Second is climate vulnerability. The accelerating pace of glacial melt, changing rainfall patterns, and increased frequency of extreme weather events represent a

growing systemic risk to infrastructure built primarily for a stable hydrological regime. The 2025 Bhotekoshi flood damage is illustrative of a risk that will intensify over time.

Third is export market concentration. Despite the tripartite agreement enabling exports to Bangladesh, India remains the sole purchaser of Nepal's electricity in any significant volume and all Bangladesh exports transit Indian territory. India's 2018 cross-border electricity guidelines, which effectively bar the import of electricity from projects with Chinese investment or contractors, mean that deepening energy cooperation with China directly constrains Nepal's ability to monetize that cooperation through exports.

Fourth is underutilized solar and storage potential. Solar power, which offers lower capital costs, faster deployment, and a natural complementarity to hydropower's seasonal profile, remains marginal in Nepal's energy mix despite the country's extraordinary resource endowment. The absence of grid-scale storage further compounds the seasonal imbalance. Both gaps represent addressable constraints where international cooperation, including with China, could be transformative.



China's Renewable Energy Ecosystem: Capacity, Strategy, and Global Role

China's dominance of the global renewable energy sector directly shapes what is possible — and what is constrained — in Nepal-China cooperation.

Domestic Development

China's renewable energy development is unprecedented. China surpassed its goal of 1.2 TW of renewable energy capacity five years ahead of schedule. Its total installed renewable energy capacity grew from approximately 470 GW in 2015 to 2,267 GW by 2025, nearly a fivefold increase in a decade. In 2025 alone, China added approximately 440 GW of new renewable capacity, contributing 64% to global additions (IRENA, 2026). The country has also constructed the world's most extensive ultra-high voltage transmission network: in 2024, it transmitted 924.7 TWh across regions and 2,000 TWh across provinces, representing increases of 50% and 30% respectively since 2020 (State Council Information Office, 2025). By end-2024, China had installed 73.76 GW/168 GWh of new-type energy storage, representing more than 40% of global total installed capacity and 20 times the level of 2020 (National Energy Administration of China, 2025).

Domestically, this expansion has been driven by state strategy. In 2010, new energy was designated one of seven 'strategic emerging industries' (Danish Institute for International Studies, 2025). Renewable energy gained a decisive additional push in 2020 when President Xi Jinping pledged that China would peak CO_2 emissions before 2030 and reach carbon neutrality by 2060 (State Council Information Office, 2025). China's total energy investment in 2025 exceeded USD 800 billion which was roughly equivalent to the combined investment made by United States and European Union (BloombergNEF, 2026). Chinese companies now manufacture approximately 80% of the world's solar panels, hold major shares in wind turbine and battery production, and have accumulated unrivalled engineering experience in large-scale hydropower (Silverstein, 2026). This has created a near-monopoly in the supply chains underpinning the global clean energy transition.

Despite this scale, China's energy system retains significant integration challenges. Coal remains a baseload power source, retaining a 53.2% share of primary energy consumption (State Council Information Office, 2025). Concentration of new renewable capacity in northern and western provinces creates long-distance transmission bottlenecks, and seasonal deficits are particularly pronounced in winter, when hydropower output falls sharply across China's river systems (State Council Information Office, 2025). This seasonal deficit is commercially significant for Nepal, whose river flow remains relatively stable even in winter months.

Global Engagement

China's global engagement in the renewable energy sector is organized primarily through the Belt and Road Initiative (BRI), which cumulatively from 2013 to 2025 has included engagement worth USD 1.399 trillion across 150 partner countries (Nedopil, 2026). Energy-related engagement dominates this portfolio. Green energy engagement reached new heights in 2025, totaling USD 21.4 billion through wind, solar, waste-to-energy, and hydropower projects — including USD 5.9 billion in investments and USD 13.7 billion in construction projects (Nedopil, 2026). This shift toward clean energy was accelerated by President Xi's 2021 commitment to end Chinese public financing of new coal-fired power plants abroad (Xi, 2021). However, oil and gas engagement surged to USD 71.5 billion in 2025 — more than triple the prior year — meaning the BRI as a whole remains a vehicle for fossil fuel infrastructure at a scale that overshadows its green components in absolute terms (Nedopil, 2026).

Within Chinese overseas renewable energy engagement, solar PV dominates the technology mix; Asian markets followed by Africa account for most of the project count and capacity; and EPC and construction contracts comprise 75% of the portfolio (IIGF China, 2026). State-owned enterprises such as China Energy Engineering Corporation (CEEC) and PowerChina dominate projects, while private firms such as Goldwind and Chint have expanded their footprint (Liu et al., 2026). Importantly, grants represent a small fraction of total BRI energy activity: deepening energy cooperation with China almost always involves a financing obligation on the receiving country's side.

Concrete examples of successful Chinese energy engagement include Pakistan's 720 MW Karot hydropower facility on the Jhelum River, which came online in 2022 and now supplies clean power to millions of households (POWERCHINA, 2024). Chinese involvement in Ethiopia's renewable energy, particularly in wind power expansion, has been instrumental in accelerating timelines (Further Africa, 2026). These cases demonstrate that Chinese-executed infrastructure can deliver real development outcomes, particularly in countries that lack either the domestic capital or the project management capacity to build complex energy assets independently.

However, the record is not entirely positive. Academic assessment of Chinese overseas energy investment finds that while host countries have seen macroeconomic benefits from capital inflows, aggregate improvements in renewable energy generation have been modest relative to the scale of Chinese engagement (Bega & Lin, 2023). Project delays, cost overruns, concerns about transparency, and debt sustainability questions have emerged in multiple BRI partner countries. Environmental

and social standards have been applied inconsistently, particularly in large hydropower projects.

China's manufacturing dominance has also driven solar panel prices down by around 60–90% since 2010 (Bradsher, 2025) — a decline that has made utility-scale solar commercially viable in dozens of countries that would not otherwise have been able to afford it, including Nepal. The concentration of global clean energy manufacturing in one country also creates dependencies, however, that are difficult to diversify in the short term.

Nepal-China Renewable Energy Cooperation: Evolution and Current Landscape

Situated within the global context of a push towards renewable energy, and Nepal and China's respective developments in the sector, cooperation between the two countries has been significant over the past years. This section covers the historical evolution of this cooperation, the different modalities of collaboration, and the strategic interests of both countries.

Historical Evolution

Nepal–China energy cooperation has developed in distinct phases since Nepal's 1992 Electricity Act liberalized the sector for private and foreign investment. Chinese interest became commercially significant around 2010, coinciding with a period of Chinese outward investment expansion and Nepal's growing recognition that it needed external capital to realize its hydropower potential. The period from approximately 2017 onwards saw the deepest intensification of cooperation, with multiple MoUs signed and several major projects contracted to Chinese firms. The formalization of this engagement was achieved through a series of bilateral instruments: Nepal's accession to the BRI framework agreement in 2017 (Government of Nepal, 2024b), the MoU on Energy Cooperation in 2018 (Ministry of Foreign Affairs Nepal, 2018), and most recently a Framework Agreement on Investment Cooperation in 2024 (Ministry of Foreign Affairs Nepal, 2024). A critical caveat is that the BRI framework has not yet produced a single implemented project in Nepal since its signing in 2017 (Shekhawat, 2024). By contrast, India's energy engagement with Nepal has been more transactional and commercially effective, if also more controlling. The India–Nepal Power Trade Agreement provides a clear legal framework for electricity export that no equivalent China–Nepal instrument yet matches.

Modalities of Cooperation

In terms of hydropower and Nepal's national transmission infrastructure, the countries have had multiple modalities of collaboration, as demonstrated in Table 1.

Modality	Description	Examples
Engineering-Procurement-Construction (EPC)	Chinese firms construct projects on a fixed-price, fixed-schedule basis	Tamakoshi V Hydroelectric Project
Financial (loans/ concessional credit)	Export-Import Bank (EXIM) or CDB finance project development	Upper Trishuli 3A
Equity investment and joint ventures	Chinese and Nepali entities hold shared ownership stakes	Butwal Power Company's joint ventures
Equipment supply and technical systems	Chinese manufacturers supply turbines, panels, transformers, and control systems	Upper Marsyangdi A
Technical assistance and capacity building	Training programs, research partnerships, academic exchange	Hydropower Research Center for Himalayan Region – Kathmandu University and Wuhan University
Cross-border transmission	Physical grid interconnection enabling power trade	Rasuwagadhi-Kerung cross-border line (under development)
Build-Operate-Transfer (BOT)	Chinese developer builds, operates, and eventually transfers the asset	Upper Marsyangdi A

Table 1. Multiple modalities of Chinese engagement in Nepali hydropower

Constraints on Nepal-China Energy Cooperation

The Geopolitical Constraint: India's Effective Veto

The most significant structural barrier to Nepal-China energy cooperation is India's 2018 Cross-Border Electricity Guidelines, which effectively bar the import of electricity from projects involving Chinese investment or contractors. Applied with particular force after the 2020 Galwan Valley clash, these guidelines create a direct conflict: Chinese expertise and capital are among the best available options for scaling Nepal's energy sector rapidly, but deploying them risks foreclosing Nepal's primary electricity export market. Nepal has responded by removing Chinese developers from multiple projects and awarding contracts to Indian companies. This has resolved the immediate regulatory conflict but at the cost of competitive pressure, alternative expertise, and financing options that Chinese participation would have provided.

Nepal currently has no formal power trade agreement with China — unlike the legal framework governing electricity exports to India. Without clear provisions on pricing, transmission access, metering, dispute resolution, and the rights of investors, structuring commercially viable cross-border electricity trade with China is technically and legally fraught. While discussions on a power trade framework have been ongoing, with diplomatic engagement in 2018 and more recently in the margins of the 2024 Beijing summit, no agreement has been finalized. A power trade agreement text was drafted by Nepal's technical team, and six rounds of joint technical group meetings between Nepali and Chinese counterparts have been completed. However, successive prime ministers declined to advance the instrument, with participants at the May 2026 policy dialogue noting that Indian concerns were an explicit factor in this reluctance. A regulator consulted during the research for this study noted that only once legal instruments, policy frameworks, and implementation mechanisms are in place can Nepal develop a credible model for investment, cost recovery, and dispute resolution. On the transmission infrastructure side, there has been meaningful recent progress. According to participants consulted for the study, the grant agreement for the Rasuwagadhi–Kerung 220 kV cross-border line, which will connect to Nepal's Chilime substation at the same voltage as the Chinese Gyirong (Gyerung) side, received approval from the relevant Nepali ministries and, as of May 2026, was ready for submission to relevant parties. Critically, China has agreed to provide this financing as a grant for the Nepal portion of the line, resolving a long-standing impasse: previous governments had insisted on grant-only terms while China initially sought soft loan classification under BRI, but the Chinese side has now accepted the grant framing.

More broadly, Nepal's energy sector suffers from policy inconsistency that makes it a difficult environment for long-term investment commitments. The absence of a single-window mechanism for energy trade and foreign direct investment (FDI) compounds administrative complexity. Investors, including Chinese developers, have consistently cited uncertainty about offtake arrangements as a primary deterrent.

Investment and Financial Risks

Delays in concluding Power Purchase Agreements (PPAs) have been a recurring source of frustration for developers across the sector. When PPAs are delayed, developers are forced into local-currency financing arrangements that increase foreign exchange exposure and reduce project bankability. Currency risk, given Nepal's managed exchange rate and limited hedging instruments, is a genuine concern for Chinese investors accustomed to USD-denominated project finance. The absence of grandfathering provisions — meaning projects approved under one regulatory regime can be affected by subsequent policy shifts — further depresses investor confidence.

A more specific constraint, raised by private sector participants at the May 2026 policy dialogue, is the non-implementation of Nepal's foreign currency hedging regulation for power purchase agreements. Foreign developers, including Chinese investors, were initially promised partial USD-denomination of PPAs to improve project bankability. In practice, this was not delivered: one prominent project received a locked NPR-denominated PPA after extended negotiation. A hedging regulation was subsequently drafted and passed but has not been operationalized despite sustained lobbying from project developers. Participants at the dialogue identified this as the single most critical bottleneck for foreign direct investment in Nepal's energy sector — affecting not only Chinese investors and not only energy, but the full range of infrastructure FDI. Addressing it sits within the mandate of the Ministry of Finance and does not require foreign policy coordination.

Administrative and Infrastructure Bottlenecks

For Chinese companies working in Nepal, administrative challenges have slowed project development. Land acquisition challenges have led to project delays and redesigns. Hydropower construction requires explosives for tunnelling — a category whose import and storage is governed by Nepal's security regulations in ways that have caused repeated delays for Chinese contractors operating under fixed project timelines. Poor road connectivity and closed borders have compounded an already difficult investment environment.

Capacity and Technology Gaps

While Nepal has developed a competent hydropower workforce over several decades, professionals lack exposure to the large-scale, technically complex projects — such as pumped storage, high-capacity transmission systems, smart grid integration, and solar-wind-hydro hybrid systems — that define the frontier of global energy development. This limits Nepal's capacity to meaningfully absorb technology transfer from China and means that many Chinese-contracted projects have been implemented largely by Chinese engineering and labor rather than building genuine domestic expertise.

Environmental and Social Considerations

Large hydropower development carries well-documented ecological costs including riverine ecosystem disruption, altered sediment regimes, displacement of communities, and land use changes in ecologically sensitive Himalayan areas. Nepal's BRI-linked and Chinese-financed hydropower proposals are concentrated in northern watersheds that are both geologically challenging and ecologically significant. Community-level opposition, particularly over inadequate consultation and compensation processes, has delayed projects and contributed to reputational risks for Chinese developers. Effective environmental and social impact management is therefore not only an ethical imperative but a practical precondition for project implementation.

Emerging Opportunities

Diversifying Energy Trade and Export Markets

The most strategically significant near-term opportunity is the development of a functional electricity export relationship with China. The Rasuwagadhi–Kerung cross-border transmission corridor, for which feasibility study commitments were reaffirmed in the December 2024 Nepal–China joint statement, provides the physical infrastructure foundation for such trade. The price differential is compelling: Nepal could receive approximately 2.5 times more per unit of electricity sold to China than it currently earns from Indian exports.[6]

The Tibetan market deserves particular attention as a near-term export destination. Tibet is geographically the closest part of China to Nepal's northern watersheds, and it remains chronically energy-deficient in winter — precisely the dry season when Nepal's own run-of-river generation falls but still exceeds local Tibetan supply. This seasonal complementarity is commercially significant. Developing Tibet as a first export destination, rather than attempting to integrate directly into China's eastern grid, is a more tractable near-term step — one that sidesteps the full complexity of cross-regional Chinese transmission while still building the legal and infrastructure foundations for a broader northern electricity relationship. Furthermore, although China has invested in massive hydropower and solar plants in Tibet, establishing the Nepal-China connection can act as a method of grid-balancing similar to what happens in Europe; access to cheaper electricity for China; and a move towards fulfilling renewable energy targets for both countries.

The feasibility of northern electricity exports depends on resolving four linked conditions: completing the cross-border transmission infrastructure (the 220 kV Jilong/Kerung–Rasuwagadhi–Chilime line being the priority project); concluding a formal power trade agreement with China; identifying Chinese grid operators willing to offtake Nepali electricity at commercially viable volumes; and managing the India relationship so that northern exports do not trigger retaliatory restrictions on southern ones. Each condition is individually achievable, but their simultaneous resolution requires coordinated policy action across diplomatic, regulatory, and infrastructure domains.

Capacity and System Development

Beyond electricity trade, Nepal has significant headroom to develop the physical and human infrastructure of its energy system with China as a partner. Expanding Nepal's solar energy capacity with Chinese partnership represents an opportunity with lower political risk than large hydropower projects, given that solar installations can be structured without Chinese equity involvement while still utilizing Chinese equipment and technical expertise.

Pumped hydropower storage — which uses excess renewable generation to pump water uphill for later release through turbines — is particularly well-suited to Nepal's topography and aligns with China's advanced capabilities in this technology. Public-private partnership structures for pumped storage development, drawing on Chinese engineering expertise and potentially Chinese concessional financing, represent a concrete avenue for cooperation that addresses Nepal's seasonal imbalance without the export market risks associated with large run-of-river projects.

Nepal's relationship with China's supply chain dominance can also be managed more strategically than at present. Rather than simply purchasing Chinese solar panels at market prices, Nepal could pursue structured procurement relationships involving preferential pricing, early access to next-generation equipment, technology licensing, and modest-scale joint manufacturing. These arrangements have been extended to partners in Southeast Asia and Africa where commercial interest and diplomatic alignment converge. Engaging private Chinese renewable energy firms — such as Jinko Solar and Chint — rather than exclusively state-owned enterprises offers additional flexibility, as private firms tend to be more commercially flexible on technology transfer and joint venture terms.

Economic Transformation Opportunities

The most ambitious reframing of Nepal–China energy cooperation shifts the question from how much electricity Nepal can export to how much value Nepal can extract from its cheap renewable energy domestically. Nepal's Energy Development Roadmap 2081 already points in this direction with its NDC targets for electric vehicles and industrial electrification.

The most discussed value-added application is renewable-powered data centers. Nepal has natural cooling advantages in certain regions, alongside hydropower-generated electricity that could be among the cheapest in the region. China's rapidly growing data processing requirements — particularly for AI computing infrastructure — create a potential demand signal. A national data center strategy, supported by cybersecurity and data sovereignty frameworks, regulatory clarity, and investment incentives, could position Nepal as a regional digital infrastructure hub rather than merely an electricity commodity exporter.

[6]As of May 2026, the Rasuwagadhi–Kerung transmission line document had been submitted to the Government of Nepal cabinet for consideration, indicating meaningful progress on this corridor.

Broader industrial electrification — in sectors such as cement, fertilizers, and light manufacturing — could similarly create domestic value from cheap renewable energy rather than exporting raw power. This strategy reduces vulnerability to fluctuations in cross-border electricity markets while expanding the domestic tax base and employment.

Learning from China and Global Experiences

Nepal need not design its energy transition from first principles. China's own development — from near-total dependence on coal four decades ago to the world's largest renewable energy installer — offers policy lessons about the sequencing of market liberalization, the role of state financing in de-risking early-stage investment, and the importance of grid modernization as a precondition for renewable integration at scale. Beyond China, countries such as Bhutan and Ethiopia offer comparative lessons. The common thread across successful small-state energy diplomacy is institutional clarity, legal frameworks that attract investment while protecting national interests, and a clear understanding of what each partnership is meant to deliver.

Policy Recommendations

The following recommendations are grounded in the evidence reviewed in this section and in insights from the Nepal Economic Forum's focus group discussion on Nepal–China energy cooperation, held under Chatham House Rules with participants from government and the private sector.

1. Establish a Clear Regulatory Architecture of Cooperation

Nepal must urgently conclude a Power Trade Agreement with China to provide a formal legal basis for cross-border electricity exports. Clear provisions on pricing, trading modalities, dispute resolution, and risk-sharing would reduce uncertainty and improve investor confidence. Alongside this, Nepal should develop dedicated cross-border electricity trade regulations and introduce a one-window mechanism for energy trade to streamline approvals, grid access, and documentation.

2. Reform Investment and Risk Allocation Mechanisms

Policy instability, PPA delays, and currency-related uncertainties have discouraged long-term Chinese investment. Nepal should guarantee policy consistency, ensure non-discriminatory treatment of foreign investors, and introduce grandfathering provisions for existing projects. A transparent market risk allocation framework — clarifying whether risks lie with the state, utilities, or private developers — is essential. Blended finance models and concessional financing mechanisms should be explored to improve project bankability.

3. Accelerate Transmission Infrastructure Development

Without cross-border transmission lines, electricity diplomacy cannot materialize. Priority should be given to completing the Rasuwagadhi–Kerung corridor and strengthening domestic grid infrastructure to handle export volumes. Land acquisition bottlenecks, delays in forest clearances, and difficulties in importing construction materials must be addressed through fast-track procedures and improved border facilitation.

4. Institutionalize Electricity Diplomacy

Nepal should adopt a structured electricity diplomacy approach that advances national interest while managing regional sensitivities. Concretely, Nepal should develop a parallel-track approach: continuing to deepen cooperation with India on projects without Chinese equity involvement, while simultaneously advancing China-facing projects under distinct ownership and financing structures. This separation allows Nepal to expand the China channel without directly triggering Indian concerns about Chinese-linked electricity in the Indian grid. Private sector participants at the May 2026 dialogue were direct on this point: unless and until Nepal opens a credible northern export channel, India has no commercial incentive to become more flexible on its cross-border electricity guidelines. The parallel-track approach is therefore not merely a risk mitigation strategy — it is the mechanism through which Nepal's leverage with both neighbors simultaneously increases. The price differential makes this urgent — China's electricity cost of approximately RMB 1 (NPR 22) per unit versus NPR 8 per unit for Indian exports represents a substantial revenue advantage Nepal is currently foregoing entirely.

5. Deepen Technology Transfer and Capacity Building

Structured technology transfer agreements should be embedded in major Chinese-invested projects, with explicit provisions for local skill development, technology licensing, and engineering co-participation. Formal partnerships between Nepal's engineering institutions and Chinese research universities — building on the precedent of the Kathmandu University–Wuhan University Hydropower Research Center — should be expanded to cover solar systems, smart grids, pumped storage, and EV infrastructure. Training programs for NEA professionals on complex large-scale project management should be institutionalized rather than ad hoc. Nepal should also actively cultivate relationships with private Chinese renewable energy firms, including Jinko Solar, Chint, and Goldwind, which tend to be more commercially flexible on technology transfer terms than state-owned enterprises.

6. Promote Value-Added Energy Applications

Nepal should develop a national strategy for renewable energy-powered data centers and digital infrastructure, including a cybersecurity framework, data sovereignty protections, investment incentives, and engagement with potential Chinese and international investors. Broader industrial electrification — using cheap hydropower to displace diesel in cement, fertilizer, and manufacturing — should be incorporated into industrial policy, with clear linkages to the energy investment climate.

7. Improve Domestic Governance and Administrative Efficiency

Many barriers to cooperation stem from internal administrative weaknesses. Reforming land acquisition procedures, digitizing approval processes, and establishing statutory timelines for project clearances would significantly improve the investment climate. Streamlined procedures for importing construction materials subject to security regulations are equally critical to reducing project delays and cost overruns.

8. Implement Environmental and Social Standards

All large hydropower and renewable energy projects, regardless of financing source, should be subject to consistent, rigorous environmental and social impact assessment standards, with genuine community consultation mechanisms and transparent benefit-sharing frameworks. Nepal should use its role as project host to insist on these standards in contracts with Chinese developers — framing them not as an obstacle to investment but as a precondition for the social license that allows projects to be built and operated without disruption.

Conclusion

Renewable energy is not one sector among many in the Nepal–China relationship. It is the domain where the bilateral relationship's most consequential opportunities and most structural constraints converge. Nepal's hydropower and solar endowments, combined with China's technological and financial leadership in clean energy, create a genuinely complementary partnership. The price differential favoring northern electricity exports, the potential for technology transfer and human capital development, and the longer-horizon opportunity of value-added energy applications together constitute a case for deeper cooperation that transcends the project-by-project logic that has characterized engagement to date.

This section has also documented how this opportunity is constrained: by India's effective veto over electricity exports, by the absence of a legal framework for cross-border power trade with China, by Nepal's administrative bottlenecks, by a BRI framework that has yet to deliver a single implemented project, and by a domestic institutional structure that is not yet adequate to the complexity of what deeper energy cooperation requires. These are not insurmountable obstacles, but they require sustained, deliberate policy work rather than episodic diplomatic engagement.

A parallel-track electricity diplomacy strategy, advancing both relationships simultaneously through carefully differentiated project structures, is the most credible path to strategic autonomy. Nepal's leverage with India increases to the extent that India perceives a credible northern export alternative; Nepal's leverage with China increases to the extent that it can offer commercial and political conditions that make investment here preferable to elsewhere. Realizing that potential requires Nepal to build the institutional foundations, legal, regulatory, administrative, and diplomatic, that make it a credible, predictable, and strategically autonomous partner. That is the work of the next decade.

References

Altieri, K., & Jones, D. (2025). What's new with national renewables targets? Nothing much. Ember. https://ember-energy.org/app/uploads/2025/07/Ember-Whats-new-with-national-renewables-targets_-Nothing-much-1.pdf

Bega, F., & Lin, B. (2023). Renewable energy and global energy transition study. Energy, 284. https://www.sciencedirect.com/science/article/abs/pii/S0360544223003456

Bradsher, K. (2025, September 8). China's clean energy push clashes with fossil fuel research. The New York Times. https://www.nytimes.com/2025/09/08/climate/china-clean-energy-fossil-fuel-research.html

BloombergNEF (2026). BloombergNEF Finds Global Energy Transition Investment Reached Record $2.3 Trillion in 2025, Up 8% from 2024. BloombergNEF. https://about.bnef.com/insights/clean-energy/bloombergnef-finds-global-energy-transition-investment-reached-record-2-3-trillion-in-2025-up-8-from-2024/

COP28 UAE. (2023). Global renewables and energy efficiency pledge. https://www.cop28.com/en/global-renewables-and-energy-efficiency-pledge

Danish Institute for International Studies (DIIS). (2025). China's promotion of overseas green projects. DIIS. https://pure.diis.dk/ws/portalfiles/portal/26594401/China_s_promotion_of_overseas_green_projects_DIIS_Report_2025_01.pdf

Embassy of China in Nepal. (2018). China–Nepal relations overview. Embassy of China in Nepal. https://np.china-embassy.gov.cn/eng/EmbassyInfo/asaa/201803/t20180327_1997068.htm

Embassy of China in Nepal. (n.d.). Study in China scholarship program. Embassy of China in Nepal. https://np.china-embassy.gov.cn/eng/StudyinChina/jxj/

Further Africa. (2026, February 11). China–Ethiopia green energy cooperation. Further Africa. https://furtherafrica.com/2026/02/11/china-ethiopia-green-energy-cooperation/

Government of Nepal. (2024a). Energy sector synopsis report (FY 2079/80). Government of Nepal. https://giwmscdnone.gov.np/media/pdf_upload/Energy%20Sector%20Synopsis%20Report%20(2024%20FY%202079-80)_qbbivka.pdf

Government of Nepal. (2024b). Framework for Belt and Road cooperation between the Government of Nepal and the Government of the People's Republic of China. Government of Nepal. https://giwmscdntwo.gov.np/media/pdf_upload/BRI%20Publishing%20Copy_giorlfm.pdf

International Energy Agency (IEA). (2025). World energy outlook 2025. IEA. https://www.iea.org/reports/world-energy-outlook-2025

International Institute of Green Finance China (IIGF China). (2026). Chinese overseas renewable energy investment brief (2022–2025). IIGF China. https://iigf-china.com/wp-content/uploads/2026/02/Chinese-Overseas-Renewable-Energy-Investment-brief-2022-2025.pdf

International Renewable Energy Agency (IRENA). (2026). Renewable capacity statistics 2026. IRENA. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2026/Mar/IRENA_DAT_RE_capacity_statistics_2026.pdf

International Renewable Energy Agency (IRENA). (2025). Renewables Boom Highlights Growing Regional Divide. IRENA. https://www.irena.org/News/pressreleases/2025/Jul/Renewables-Boom-Highlights-Growing-Regional-Divide

Karki, S. (2024, July 22). Unlocking the geopolitics of hydropower in Nepal. Nepal Economic Forum. https://nepaleconomicforum.org/unlocking-the-geopolitics-of-hydropower-in-nepal/

L., J. (2026, February 4). China adds power 8x more than the US in 2025, with $500B energy build-out in a single year. Carbon Credits. https://carboncredits.com/china-adds-power-7x-more-than-the-us-in-2025-with-500b-energy-build-out-in-a-single-year/

Liu, B., Zhou, Z., & Shen, W. (2026). Chinese overseas renewable energy investment brief (2022–2025). IIGF China. https://iigf-china.com/wp-content/uploads/2026/02/Chinese-Overseas-Renewable-Energy-Investment-brief-2022-2025.pdf

Ministry of Foreign Affairs, Government of Nepal. (2015). Press release on solar power handover ceremony. Ministry of Foreign Affairs, Government of Nepal. https://mofa.gov.np/content/241/press-release-on-solar-power-handover-ceremony/

Ministry of Foreign Affairs, Government of Nepal. (2018). Joint statement between Nepal and China. Ministry of Foreign Affairs, Government of Nepal. https://mofa.gov.np/content/1107/joint-statement25156485458084/

Ministry of Foreign Affairs, Government of Nepal. (2024). Framework for Belt and Road cooperation. Ministry of Foreign Affairs, Government of Nepal. https://mofa.gov.np/content/641/framework-for-belt-and-road-cooperation-between/

National Energy Administration of China. (2025). China energy statistical report. National Energy Administration of China. https://www.nea.gov.

Nedopil, C. (2026). China Belt and Road Initiative investment report 2025. Green Finance & Development Center. https://greenfdc.org/wp-content/uploads/2026/01/Nedopil-2026-China-BRI-Investment-Report-2025.pdf

Nepal Electricity Authority. (2024). Nepal Electricity Authority: A year in review, fiscal year 2023/2024. Nepal Electricity Authority. https://www.nea.org.np/admin/assets/uploads/supportive_docs/60896609.pdf
Nepal Electricity Authority. (2025). Annual report (40th anniversary edition). Nepal Electricity Authority. https://www.nea.org.np/admin/assets/uploads/annual_publications/Annual_Report_40_Anniversery.pdf

Nepal Rastra Bank. (2025). Current macroeconomic and financial situation (based on six months data of 2082/83). Nepal Rastra Bank. https://www.nrb.org.np/category/current-macroeconomic-situation/?department=red&fy=2082-83&subcategory=six-months

POWERCHINA. (2024, September 18). POWERCHINA's project wins 2024 National Quality Engineering Award. POWERCHINA. https://en.powerchina.cn/2024-09/18/c_828777.htm

Sharma, G. (2025, June 16). Nepal begins first power exports to Bangladesh via India's grid. Reuters. https://www.reuters.com/business/energy/nepal-begins-first-power-exports-bangladesh-via-indias-grid-2025-06-16/

Shekhawat, S. (2024, June 10). BRI in Nepal: An appraisal. Observer Research Foundation. https://www.orfonline.org/research/bri-in-nepal-an-appraisal

Silverstein, K. (2026, March 8). China's green leap: An industrial strategy leaving the West behind. Forbes. https://www.forbes.com/sites/kensilverstein/2026/03/08/chinas-green-leap-an-industrial-strategy-leaving-the-west-behind/

State Council Information Office, People's Republic of China. (2025). China's energy development in the new era. State Council Information Office. https://english.www.gov.cn/archive/whitepaper/202511/08/content_WS690ee812c6d00ca5f9a076cd.html

Xi, J. (2021, September 21). Statement by H.E. Xi Jinping at the general debate of the 76th session of the United Nations General Assembly. United Nations. https://gadebate.un.org/sites/default/files/gastatements/76/cn_en.pdf