



GMMC Journal of Interdisciplinary Studies

Vol. 15, Issue 1, June 2026, pp. 93-121

ISSN : 2392-4519 (Print), 3021-9086 (Online)

Journal homepage: <http://gmmcjournal.edu.np>

Hydropower Landscape and Energy Diplomacy as Strategic Priorities of Nepal

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ABSTRACT

Received: March, 2026

Revised: May, 2026

Accepted: June, 2026

Available online: June, 2026

DOI: <https://doi.org/10.3126/jis.v15i1.96504>

v15i1.96504

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Nepal's hydropower development stands as one of the most influential energy transition cases in South Asia. Over the span of two decades, it has transformed from a state of chronic power shortages and reliance on electricity imports to, as of early 2025, a major actor with an installed power capacity of nearly 3,591 megawatts, well-positioned to emerge as a regional energy exporter. This paper conducts its analysis centered on the core analytical perspective of "energy

statecraft", a framework that refers to the proactive deployment of energy resources to advance diplomatic goals and reduce structural vulnerabilities. The study, based on a systematic analysis of Nepal's 15th and 16th Periodic Plans, bilateral energy agreements and secondary literature on the nexus of energy economics and South Asian geopolitics, finds a substantial gap in the existing scholarship. While hydropower development in Nepal has been a subject of much technical and economic analysis, its instrumentalization as a foreign policy tool remains theoretically underdeveloped. This article addresses this gap by analyzing how energy export commitments, including 10,000 MW long-term supply agreements with India and 9,000 MW with Bangladesh, have been incorporated into Nepal's diplomatic stance and regional positioning. The analysis reveals an eminent stress between Nepal's statecraft ambitions and its structural limitations. Export reliability is constrained by seasonal generation asymmetries, limited cross-border transmission infrastructure, and asymmetric geopolitical dynamics of the

India-Nepal-China triangle. Also, the intermittent governance vacuums and absence of stable energy policy frameworks undermine investor confidence and the sustainability of long-term projects. The study argues for a conceptual and functional shift in hydropower from a resource for domestic development to an active tool for projecting national power, but contends that this transformation is institutionally unsupported. Turning energy potential into credible statecraft requires more than megawatt capacity but demands a coherent governance architecture, transmission sovereignty, and policy continuity across electoral cycles.

Keywords: Energy diplomacy, energy statecraft, hydropower landscape, strategic policy priorities.

INTRODUCTION

Energy is one of the key elements in shaping the state of the world in the 21st century. As the global dependence on fossil fuels causes not only changes in geopolitics but also intensifies the need to find new sources of energy that are environmentally friendly, countries having access to hydropower sources are becoming increasingly important in the formation of regional energy systems. Nepal which in the past has been synonymous with energy shortages and underdevelopment due to limited infrastructural and human resources despite having huge potential for hydropower has been a great learning experience for other countries. With a massive increase in energy generation capacity, Nepal is transforming the country to energy exporter from energy importer (NEA, 2025). The paper argues that this uptake should not be seen only as a technical or economic progress; rather it is a deepening engagement in energy diplomacy, the deliberate use of energy resources to achieve foreign policy goals, handle imbalanced dependencies in the region and form a powerful and proud national identity. The development path of Nepal's hydropower sector has been complex and low paced. Chandrajyoti Hydropower Project with a capacity of 500 KW that was started in 1911, officially opened the sector (Paudel, 2008). Though, by the time the country got democracy again in 1990, almost 80 years later, the total installed capacity was still around 250 MW which was catering to only twenty four percent of the population (Basnet, 2024). This slow pace is not due to a lack of physical resources since Nepal has a potential of more than 40,000 MW that can be utilized for hydropower generation, but it is due to the lack of institutional capacity, proper policy direction and strategic investment. The ten years from the 2006 political change saw 300 MW being added to the capacity which became approximately 800 MW, and the percentage of

people having access to electricity went up to fifty eight, which when considered to the natural resource of the country, is still a modest one (Dhungel, 2008).

The enactment of Nepal's constitution in September 2015 was a revolutionary moment. Over the next ten years, almost 2,500 MW was added with the help of rigid rules, increasing number of investors from private sector and constant investment in infrastructure (NEA, 2025). This faster growth changed Nepal's energy situation from a condition of controlled shortage to one of exportable surplus - a change which had direct foreign policy implications. India's offer to buy up to 10,000 MW within eight years and Bangladesh's willingness to import 9,000 MW in fifteen years indicate that Nepal's hydropower has reached a level of diplomatic opening, going far beyond the domestic grid (Aryal et al. 2024). The current export of 40 MW to Bangladesh via the Baharampur-Bhedamara inter-connection which is a small beginning, illustrates the regional integration (The Kathmandu Post, 2023).

But the gap between ambition and institutionalization is still wide. Nepal's energy diplomacy is built on structural vulnerabilities: significant seasonal generation asymmetries that lead to monsoon surpluses and winter deficits; cross-border transmission infrastructure that is still insufficient for sustained large-volume exports; and an asymmetric geopolitical environment characterized by the competing gravitational pulls of India and China. These physical and geopolitical constraints are compounded by a governance deficit, recurrent leadership changes, inconsistent policy frameworks, and the lack of long-horizon energy planning that survives electoral cycles. Nepal's 28,000 MW production target and the vision embedded in its successive Periodic Plans remain aspirational without the institutional scaffolding to sustain them (Adhikari & Aryal, 2025; Lamsal, 2024).

Although an increasing amount of literature has explored the economic aspects of hydropower and South Asian energy trade, the diplomatic instrumentalization of Nepal's energy transition has been inadequately theorized. Studies have engaged with project finance , environmental impact and bilateral trade logistics. Few have interrogated whether and how Nepal's energy sector has been consciously mobilized as a foreign policy tool- what Blackwill and Harris (2016) term geo-economic statecraft- and with what effectiveness. This is not just a theoretical gap. Without a rigorous framework for assessing energy statecraft, policymakers are denied the analytical tools required to distinguish between genuine diplomatic leverage and structural dependency disguised in the language of partnership.

This study aims to fill these gaps, answering the major question- how far has Nepal come in making use of hydropower as a tool of energy statecraft? while figuring the threefold

objectives of the study which are to conceptualize Nepal's hydropower diplomacy as part of energy statecraft by using its 15th and 16th Periodic Plans and bilateral energy agreements, to evaluate the structural, institutional, and geopolitical factors that hinder Nepal's energy diplomacy's effectiveness, and to assess those strategic scenarios where hydropower can be an effective foreign policy tool rather than a source of vulnerability. The method of analysis is through qualitative policy analysis and depth analysis of primary planning documents and secondary literature at the crossroads of energy governance and South Asian international relations.

METHODS AND MATERIALS

This study adopts a multidimensional analytical framework to examine Nepal's hydropower sector through the lens of energy statecraft, focusing on the interaction between energy development, national power, diplomacy, and economic transformation. The methodology is primarily qualitative, supported by quantitative data to capture both policy dynamics and empirical trends. It relies on a comprehensive review of secondary sources, including annual reports and statistical data from the Nepal Electricity Authority, as well as key policy documents such as the Fifteenth and Sixteenth Periodic Plans of the Government of Nepal. Additional materials include bilateral Power Purchase Agreements (PPAs), records of energy trade dialogues between Nepal, India, and Bangladesh, and institutional reports published by the Ministry of Energy, Water Resources and Irrigation, alongside relevant academic literature and policy studies.

Methodologically, the study integrates document analysis with critical interpretation. Quantitative data on electricity generation, seasonal supply variations, and infrastructure development are examined to identify trends and performance gaps, while qualitative analysis is employed to assess structural and institutional constraints such as political instability, legal and regulatory barriers, and geopolitical sensitivities. A comparative review of planned targets and actual achievements over the past decade further strengthens the analysis by revealing inconsistencies between policy commitments and implementation outcomes. This combined approach enables a coherent and grounded assessment of Nepal's evolving energy landscape and its strategic use in foreign policy.

This article emphasizes the interface between energy diplomacy and foreign policy. In this process, it precisely observes how hydropower development and export strategies have transformed the energy landscape of Nepal. So, the scope incorporates a serious examination

into Nepal's energy statecraft, investigating it through the lens of hydropower development, energy diplomacy, and regional power trade with India and Bangladesh

LITERATURE REVIEW

Energy statecraft is understood as the utilization of energy as a strategic tool both for national development and external influence (Bazilian et al., 2017). There are three objectives in it: energy security, economic prosperity and international influence Goldthau & Witte (2010). Although many regard energy policy and energy statecraft in a similar fashion, these are essentially differing concepts (Weiss & Thurbon, 2021). Policy is related to technical and administrative management dealing with the issues such as supply, transmission and tariff. The statecraft endeavors to secure its achievements by taking the policy together with national power and diplomacy. The statecraft further acts for domestic rule and promotion, financial mechanism, trans-border trade agreement and access to market, among others.

In the international context, energy statecraft is associated with two major trends. First, the geopolitics of energy supply, which impacts balance of power in source, route and market control. These become the means of power projection through the infrastructures like pipeline, transmission line and port. Second, the green transformation, which has gradually contributed to renewable energy and grid integration by reducing the dependency on fossil fuel (Dhungel, 2026). The erratic weather and need of storage in relations to renewable energy has brought to fore the determination of market rule and regional coordination. Thus, energy statecraft is not mere energy but it is environmental acceptability and integration of cross-border coordination.

In the small countries like Nepal, energy statecraft, however, counts differently. Limited market, weak financial capacity, dependency on many things makes negotiation power with bigger countries a low key. However, the small countries too have two vital points. First, niche strategy, that is to say, development of competitive benefit in a sustainable manner. Next, bringing to one's own fold the international rule and allied countries (Kemp, et al., 1998). It means multilateral standard, transparent bidding, risk sharing, use of credit can benefit small countries with attraction of huge capital. Small countries' energy diplomacy is generally running on hedging and diversification. But the long-term risks can be minimized by adopting the trade policy that does not depend entirely on single market or a single transmission line. The wise use of statecraft has the relevance here.

Hydropower is the center of Nepal's energy statecraft (Dhungel, 2026). But most of the hydropower projects in Nepal are run-off-river, thereby having a production surplus in

monsoon and short of supply in winter. Transmission connectivity, reservoir/storage project and market access are essential for Nepal. Domestic electrification, e-cooking and expansion of industrial need adds value to the surplus energy. Trade balance should be maintained in energy by having both long-term and short-term power trades with India and Bangladesh.

Nepal requires adopting three major pillars for its energy statecraft. First is regular supply. With increase in domestic storage, the hydropower supply should be ensured even in peak season of winter, for it, multi-energy scheme can be in place, linking solar and wind energy in grid. Second is market-oriented diplomacy: simultaneous arrangement of access to Indian market with long-term bilateral agreement, entry to Bangladesh, energy banking and use of production and trade tool like wheeling and involvement of stakeholders in price determination. Third is creation of demand: once the electricity tariff and infrastructures are speeded up with expansion of e-cooking, irrigation pump, industrial park and electric vehicle, the surplus energy creates adequate value to the domestic economy (Bharati, 2024; Dhungel, 2026; GoN, 2023).

Domestic tools need to be clear for the statecraft. Law and order, institutional stability and one-door service policy are essential (Goddard, et al., 2019). In the power purchase agreement (PPA), a clear formula is equally necessary. Meteorological risk, risk associated with exchange rate and delayed construction warrant separate handling. It would be challenging to launch mega project before finalizing issues like green bond, credit guarantee, mechanism to reduce foreign currency risk and local share allocation or royalty distribution. Installation of smart meter at distribution level, loss reduction program and timely tariff help in improving consumption profile. All these are not simply the policy arrangement but the exercise of statecraft. The goal of statecraft is not mere increase in production of energy but transformation of hydropower to strength.

Hydropower is more than a source of power- a solid basis of statecraft. It helps in substitution of import, income from export, industrialization, regional ties, commitment relating to climate action. Reservoir-based hydropower meets demand in peak season of winter while run-off-river scheme guarantees low cost energy during monsoon, and solar energy alleviates daytime load (Bhatta, 2024). Transmission establishes market links. Irrespective of having a small economy, integration of these very issues is helping to place Nepal as a credible energy partner with neighboring countries. It, thus, shows the credibility and adherence to rule is power of small nations. These initiatives have promoted hydropower from energy production to an instrument of national power and diplomacy. At present, development of hydropower

and its trade is a proper energy statecraft for Nepal. It is necessary for Nepal to exercise it effectively with formulation of relevant plans and objectives (Aryal et al., 2024).

Planned Target and Achievement

The multi-year projects have been keeping hydropower production in priority in Nepal. However, there lies gaps in target and achievement.

Table 1

Planned Target and Achievement

Plan Year	Production Target (MW)	Achievement Made (MW)	Achievement (%)
13th 3-year plan (FY 2013/14–2015/16)	1,460 MW	~851 MW	58.29%
14th 5-year plan (FY 2016/17–2020/21)	2,300 MW	~1,250 MW	54.32%
15th 5-year plan (FY 2019/20–2023/24)	5,820 MW	2,892 MW	49.69%
16th 5-year plan (FY 2024/25–2028/29)	11,769 MW	— (ongoing)	—

Source: National Planning Commission, 2025

The data represented in the table above shows Nepal had increasing production of hydropower but failed in achieving the goals. As periodic plan witnessed the production growth below 50 percent in row.

Production and Consumption

Nepal’s total installed hydropower capacity has reached some 3,591 MW at the end of 2025. Of this, the powerhouses set up under Nepal Electricity Authority (NEA) has the capacity of 661.7 MW, while the remaining portion is generated by private sector. Domestic power consumption ranges from 1,800 MW to 2,500 MW depending on season (NEA, 2025). It suggests that huge amount of power produced by Nepal is poised to be exported. Currently, from 500 to 700 MW electricity is being exported to India annually.

Table 2

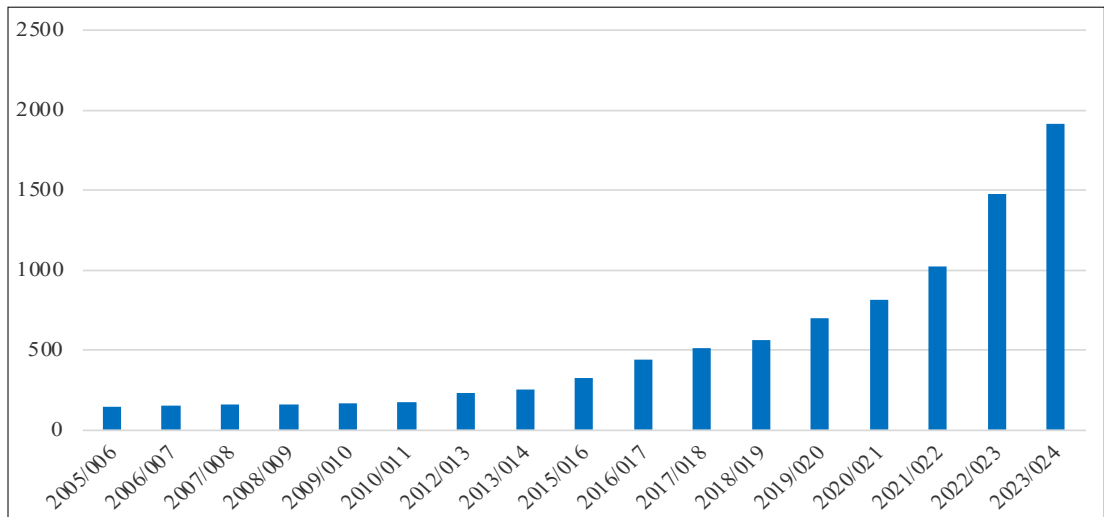
Power Development From IPPs :

F/Y	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2012/13	2013/14	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
	148.23	152.713	156.34	158.315	166.806	174.526	230.589	255.647	324.446	441.052	512.696	560.776	696.1687	814.645	1020.528	1477.013	1914.772

Source: NEA, 2025

Figure 1

Development of Electric Power from IPPS with Time



Of the total available electricity (including import) of 15,641 Giga Watt per hour (GWh) till 2025, nearly 11,343 GWh is consumed domestically and 2,380 GWh is exported. In this period, nearly 1,918 GWh or 12.26 percent is found spillage (NEA, 2025). The highest demand for the electricity in the same period stands at 2409 MW, while the need is projected to be 2,438 MW by the end of current fiscal year.

Figure 2

National Peak Demand MW

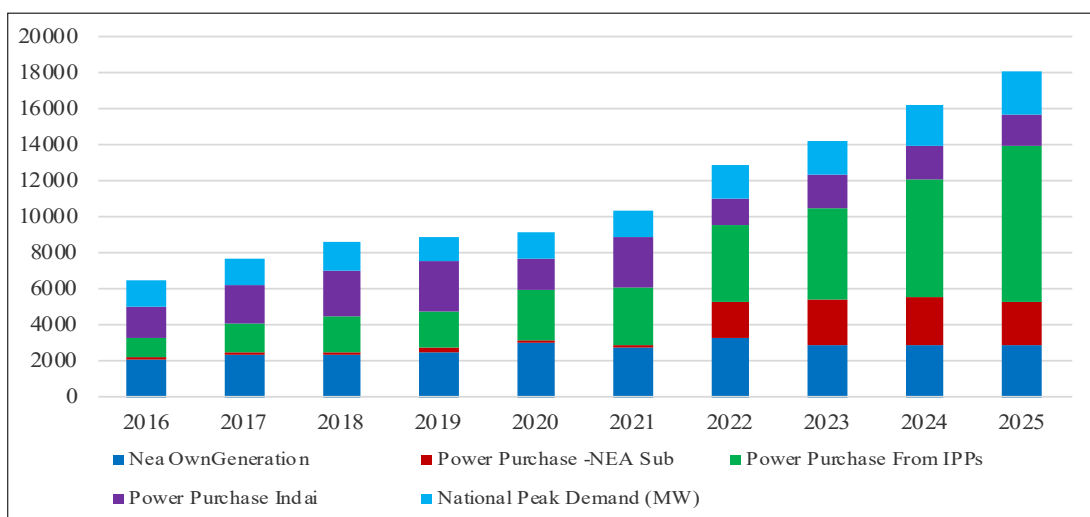


Table 3

National Peak Demand MW

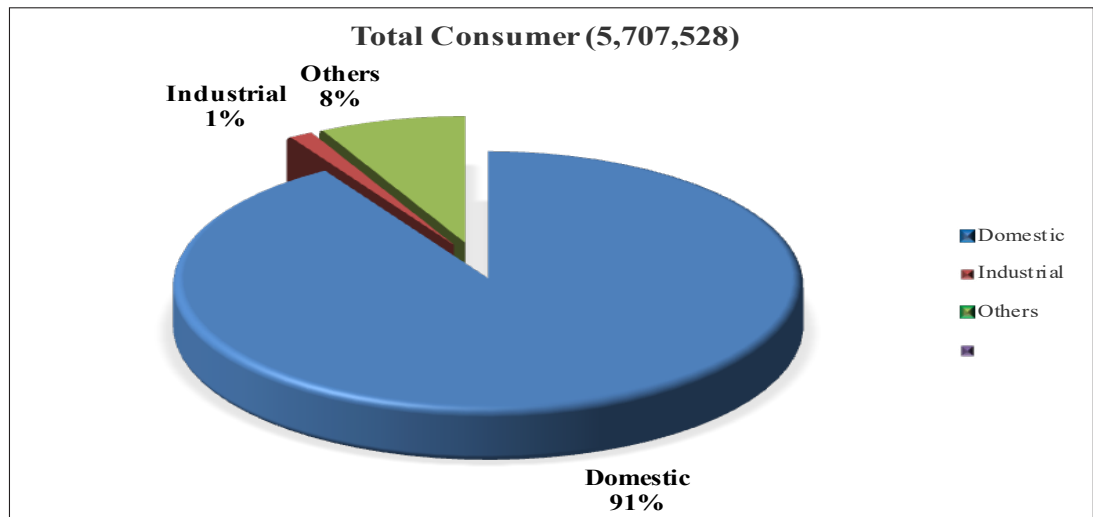
Particular	NEA's Own Generation	Power Purchase -NEA Sub	Power Purchase From IPPs	Power Purchase India	National Peak Demand (MW)
2016	2133	154	1012	1778	1385
2017	2305	155	1623	2175	1444
2018	2308	149	2019	2582	1508
2019	2548	157	2033	2813	1320
2020	3021	155	2836	1729	1408
2021	2804	148	3093	2806	1482
2022	3259	1976	4286	1543	1748
2023	2930	2488	5118	1833	1870
2024	2911	2597	6564	1895	2212
2025	2953	2400	8606	1681	2409

Source: NEA, 2025

Nepal made a remarkable progress in electricity access in the last decade. It was 55 percent of population enjoying electricity access a decade back, which is now increased to 97.5 percent of local level, 95 percent of ward, 91.41 percent houses and 84.62 percent families. Nearly 2,073,514 households are using less than five amperes of electricity. Till Asar 2082, NEA recorded installment of total 5,707,528 customers' meters. However, 18 local levels are still awaiting electricity service in Nepal (NEA, 2025).

Figure 3

Total Consumer



Source: NEA, 2025

Table 4

Vital Performance of Electricity Usage

Customer Category	Percent of total consumer (%)	Sales (%)	Revenue (%)
Domestic	91 .08%	42 .02%	39 .05%
Non- Commercial	0 .72%	3 .07%	4 .47%
Commercial	0 .77%	7 .79%	11 .33%
Industrial	1 .23%	36 .64%	36 .52%
Other	6 .21%	10 .48%	8 .62%

Source: NEA,2025

Figure 4

Growth of Consumers

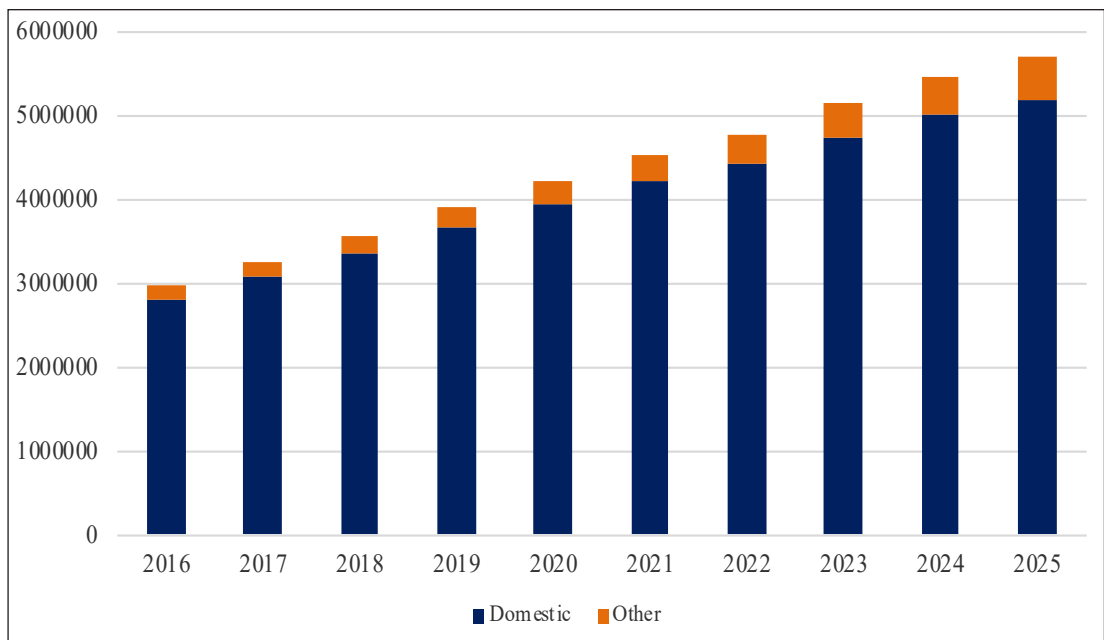


Table 5

Growth of Consumers

F/Y	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Domestic	2796621	3061709	3355830	3657887	3933574	4208208	4418593	4739753	4997612	5198479
Other	173704	196819	219155	252549	284968	321081	347428	394305	461663	509049

Source: NEA,2025

Capacity and System Loss

Till Asar 2082, power leakage stood at 10.39 percent in transmission and distribution. Determining actual leakage is not possible while including export, so, once export is curtailed from production and sale, the internal leakage amounts 10.39 percent, according to NEA.

Figure 5

Energy Consumption and System Loss

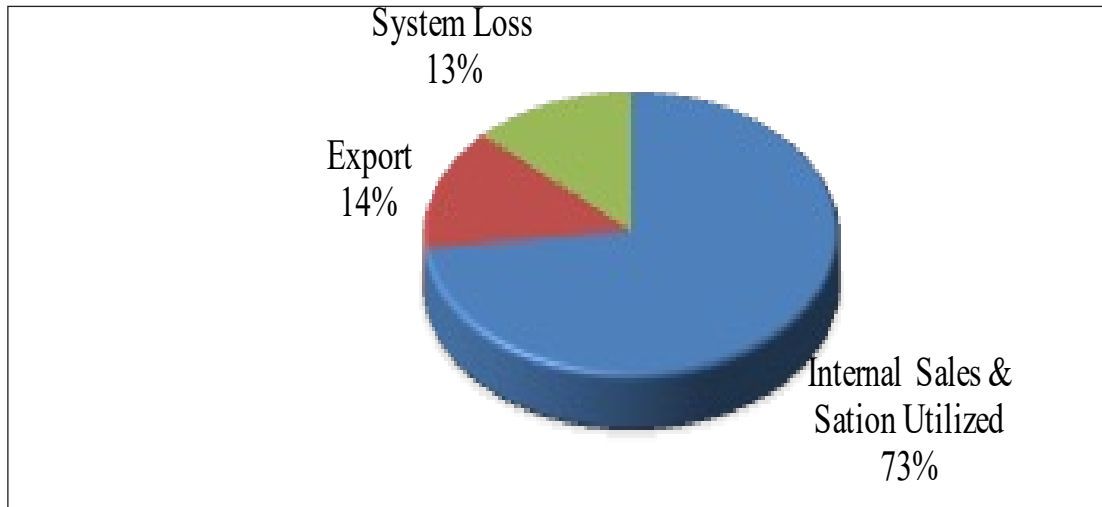


Table 6

Capacity and System Loss

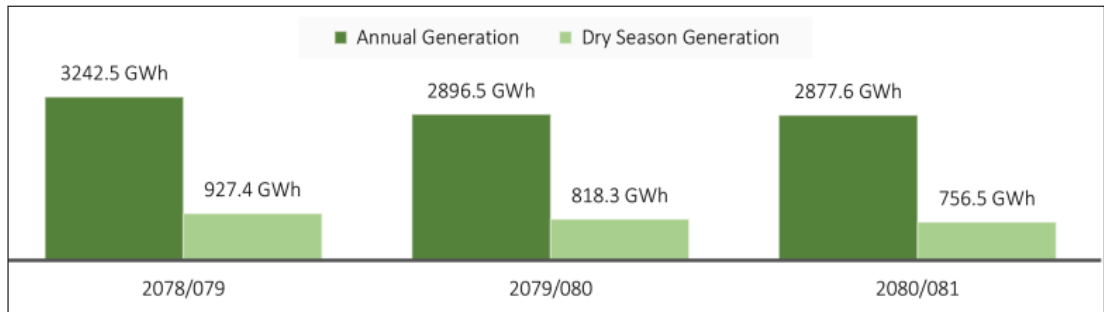
Internal Sales & Station Utilized	Export	System Loss
73%	14%	13%

Source: NEA, 2025

In the rainy season of fiscal year, 2081/82, the production was 2,110.70 GWh, while it was 791.7 GWh in dry season. The power production in dry season is three times less than of monsoon season. Nepal still faces the challenge of maintaining balance in demand and supply of power. The electricity goes in waste in the rainy season on the one hand and there is scarcity during dry season on the other.

Figure 6

Annual vs Dry Season Generation of Last Three FY



Source: NEA, 2024

Table 7

Comparison of electricity production in Monsoon and Dry Season, 2024/025

Parameter	Monsoon (Jun-Sep)	Dry Season(Dec-Apr)
Generation	3,300 MW	1,000 MW
Demand	2,300 MW	2,300 MW
Balance	1,200 MW Surplus	>50% Deficit

Source: NEA, 2025

NEA has projected the export of 2,648 MW power in the fiscal year, 2082/83 and 3,316 MW in fiscal year, 2083/84. But, in dry season, Nepal is in need of importing 791 MW electricity in the fiscal year, 2082/83, and 728 MW electricity in fiscal year 2083/84.

Figure 7

Import & Export (Million Units)

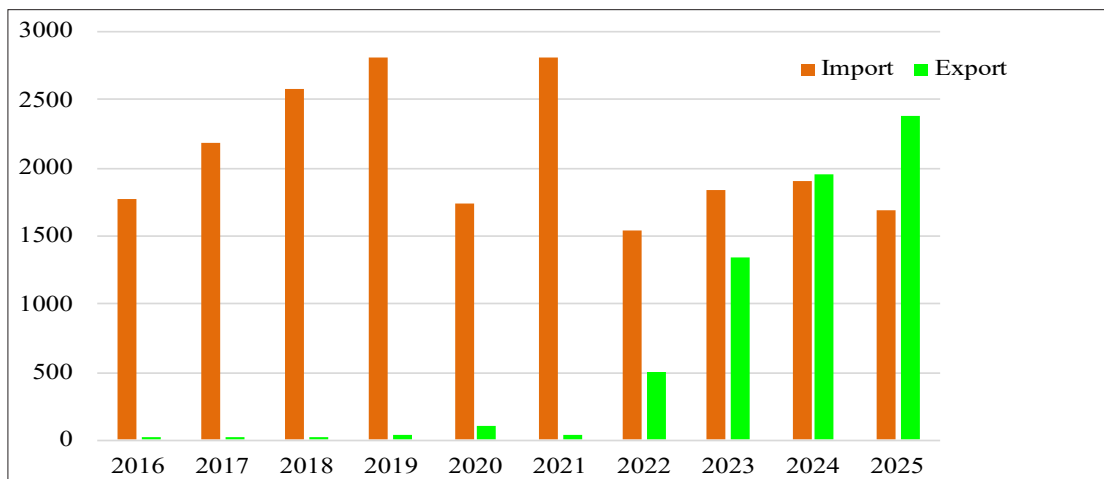


Table 8

Import & Export (Million Units)

F/Y	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Import	1778	2175	2582	2813	1729	2806	1543	1833	1895	1681
Export	3	3	3	35	107	38	494	1346	1946	2380

Source: NEA, 2025

Infrastructure and System Development

Nepal is currently expanding high voltage network. In NEA’s power system, the electricity transmission is operative in 33 KV, 66 KV, 132 KV and 400 KV scale. So far, 6,760 high voltage circuit KM transmission line and 14,123 MW substations are in operation (NEA, 2025). The transmission line of 2024 circuit KM and 6,338 substation are currently undergoing.

Table 9

Comparison of Transmission line length within the last decade

FY	Circuit km				Total	Total Increment (ckt . km)	% of Increment %
	66kv	132kv	220kv	400kv			
2072/073	494	2417			2911		10 .94
2073/074	494	2596	75	78	3243	332	11 .41
2074/075	514	2717	75	78	3384	141	4 .35
2075/076	514	3142 .5	255	78	3990	606	17 .91
2076/077	514	3240	437	78	4269	280	7 .02
2077/078	514	3540 .54	741 .2	78	4874	605	14 .17
2078/079	514	3816 .54	896 .6	102	5329	455	9 .34
2079/080	514	3979	1101	148	5742	413	7 .75
2080/081	514	4136	1213	644	6508	766	13 .34
2081/082	514	4193	1266	787	6760	252	3 .87
Total increment in eleven years						3850	

Source: NEA, 2025

Table 10

Comparison of Substation Capacity from 2072-082 BS:

FY	Total Capacity (MVA)	Total Increment (MVA)	Percentage of Increment
2072/073	2223	0	0
2073/074	2618	394	17 .72
2074/075	3198	580	22 .15
2075/076	3935	738	23 .08
2076/077	4300	364	9 .25

2077/078	6434	2134	49 .63
2078/079	7149	715	11 .11
2079/080	8867	1718	24 .03
2080/081	13050	4183	47 .17
2081/082	14123	1073	8 .22
Total increase in 10 years		11899	

Source: NEA, 2025

For PPA, total 494 projects of 11,436 MW capacity have been endorsed and 253 others of 16,027 MW are proposed and registered. Among these, the projects worth 5,478 MW have reached the stage of connecting to grid. Similarly, till the end of fiscal year, 2081/082, the solar projects of nearly 960 MW were under process for PPA.

Current Status of Electricity Export

Nepal had got approval for power export of 936.72 MW to India and Bangladesh by the end of 2081/082. Similarly, the projects worth 290 MW capacity are awaiting export permit. However, it is challenging because of compulsion to get annually renewed for bidding in Indian market in addition to time limit for import and constraints in interstate transmission.

Table 11

Highlights of Electricity Exports (Qty)

Particular	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Export Sales (GWh)	4	3	3	3	3	3	35	107	38	494	1346	1946	2380
Export Sales Growth %	-	-	-	-	-	-	1082%	207%	-64%	1200%	173%	45%	22%

Source: NEA, 2025

Table 12

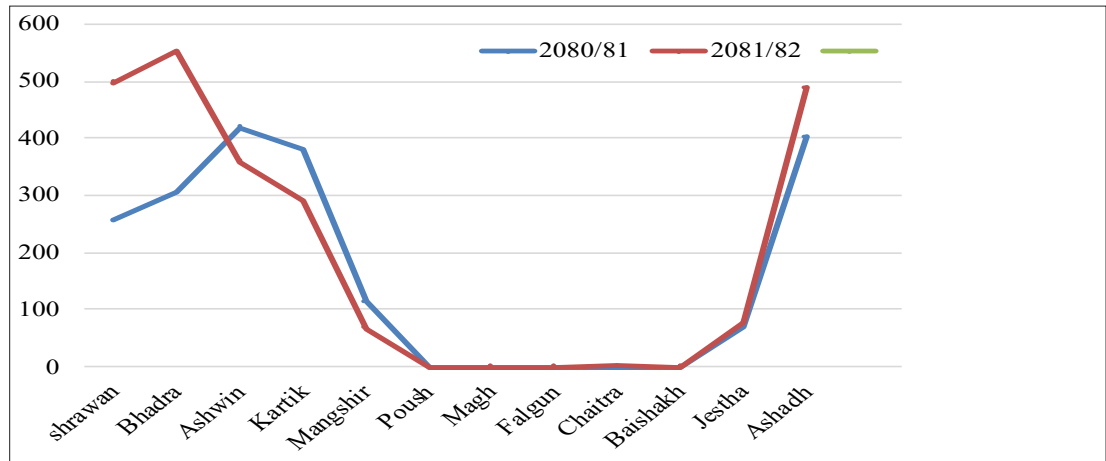
Comparison of Exported Energy (GWh) to India

F/Y	Shrawan	Bhadra	Ashwin	Kartik	Mangshir	Poush	Magh	Falgun	Chaitra	Baishakh	Jestha	Ashard	Total
2079/80	251 .55	255 .66	280.97	202.25	87.80	0.38		0	0	0	24 .20	230 .06	1332.9
2080/81	255 .53	304 .58	417 .82	380.02	114 .16	0 .43	0 .03	0 .10	0 .31	0 .30	67 .92	401 .35	1942.6
2081/82	497.86	552 .33	358 .20	289.78	66.229	0 .11	0	0	1 .09	0	78 .93	487 .17	2331.7

Source: NEA, 2025

Figure 8

Comparison of Exported Energy (GWh) to India



On August 21, 2025, the Indian government agreed to purchase 80 MW more electricity from Nepal, thereby totaling the export to India at 1,090.9 MW. Although on August 11, 2025, India had agreed to purchase 200 MW electricity, it made agreement for further purchase within two weeks. As per bilateral agreement, it is for the purchase of power from Mewakhola and Kuruwaseti Hydropower.

Table 13

Status of Approval for Sale of Power to India and Bangladesh

Headings	No .	Approved Quantum (MW)	TL Network
India Power Exchange Market (DAM/RTM)	9	451 .62	Dhalkebar-Mujaffarpur,400 KV TL
	2	70 .00	Tanakpur- Mahendranagar,132 KV TL
Medium Term Bilateral Agreement (Nepal And India)	15	375 .10	Dhalkebar-Mujaffarpur,400 KV TL; Bihar/ UP-Nepal 132 KV TLs
Medium Term Bilateral Agreement (Nepal and Bangladesh)	2	40 .00	Dhalkebar-Mujaffarpur, 400 KV TL;
Total	28	936 .72	

Source: NEA, 2025

RESULTS AND DISCUSSION

Major Challenges and Potentials in the Hydropower Sector of Nepal

Challenges

The problems of Nepal's hydropower are not only limited to technical barriers but also greeted with a host of challenges like political instability, financial uncertainty, institutional weakness, socio-economic sensitivity and regional geopolitical balance (Khatri, 2025). These pose structural barriers to the development and expansion of hydropower.

We can see five major structural challenges before the plan of energy development and export. First, political instability and lack of policy continuity have eroded the credibility of long-term project (Schafer, 2002). Second, in the mega projects, safety and financial credibility are the issues that increased risks to private sector and foreign investors (Kardes, et al., 2013). Third, complexities surrounding management of environmental and social impact caused equally sensitive questions like local acceptability, rehabilitation and balance of ecosystem (Burger, 2008). Fourth, the limited transmission and grid structures have created difficulty in expanding production and linking effectively to market access (Medina, et al., 2022). Fifth, the neighboring and regional geopolitical balance is linked to strategic dependency and concern of power equation for energy trade (He, 2008). All these issues are interrelated. To this, policy uncertainty created by political instability has adverse impact on timely investment, rising cost of project, socio-ecological conflict and additional pressure on transmission infrastructures. The actual transformation of hydropower potential is facing continuous challenges for lack of integrated, stable and strategic perspective.

Although Nepal aimed at speeding up production capacity, the lack of cross-border and domestic high-voltage corridors have caused multiple problems to ensure market to the produced power. The challenge of managing environmental and social impact is multi-dimensional (Celata & Sanna, 2019). The mega dam projects create huge impact on river-based local and economic structures and community life. Dearth of monitoring of the project site, fair compensation to the displaced persons, long-term plan of rehabilitation and a transparent process result in obstruction at local level, legal dispute and barriers. The ecological risk and community dissatisfaction delay the project construction and spread negative message for international investment.

The geopolitical relations with neighboring countries is a very sensitive and practical diplomatic challenge. Regional competitiveness of India and China pushes Nepal's mega

projects into a political dilemma. India has already informed that it would not buy the electricity generated from the China-funded project (Adhikari & Acharya, 2025). However, power trade with Bangladesh is likely to open up new market for Nepal's electricity. For it, India's agreement for transit and tri-lateral technical and security arrangement is essential. Smooth and well coordination at government level, guiding framework and commitment to long-term policy makes trilateral project successful. Otherwise, India's gatekeeping role will limit Nepal's ambition.

Recent studies and documents have exposed subtle but decisive challenges Nepal is facing. First, complexities over entry to regional energy market. Present manner requiring Nepal to adopt two models- bilateral agreement and G2G- for energy export are limited and challenging it itself. In the bilateral agreement, trade hindrances prevail over technical aspects. For example, once transmission load is high, the right to control power supply as per agreement lies solely to grid operator of importing country (Ghimire, et al., 2022). It ultimately jeopardizes exporters' status. Similarly, the change of tax, fee or import policy over a short time makes commercial gain uncertain.

Second, the political-diplomatic risk inherent in G2G. Such agreements are not based on market pace but on diplomatic understanding, so they do not ensure long-term stability. Dhungel, (2008) emphasizes the multi-purpose project of 6,480 MW said to be developed as per Mahakali Treaty (1996) is limited to paper till date.

Third, the financial and technical burden associated with the strategy of export via separate transmission line. It requires huge capital to construct such transmission line, for which Nepal's limited internal financial sources is insufficient (Dhakal, et al., 2021). Foreign investment and cooperation is imperative, but it comes with geopolitical dependency and unnecessary conditions.

Fourth, unclear regulation associated with role of private sector (Nepal, 2024). Although private sectors contribute significantly to power production, they want stability in power trade. Fifth, lack of regulatory coordination in regional cooperation. In order to institutionalize energy trade, the essential regulatory system is still in initial phase (Aryal & Dhakal, 2023). There is huge potential for common energy market in South Asia, but institutional development in the involving countries is uneven. It further creates erosion of transparency and trust. Therefore, the countries like Nepal have not been able to fully utilize the potential benefits that Nepali is entitled to from energy trade with other countries.

Another serious challenge is PPA (Tata & Nweke, 2025) and obstruction related to financial management. Since 2075BS, PPA has not been opened, resulting in long-term uncertainty hovering over hundreds of hydropower projects (My Republica, 2026); (Nepal Energy Forum, 2025). Meanwhile, the agreement for 15,000 MW has been opened, but projects of over 5,000 MW are waiting for agreement. In private sector's perspective, the problem lies in making NEA the sole purchaser because the commercial banks show unwillingness to provide loan at such condition. The government's efforts to impose "take and pay" model also seem impossible to materialize. All these indicate difficulty in securing investment, hindrance to project and discouragement to private sectors.

The technical and infrastructural obstructions are of no less significance. The testing equipment required for tunnel examination is not readily available in Nepal, as its import is constrained by regulatory bottlenecks, which function as structural barriers to infrastructure development (Bajgain, et al., 2025). The handover of complete projects is also being delayed, increasing interest rate. The rigorous rule imposed by government on report and transportation of explosives required for hydropower project has stalled the projects for long. Inadequacy of explosives not only slows construction but also increases cost.

Legal hurdle is another noteworthy challenge. It has been a commonplace to see court case and issuance of interim order in construction of hydropower and transmission line. Such legal orders halts progress, while some projects even lose license period. Currently, the projects of some 20,000 MW capacity are mired in legal disputes (My Republica, 2025). It has not only stalled projects but also jeopardized the security of huge investment.

Lack of coordination among government bodies is another pressing issue. Significant agencies like Energy Development Authority, NEA and Electricity Regulatory Commission are suffering dearth of coordination, thereby resulting in frequent fines to project developers. Once the government agencies themselves fail to maintain necessary coordination, the projects are not forwarding but getting stuck. It has caused negative impact in investors' trust and dwindling atmosphere for investment. Thus, Nepal's hydropower projects are facing challenges from multiple sides, which have caused insecurity in investment atmosphere. If such structural problems are not addressed effectively, it is clear that Nepal's hydropower potential remains limited to paper and opportunity to create prosperous Nepal eludes.

Potentials

Nepal's goals of energy development and achievement have taken a historic mode in recent years. Nepal, with strategic utilization of maximum potential of hydropower, will make itself

self-reliant and establish as an energy exporter in region. Such capacity is in deed a redefinition of policy making. The goal of long-term export to India, agreement with Bangladesh for energy export, growing participation of private sector, access to international climate fund and green investment are major opportunities created with this. These opportunities further elevate Nepal's status from energy producer to economic transformation, diplomatic balance and strategic effectiveness.

Long-term Export Agreement with India and Bangladesh

Nepal is poised to be self-reliant and emerge as a regional energy exporter by utilizing abundant potential of hydropower. Proper understanding and evaluation of long-term plan, international cooperation, participation of private sector and access to finance for renewable energy is imperative to fully unlock the potential. Most important opportunity among these is the long-term agreement on electricity export to India. Nepal has aimed at exporting 10,000 MW electricity to India till 2023 AD (The Economic Times, 2024). It has clarified Nepal's long-term direction on energy sector. Currently, nearly 500 MW electricity is being exported to India from Nepal via the 400KV Dhalkebar-Mujaffapur transmission line. However, construction of high capacity transmission infrastructures is essential to achieve the set goal. It is therefore urgent to complete Chaptakot-Gorakhpur, Inaruwa-Purniya and Hetauda-Bihar transmission lines, which would help materialize export of 10,000 MW energy to India.

Expansion of high capacity interstate transmission corridor, transparent market access and guarantee of financial mechanisms are equally essential to achieve the long-term goals. Construction of Dhalkebar-Mujaffapur transmission line, which prepares an initial base, has begun (Fiscal Nepal, 2026). Construction of 400 KV lines, expansion of proper sub-station and coordination of bilateral agency is awaited. It is necessary for Nepal to diversify financing and contract mechanism in view of India's reluctance to buy electricity generated from China-funded hydropower projects. To safely ensure Nepal's hydropower to Indian market, PPA, government guarantee and grid synchronization should be forwarded in a way banks feel it comfortable for investment. It also requires a long-term mechanism. Continuous rise of energy need in India, ecological crisis owing to coal-based fuel, rising attraction to renewable energy have, however, reinforced potential of Nepali hydropower to Indian market. The energy demand is projected to increase by 31 percent by 2030 in India (Luna Notes, 2026), which obviously requires a significant boost to clean energy. It finally paves way to long-term trade benefit and bolsters diplomatic effectiveness and regional strategy. Once the energy export to India is ensured interdependence-based transformation, Nepal's energy strategy would

be further sustainable, long-term and effective. Although energy trade between Nepal and Bangladesh is in initial phase, it also bears huge potential in a long run. For its transformation to a feasible and longstanding opportunity, the rights of transit via India should be guaranteed and the Nepal-India-Bangladesh trilateral legal and technical mechanism in place. Currently, preparation is underway to export 500 MW electricity to Bangladesh via Indian transmission line (ASIA, 2016). In view of rapid industrialization in Bangladesh and the energy demand at a rate of 8 to 10 percent, Nepal has the potential of reaping benefits with additional export of power. However, sustainable achievement lies in clarity in several technical aspects. If such issues are managed well, Nepal can permanently export energy to Bangladesh. Bangladesh will also ensure energy market to Nepal, thereby opening avenue for trilateral energy cooperation (Nepal-India-Bangladesh) in South Asia. Such development would not be limited to trade benefit but be expanded to a solid foundation of regional energy cooperation. The Nepal-Bangladesh energy corridor will further unlock Nepal’s potential to make emergence in the regional mechanisms like BIMSTEC and BBIN.

Table 14

Electricity Trade Dialogue with Bangladesh and India

S.N.	Date	Types of Dialogue	Remarks
1	3-4 Dec . 2018	Trade Dialogue of Power Sector	Nepal-Bangladesh
2	20-21 Jun . 2019	Trade Dialogue of Power Sector	Nepal-Bangladesh
3	13-14 Sept . 2021	Trade Dialogue of Power Sector	Nepal-Bangladesh
4	24-25 August 2022	Trade Dialogue of Power Sector	Nepal-Bangladesh
5	16 May 2023	40MW Electricity Trade Agreement	Nepal-Bangladesh
6	20 Nov . 2014	Trade Dialogue of Power Sector	Nepal-India
7	28-29 Jan . 2016	Trade Dialogue of Power Sector	Nepal-India
8	27-28 June 2016	Trade Dialogue of Power Sector	Nepal-India
9	13-14 Feb . 2017	Trade Dialogue of Power Sector	Nepal-India
10	16-17 April 2018	Trade Dialogue of Power Sector	Nepal-India
11	23-24 Jan . 2019	Trade Dialogue of Power Sector	Nepal-India
12	14-15 Oct . 2018	Trade Dialogue of Power Sector	Nepal-India
13	10-11 Dec . 2020	Trade Dialogue of Power Sector	Nepal-India
14	23-24 Feb . 2022	Trade Dialogue of Power Sector	Nepal-India
15	17-18 Feb . 2023	Trade Dialogue of Power Sector	Nepal-India
16	02 June,2023	25 Yrs LTA of PTA,1000MW Electricity Trade in 10 yrs, 40MW Electricity export to Bangladesh via Baharampur- Bhedemara Grid	Nepal-India

Source: MoEWRI, 2025

Transmission Infrastructure and Cooperation with China

Although Nepal does not have a direct energy trade with China, it bears huge potential. The proposal of construction of a trans-Himalayan transmission line is under discussion for long. Once the high-voltage line is constructed linking China via Tibet, Nepal has the potential to export energy to western belt of China. Such potential was reflected during former Prime Minister Pushpa Kamal Dahal's visit to China in September 2023, where he had signed an agreement with China on construction of 220 KW Chilime-Keyrong transmission line (Gyawali, et al., 2023).

The network expansion this way would help Nepal diversify its energy trade, going further from the current dependency on India. The market diversification is further linked to trade security which contributes to maintain geopolitical balance. The cooperation with Chinas also help in investment, technology transfer and grid modernization. It creates a solid base for Nepal to enter a trilateral or multilateral energy trade in a sustainable manner.

Energy Diplomacy as Strategic Priorities

In regards to the energy and hydro diplomacy in Nepal, its 15th periodic plan has prepared a base for elevating energy sector to a regional energy market from the status of focusing internal self-sufficiency (Lamichhane, 2023). The 16th periodic plan further bolstered that base for maximum strategic and result-oriented use of hydro diplomacy along with expansion of energy and infrastructures (*The Economic Frontline*, 2025). Both plans have common perspective on water resources as major means of economic prosperity, income of foreign currency and reduction of trade deficit. However, the 16th plan is further clear in goals, result indicators and structural preparation.

The 15th periodic plan's energy diplomacy was focused specially on creation of regional energy market and expansion of bilateral and multilateral cooperation. It paved way for Nepal to export energy to India and other neighbors through PPA. The New Butwal-Sunauli Transmission Line of 400 KV was forwarded as a 'game changer' under the MCA-Nepal (Neupane & Parajuli, 2024). It prioritized study and construction of a cross-border transmission line. Similarly, a strategy was adopted to produce export-oriented energy by constructing reservoir-based mega projects. For mitigating risk associated with international trade, concept of hedging fund was forwarded, which aimed at managing the risk of exchange rate. With this, Nepal had a clear policy on national transformation through energy sector that builds Nepal-India-China bilateral and trilateral cooperation.

The 16th periodic plan further broadened the previous scheme by aiming at augmenting energy and hydro diplomacy. It was structured and goal oriented. It had aimed at expanding international power trade not only to bilateral but also the regional and sub-regional markets. By defining hydropower export as a major source of foreign currency income, it adopted a clear policy to export additional power- after domestic consumption- to neighboring countries. Diversification of export markets to the potential countries has signaled an expansion of energy diplomacy beyond India, thereby securing broader geopolitical dimension through energy.

Infrastructure development is a major base of the 16th periodic plan, where upgrading of cross-border and transmission line is expected to lever energy exchange in huge amount. The long-term plan of Nepal to prepare necessary infrastructures for producing 28,500 MW hydropower in coming 12 years has contributed to the transformation of Nepal's energy diplomacy to an integrated model via energy production, transmission and export. It has established energy sector as a diplomatic tool based on value chain which is a significant stride from mere production of energy.

In regards to cooperation in water resources, the 16th periodic plan further makes a clear plan on sharing the cost and benefit in upper and lower streams. The multi-purpose and reservoir-based projects would be advanced via bilateral cooperation and national interest ensured safe through a robust hydro diplomacy. Thus, it has established hydro diplomacy not only as a medium of cooperation but also as a strategic instrument.

Budhigandaki, Upper Arun, Dudhkoshi, Nalsingadh and Naumure hydropower projects are defined as the 'game changer' ones (Nepalpage, 2023) ; (Spotlight, 2023); (The Kathmandu Post, 2026). The projects are expected to increase the export capacity by addressing the energy imbalance as per season. Energy security and diplomatic influence are strengthened by such projects. In addition to this, result targets are ambitious, for example, by the end of fiscal year, 2085/086, Nepal has aimed at earning foreign currency of Rs 41 billion from electricity export, while the export would stand at 5,500 MW per hour with 11,769 MW installed capacity and 9,356 circuit kilometer transmission line (The Annapurna Express, 2024). These projections are directly related to energy diplomacy. Similarly, energy sector is aimed at contributing 4 percent to the efforts of reducing trade deficit, thereby getting it directly associated with overall economy.

With this, it is obvious that the 15th periodic plan had created institutional, policy level and infrastructural foundation of energy and hydro diplomacy, which was further made elaborate by the 16th plan, giving special focus on quantitative goals and strategic depth. The

first phase focused on ‘capacity building and market access’ while ‘expansion, diversification and benefit maximization’ was in the second phase. It is a clear indication that Nepal’s energy and hydro diplomacy are being transformed to a medium of keeping regional energy balance and economic diplomacy from a medium of internal development.

Nepal has begun utilizing energy diplomacy as an integral part of foreign policy by stressing hydropower production, expansion of transmission line and electricity export. It finely articulates practical aspect of ‘energy statecraft’. The energy ties with India has been a major basis of strategic structure, where construction of trans-border transmission line, PPA and long-term export model, has provided Nepal with stable market access. The strategy to expand power trade to third countries via India has elevated Nepal from bilateral ties and integrated to a regional energy network. Although hugely dependent on India’s transit, the energy trade with Bangladesh is a solid example of practical transformation of energy cooperation in South Asia. It has further advanced Nepal into multilateral energy diplomacy.

Moreover, Nepal has made efforts to expand alternative diplomatic dimensions with project development on Chinese funding, infrastructure investment and technology transfer. It reflects a policy to maintain strategic balance in energy sector. The cooperation with multilateral institutions, international financial agencies and regional cooperation mechanism has developed Nepal’s energy from bilateral relations to international political economy. The foreign currency income, mitigation of trade loss, increase in investment flow through energy export and the goals of strengthening of economic stability are inherently linked to foreign policy. The hydropower projects are forwarded as national pride projects while transmission infrastructures (especially high capacity cross-border lines) expanded and integration of energy market focused by Nepal so that it would transform itself as an “energy-allied nation”.

However, this process is not free of geopolitical sensitivity and strategic complexities. Much dependency on India, lack of competitiveness with China and regional energy balance are challenges before Nepal’s energy diplomacy. The competition of international power in investment in energy project, ownership and access to market have pushed Nepal’s foreign policy to a state of critical balance. Therefore, Nepal’s hydropower diplomacy is not merely an economic opportunity but also associated to protection of strategic autonomy, expansion of multidimensional partnership and utmost guarantee of national interest. Overall, Nepal’s hydropower strategy is not simply limited to a medium of internal development but it is clear that it has been established as a dynamic and strategic tool centered on expansion of regional influence, consolidation of diplomatic access and restructure of foreign policy.

CONCLUSION

Although Nepal's hydropower has huge potential, unlocking its full potential faces multi-sectoral barriers like political instability, lack of policy continuity, structural weakness, financial insecurity, socio-ecological threats and limited transmission infrastructures. This research analyzes the data relating to such challenges, policy documents, bilateral agreements, annual reports and theoretical resources, thereby making clear that hydropower is not merely an economic or technical subject but an issue closely tied to the creation of national power, regional diplomacy and long-term strategic priorities. Although Nepal has been utilizing hydropower as a strategic tool from the view point of energy statecraft, it is yet to address the challenges like policy stability, commitment from leadership and regional dependency. The analyses of bilateral PPAs with India and Bangladesh, annual energy reports and trade dialogues show that Nepal forwarded the initiatives with strategic role of its hydropower in regional energy market (Lad & Jaybhaye, 2025). However, erratic weather pattern, limited network and grid capacity, and dispute surrounding socio-ecological aspects have posed serious challenges. It is indeed a practical test of energy statecraft, which ultimately exposes need of institutional strengthening and strategic evaluation of hydropower development. Finally, this study has reassessed Nepal's hydropower sector from multidimensional strategic perspective. Under the energy statecraft, the study has analyzed dimensions of national power, diplomacy and economic transformation, and identified strategic priorities, potentials and challenges. Nepal's hydropower development will not only contribute to growth in national production but also ensure a long-term strategic interest with robust links to regional cooperation, stability of political leadership and national independence.

IMPLICATION

The study's findings are pertinent to three distinct levels- institutional, diplomatic as well as theoretical level. The primary implication at the institutional level is that Nepal requires a long-lasting, cross-party system of energy governance, such as an independent energy commission whose members are legally shielded from election-related changes so that planning continuity can be maintained regardless of changes in government. The biggest reason for underachievement of transmission targets in the 15th Plan was not a shortage of resources supply; it was a coordination and continuity mismatch. Institutional reforms which consider leadership turnover as a mere variable in experiments of the management of other variables rather than a structural upheaval are the first and last things needed for everything else. At the

diplomatic level, Nepal's energy agreements with India and Bangladesh can be renegotiated so that they can move beyond only volume-based commitments and instead finalize setup agreements which acknowledge transmission sovereignty explicitly, dispute resolution mechanisms, and pricing review provisions. The current power purchase agreements favor mainly the selling right achievement - that is, being able to sell - without provisions for the circumstances under which the exercise of that right can be made. Bangladesh's reliance on Indian transmission corridors for power from Nepal is a structural weakness that affects both buyer and seller; yet, a trilateral technical arrangement - no matter how difficult politically - would be able to reduce this vulnerability much better, than just bilateral agreements alone. On a theoretical level, the interaction of this research with the energy statecraft system uncovers a gap that should be identified. Blackwill and Harris (2016) designed their structure mostly referencing major or middle powers — states that have enough institutional capacity to intentionally carry out strategic energy policy. Nepal's example shows that the fundamental logic of the structure is valid even for countries with lower state capacity levels, but it also indicates that changes are needed: in particular, the concept of an institutional sufficiency threshold, i.e. a minimum governance capacity, below which energy resources cannot be weaponized or exploited effectively but on the contrary become a source of vulnerability to more institutionally capable neighboring countries. Further development of this threshold idea can lead comparative studies on energy statecraft in developing and landlocked states of South and Southeast Asia to fruitful results.

Comparative methods should generally be the next natural step for researchers. They can determine whether Bhutan's more centralized hydroelectric governance structure has actually produced better results in energy statecraft, or whether Laos's position regarding Chinese-financed hydropower would be more of a warning or a parallel example. Nepal's case is the most notable in the region due to its intricacy and numerous facets. However, there would be very few lessons to be learned without regional comparison.

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