India's Cross-Border Energy Trade in South Asia

Regional Energy Security, Geopolitical Dynamics and Sustainable Integration

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Abstract**—***This paper investigates the role of cross-border energy trade in strengthening India's energy security and regional cooperation in South Asia. Using a qualitative and analytical approach, it examines geopolitical, economic, and infrastructural dimensions of regional energy integration, with special focus on the BBIN framework and the Northeastern Region of India as an emerging electricity trading hub. The study finds that regional energy cooperation can diversify India's energy sources, support renewable energy transition, reduce carbon emissions, and enhance economic integration. It concludes that strategic infrastructure development, balanced diplomacy, and sustainable regional partnerships are essential for ensuring long-term energy security and regional stability.*

Keywords**—***Cross-Border Energy Trade; Energy Security; South Asia; Regional Energy Integration; Renewable Energy Cooperation.*

1. Introduction

South Asia continues to face persistent energy insecurity despite possessing vast renewable energy resources, particularly hydropower potential in countries such as Nepal and Bhutan. Rapid economic growth, population expansion, and increasing industrialization have intensified energy demand across the region, while dependence on imported fossil fuels has exposed states to global market volatility and geopolitical uncertainties. In this context, cross-border energy trade has emerged as a significant strategy for strengthening regional energy security, promoting economic cooperation, and accelerating the transition toward sustainable energy systems (International Energy Agency [IEA], 2023).

Regional energy integration offers multiple benefits, including diversification of energy sources, reduction of supply risks, lower electricity generation costs, and improved grid stability through interconnected power systems (South Asian Association for Regional Cooperation [SAARC], 2022). The development of regional transmission corridors and power-sharing arrangements can also facilitate the efficient utilization of renewable energy resources, particularly hydropower and solar energy, thereby contributing to climate change mitigation and reduced carbon emissions (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021). Furthermore, enhanced energy cooperation can stimulate regional trade, investment, and economic interdependence among South Asian nations.

India occupies a central position in this process due to its geographical location, expanding energy demand, and technological capabilities. By promoting initiatives such as the BBIN framework and investing in cross-border electricity infrastructure, India can strengthen regional energy cooperation while securing reliable and diversified energy supplies for its growing economy. The Northeastern Region of India, strategically located near Bangladesh, Bhutan, and Myanmar, possesses significant potential to emerge as a regional electricity trading hub (Government of India, Ministry of Power, 2023).

Despite these opportunities, the establishment of an integrated South Asian energy market faces considerable challenges, including high infrastructure costs, regulatory inconsistencies, political sensitivities, and the absence of

coordinated regional policies. These barriers continue to limit the full realization of regional energy integration. Therefore, this study examines the opportunities and challenges of cross-border energy trade in South Asia, with particular emphasis on its implications for India's evolving energy security framework and regional economic cooperation.

2. *Literature Review*

The issue of cross-border energy trade in South Asia has attracted growing scholarly attention due to the region's increasing energy demand, uneven distribution of natural resources, and the strategic importance of regional cooperation. Early studies on South Asian energy security primarily focused on the challenges of fossil fuel dependency, inadequate domestic production, and limited regional coordination. Researchers argued that the absence of integrated energy infrastructure and political mistrust among neighboring countries significantly constrained regional energy cooperation (Kumar, 2015).

Subsequent studies emphasized the economic and environmental benefits of regional power integration. Scholars such as Wijayatunga and Fernando highlighted that interconnected regional electricity markets could reduce overall generation costs and improve energy efficiency by enabling countries to utilize comparative advantages in hydropower, natural gas, and renewable energy resources (Wijayatunga & Fernando, 2013). Similarly, research conducted by the Asian Development Bank demonstrated that regional electricity trade could enhance energy access, strengthen grid reliability, and reduce carbon emissions through the increased use of renewable energy sources (Asian Development Bank [ADB], 2020).

Several researchers have specifically examined India's role in promoting regional energy cooperation. Studies on the BBIN initiative and India's cross-border electricity trade policies suggest that India's strategic geographical position and expanding energy market make it the central actor in South Asian energy integration (Government of India, Ministry of Power, 2023). Researchers have also explored the significance of the Northeastern Region of India as a potential energy corridor linking South Asia with Southeast Asia. These studies argue that the region possesses strong potential for hydropower development and electricity transmission, which could facilitate broader regional economic integration (Baruah, 2018).

More recent literature has focused on the geopolitical dimensions of energy connectivity, particularly in the context of China's growing influence in regional infrastructure projects and the emergence of new economic corridors such as the India-Middle East-Europe Economic Corridor. Scholars contend that cross-border energy infrastructure has become closely linked with strategic competition, regional diplomacy, and economic security (Singh, 2022). At the same time, critics highlight persistent barriers such as political instability, financing constraints, regulatory differences, and concerns regarding overdependence on neighboring countries for energy supplies (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021).

Overall, the existing literature recognizes cross-border energy trade as an important mechanism for strengthening regional energy security, promoting renewable energy integration, and fostering economic cooperation in South Asia. However, significant gaps remain regarding the long-term sustainability, geopolitical implications, and institutional mechanisms necessary for building a fully integrated regional energy market. This study seeks to contribute to this growing body of research by critically examining the opportunities and challenges of cross-border energy trade with particular reference to India's evolving energy security strategy.

3. *Methodology*

This study adopts a qualitative and analytical research methodology to examine the role of cross-border energy trade in enhancing India's energy security within the South Asian region. The research is primarily based on secondary sources of data, including government reports, policy documents, academic journals, books,

regional energy agreements, and publications from international organizations such as the International Energy Agency (IEA), Asian Development Bank (ADB), SAARC Energy Centre, and the United Nations. The study also reviews official policy frameworks related to cross-border electricity trade and regional energy cooperation in South Asia.

The research follows a descriptive and comparative approach to analyze the existing energy landscape of South Asian countries, particularly focusing on India, Bangladesh, Bhutan, Nepal, and Myanmar. Special emphasis is placed on examining regional initiatives such as the BBIN framework, bilateral electricity trade agreements, and regional grid connectivity projects. The study further evaluates the economic, geopolitical, and environmental dimensions of cross-border energy integration, including the potential of renewable energy resources and the strategic significance of India's Northeastern Region as a regional electricity trading hub.

To assess the effectiveness of regional energy cooperation, the paper investigates key factors such as infrastructure development, regulatory frameworks, political relations, and energy security concerns. Comparative analysis is used to identify both opportunities and challenges associated with regional energy integration. In addition, the study considers the broader geopolitical context shaped by emerging international energy corridors and shifting global energy dynamics.

The methodology aims to provide a comprehensive understanding of how cross-border energy trade can contribute to sustainable energy security, regional economic cooperation, and climate goals while also identifying the limitations and policy challenges that may hinder the development of an integrated South Asian energy market.

4. *Results and Discussions*

The findings of this study indicate that cross-border energy trade has emerged as a crucial mechanism for strengthening regional energy security and economic interdependence in South Asia. The region continues to experience increasing energy demand driven by rapid industrialization, urbanization, and population growth, while domestic energy production remains insufficient to meet future requirements. As a result, South Asian countries, particularly India, remain highly dependent on imported fossil fuels, exposing their economies to global price fluctuations, geopolitical instability, and supply-chain disruptions (International Energy Agency [IEA], 2023). The study reveals that regional energy integration through interconnected electricity grids and cross-border power trade can significantly reduce these vulnerabilities by diversifying energy sources and promoting access to renewable energy resources available within neighboring countries.

India occupies a central position within the South Asian energy landscape due to its rapidly growing energy consumption and strategic geographical location. According to projections by the International Energy Agency, India is expected to account for one of the largest increases in global energy demand over the coming decades (International Energy Agency [IEA], 2021). However, India's heavy dependence on imported crude oil, natural gas, and coal continues to create substantial energy security concerns. The analysis demonstrates that regional cooperation with countries such as Bhutan, Nepal, Bangladesh, and Myanmar offers opportunities to diversify India's energy portfolio through the import of hydropower and other renewable energy resources. This approach aligns with previous studies which argued that regional electricity trade can lower overall energy system costs, enhance grid reliability, and support sustainable development goals (Wijayatunga & Fernando, 2013).

The study further identifies that regional energy interdependence contributes not only to energy security but also to political and economic cooperation. Cross-border electricity trade promotes mutual dependence among neighboring countries, thereby encouraging diplomatic engagement, infrastructure investment, and regional stability. Existing bilateral and

multilateral arrangements under the BBIN framework demonstrate the growing importance of energy connectivity within South Asia (Government of India, Ministry of Power, 2023). In particular, Bhutan and Nepal possess significant hydropower potential capable of supplying clean electricity to India and Bangladesh, while India's Northeastern Region can function as a strategic energy corridor connecting South Asia with Southeast Asia.

Despite these opportunities, the findings also reveal substantial barriers to regional energy integration. These include inadequate transmission infrastructure, regulatory inconsistencies, financing constraints, and political mistrust among regional states. The high capital costs associated with developing transnational power grids and harmonizing national energy regulations remain major obstacles to the creation of an integrated regional energy market (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021). Moreover, excessive dependence on external energy supplies may create new strategic vulnerabilities if regional political relations deteriorate. Therefore, while cross-border energy trade offers considerable economic and environmental benefits, a balanced approach combining regional cooperation with domestic energy development remains essential.

The results of this research are broadly consistent with earlier studies conducted by the Asian Development Bank and the United Nations Economic and Social Commission for Asia and the Pacific, which emphasized that regional power connectivity can reduce electricity shortages, lower carbon emissions, and improve energy accessibility across South Asia (Asian Development Bank [ADB], 2020). However, this study further contributes by emphasizing the geopolitical significance of emerging energy corridors and the strategic role of India's Northeastern Region in facilitating regional energy integration.

Table 1: India's Energy Import Dependency

Energy	Estimated Import Dependency	Major Import Regions
Crude Oil	85%	Middle East, Russia
Natural Gas	50%	Qatar, Australia
Coal	25%	Indonesia, Australia
Renewable Energy Imports (Hydropower)	Increasing	Bhutan, Nepal

Source: International Energy Agency (2023); Ministry of Power, Government of India (2023).

Table 2: Hydropower Potential in Selected South Asian Countries

Country	Estimated Hydropower Potential (MW)	Current Utilization (%)
Bhutan	30,000	10%
Nepal	40,000	5%
India (Northeast)	58,000	15%
Myanmar	100,000	8%

Source: Asian Development Bank (2020); SAARC Energy Centre (2022).

Overall, the results demonstrate that regional energy interdependence can serve as an effective strategy for addressing South Asia's energy deficits while simultaneously promoting economic integration, renewable energy transition, and long-term regional stability. Nevertheless, the success of such integration depends on sustained political cooperation, institutional coordination, and investment in cross-border infrastructure.

5. South Asia's Energy Resource Landscape

South Asia possesses a diverse and unevenly distributed energy resource base that creates substantial opportunities for regional energy cooperation and cross-border trade. The region contains abundant hydropower, natural gas, coal, solar, and wind energy resources; however, these resources are concentrated in different countries, resulting in varying levels of energy availability and dependence. This unequal distribution of resources highlights the importance of regional

energy integration, as countries with surplus energy potential can complement the deficits of neighboring states (Asian Development Bank [ADB], 2020).

Hydropower represents one of the most significant renewable energy resources in South Asia, particularly in Nepal and Bhutan. Nepal possesses an estimated hydropower potential of more than 80,000 MW, of which nearly 40,000 MW is considered economically feasible (Government of Nepal, Ministry of Energy, 2023). Similarly, Bhutan has an estimated hydropower potential of approximately 30,000 MW, with substantial capacity already being exported to India through bilateral electricity agreements (Government of Bhutan, Ministry of Economic Affairs, 2023). These hydropower resources are strategically important because they provide reliable and clean energy capable of supporting regional electricity demand while contributing to carbon emission reduction goals.

The study finds that hydropower cooperation between India, Nepal, and Bhutan has already demonstrated the economic and environmental advantages of cross-border electricity trade. Bhutan's hydropower exports to India constitute a major source of national revenue, while India benefits from access to relatively low-cost renewable electricity (International Energy Agency [IEA], 2023). Furthermore, expanding hydropower connectivity within the BBIN framework could significantly strengthen regional grid stability and renewable energy integration.

In contrast to hydropower-rich Himalayan countries, Bangladesh and Myanmar possess considerable natural gas reserves that contribute to the regional energy mix. Bangladesh has historically relied on domestic natural gas for electricity generation and industrial development, although declining reserves and increasing demand have led to rising imports of liquefied natural gas (LNG) (Bangladesh Energy Regulatory Commission [BERC], 2022). Myanmar also possesses substantial natural gas resources and has emerged as an important energy exporter within the region. These gas resources can complement renewable energy development by providing stable transitional energy supplies necessary for balancing intermittent solar and wind generation.

South Asia also contains significant coal reserves, particularly in India, which continues to rely heavily on coal for electricity generation despite increasing investments in renewable energy. India remains the largest producer and consumer of coal in the region, reflecting the continued importance of thermal power in meeting industrial and urban electricity demand (Ministry of Coal, Government of India, 2024). However, concerns regarding environmental degradation and climate change have accelerated investments in solar and wind energy across South Asia.

The findings of this study indicate that renewable energy development is expanding rapidly throughout the region. India has emerged as a global leader in solar energy deployment through initiatives such as the National Solar Mission, while wind energy projects have expanded significantly in western and southern India (Ministry of New and Renewable Energy, Government of India, 2024). Bangladesh and Sri Lanka have also increased investments in solar power to improve rural electrification and reduce fossil fuel dependence. These developments demonstrate the growing regional transition toward sustainable energy systems.

Table 3: Comparative Energy Resource Distribution in South Asia

Country	**Major Energy Resources**	**Estimated Potential/Reserve**
India	Coal, Solar, Wind	344 billion tonnes coal reserves; 750 GW solar potential
Nepal	Hydropower	83,000 MW hydropower potential
Bhutan	Hydropower	30,000 MW hydropower potential
Bangladesh	Natural Gas, Solar	11.4 trillion cubic feet gas reserves
Myanmar	Natural Gas, Hydropower	Significant offshore gas reserves
Sri Lanka	Wind, Solar	High coastal wind potential

Source: International Energy Agency (2024); Asian Development Bank (2023); Government Energy Reports.

The comparative analysis demonstrates strong complementarities among South Asian energy resources. Hydropower from Nepal and Bhutan can provide clean baseload electricity to India and Bangladesh, while natural gas resources in Bangladesh and Myanmar can support industrial growth and energy stability. Simultaneously, India's expanding solar and wind capacities can contribute to regional renewable energy markets through interconnected transmission networks (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2022).

The study further reveals that regional energy integration could reduce overall energy system costs by enabling countries to specialize according to their comparative energy advantages. Previous research by the Asian Development Bank similarly concluded that integrated regional electricity markets could significantly improve energy efficiency, reduce dependence on imported fossil fuels, and strengthen long-term energy security (Asian Development Bank [ADB], 2021).

Despite these opportunities, several challenges continue to hinder full regional energy integration, including inadequate transmission infrastructure, financing constraints, political tensions, and regulatory differences among South Asian countries. Nevertheless, the region's complementary resource structure provides a strong foundation for expanding cross-border energy trade and achieving sustainable regional energy cooperation.

6. *Historical Evolution of Cross-Border Energy Trade*

The historical evolution of cross-border energy trade in South Asia reflects the gradual transformation of regional energy diplomacy from limited bilateral arrangements to broader sub-regional and multilateral cooperation frameworks. Initially, energy cooperation in South Asia was primarily driven by bilateral agreements aimed at addressing immediate energy shortages and promoting economic development. Over time, increasing energy demand, concerns regarding energy security, and the global transition toward sustainable energy systems encouraged South Asian countries to pursue more integrated and cooperative approaches to regional energy connectivity (Asian Development Bank [ADB], 2020).

One of the earliest and most successful examples of regional energy cooperation emerged through India–Bhutan hydropower collaboration. Since the 1960s, India has played a central role in financing and developing hydropower projects in Bhutan, including major projects such as Chukha, Tala, and Mangdechhu (Government of Bhutan, 2022). These projects enabled Bhutan to utilize its vast hydropower resources while providing India with a reliable source of clean electricity. The partnership not only strengthened bilateral relations but also demonstrated the economic and strategic potential of cross-border electricity trade in South Asia. This model later influenced similar cooperation initiatives with Nepal and Bangladesh.

Another important dimension of regional energy diplomacy developed through pipeline projects and energy transit negotiations, often referred to as "pipeline diplomacy." Proposed projects such as the Turkmenistan–Afghanistan–Pakistan–India (TAPI) gas pipeline and the Iran–Pakistan–India pipeline highlighted the growing recognition of energy connectivity as a strategic and geopolitical instrument (Singh, 2022). Although many of these projects faced delays due to political instability, security concerns, and geopolitical rivalries, they reflected the increasing importance of regional cooperation in securing long-term energy supplies.

The institutionalization of regional energy cooperation gained momentum with the establishment of the South Asian Association for Regional Cooperation (SAARC) Energy Centre and the adoption of regional energy frameworks. SAARC initiatives sought to promote energy sharing, grid interconnection, and coordinated energy policies among member states (South Asian Association for Regional Cooperation [SAARC], 2021). However, political tensions between major regional actors often limited the

effectiveness of SAARC-led cooperation. As a result, South Asia gradually witnessed a shift from broad regionalism toward sub-regional frameworks that were more flexible and economically focused.

This transition became more evident through the emergence of the BBIN (Bangladesh, Bhutan, India, and Nepal) initiative and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC). These frameworks emphasized practical cooperation in electricity trade, transport connectivity, and infrastructure development while avoiding some of the political complexities associated with larger regional organizations (Government of India, Ministry of External Affairs, 2023). BBIN, in particular, strengthened cross-border electricity trade involving hydropower exports from Bhutan and Nepal to India and Bangladesh. Similarly, BIMSTEC expanded the strategic dimension of regional energy cooperation by linking South Asia with Southeast Asia, thereby increasing the geopolitical significance of India's Northeastern Region as an emerging energy corridor.

The evolution of cross-border energy trade in South Asia demonstrates that regional energy diplomacy has increasingly become intertwined with geopolitical competition, economic integration, and strategic influence. Energy infrastructure projects are now viewed not only as economic ventures but also as instruments of regional power projection and connectivity (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021). Consequently, India's energy diplomacy has evolved from a primarily bilateral approach toward a broader strategy of sub-regional integration aimed at enhancing energy security, strengthening regional partnerships, and counterbalancing external geopolitical influences within the Indo-Pacific region.

7. Institutional and Policy Frameworks

The development of cross-border energy trade in South Asia has increasingly depended on the establishment of institutional mechanisms and policy frameworks designed to promote regional energy cooperation, regulatory coordination, and infrastructure connectivity. Over the past two decades, South Asian countries have gradually recognized that effective governance structures are essential for ensuring energy security, facilitating electricity trade, and integrating renewable energy resources across national borders. However, despite significant policy advancements, regional energy governance continues to face challenges arising from political tensions, regulatory inconsistencies, and strategic competition (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021).

The South Asian Association for Regional Cooperation (SAARC) Energy Centre represented one of the earliest institutional efforts aimed at promoting regional energy collaboration. Established to encourage research, policy coordination, and technical cooperation among member states, the SAARC Energy Centre sought to create a framework for regional electricity trade and energy connectivity (South Asian Association for Regional Cooperation [SAARC], 2022). Its initiatives focused on energy efficiency, renewable energy development, and regional grid integration. Nevertheless, the effectiveness of SAARC-led energy cooperation remained constrained by broader geopolitical tensions within the region, particularly the strained political relations between major member states. As a result, the organization struggled to transform policy discussions into fully operational regional energy markets.

In response to these limitations, sub-regional frameworks such as BIMSTEC and BBIN emerged as more flexible and pragmatic mechanisms for advancing energy cooperation. The BIMSTEC Energy Grid Master Plan represents a significant attempt to strengthen electricity connectivity between South Asia and Southeast Asia through the development of regional transmission infrastructure (BIMSTEC Secretariat, 2022). The framework emphasizes power grid interconnection, renewable energy integration, and coordinated energy planning among member states bordering the Bay of Bengal. BIMSTEC's strategic significance

extends beyond energy cooperation, as it also supports broader geopolitical objectives related to regional connectivity and Indo-Pacific economic integration.

Similarly, the BBIN initiative has become a major platform for promoting cross-border electricity trade within the eastern sub-region of South Asia. Through bilateral and trilateral agreements, BBIN has facilitated the export of hydropower from Bhutan and Nepal to India and Bangladesh while improving regional transmission connectivity (Government of India, Ministry of External Affairs, 2023)**.** These arrangements demonstrate the gradual transition from traditional bilateral energy diplomacy toward sub-regional market integration based on shared economic interests and infrastructure cooperation. The BBIN framework also highlights the growing strategic importance of India's Northeastern Region as a regional energy transit corridor connecting neighboring countries.

India's Cross-Border Electricity Trade (CBET) Guidelines constitute one of the most significant policy developments in regional energy governance. Initially introduced to regulate electricity imports and exports, the CBET framework evolved over time to encourage greater market participation, private sector involvement, and regional power exchange mechanisms (Government of India, Ministry of Power, 2021). The policy reforms reflected India's broader objective of positioning itself as the central hub of South Asian electricity trade while promoting regional energy integration and grid stability.

The evolution of the CBET framework illustrates India's gradual shift toward liberalization and market-oriented energy cooperation. Earlier regulatory approaches primarily emphasized government-to-government transactions and strategic oversight, whereas subsequent reforms introduced greater flexibility for power traders, distribution companies, and private market participants (Asian Development Bank [ADB], 2020)**.** These changes supported the development of competitive electricity markets and enabled neighboring countries to access India's energy exchanges and transmission networks more efficiently. At the same time, the regulatory framework sought to maintain strategic control over energy infrastructure and cross-border transactions in order to safeguard national security interests.

Despite the liberalization of regional electricity trade, India's CBET policies continue to reflect concerns regarding strategic sensitivities and energy dependence. Regulatory provisions concerning ownership structures, transmission access, and approval mechanisms demonstrate the state's cautious approach toward external participation in critical energy infrastructure (Singh, 2022). Such concerns have become increasingly relevant in the context of shifting geopolitical dynamics, external investments in regional infrastructure, and growing strategic competition within the Indo-Pacific region. Consequently, India's cross-border energy policies attempt to balance economic integration with national security considerations.

Overall, the institutional and policy frameworks governing cross-border energy trade in South Asia reveal both progress and persistent limitations. While organizations such as SAARC, BIMSTEC, and BBIN have strengthened regional dialogue and infrastructure cooperation, the success of regional energy integration ultimately depends on sustained political trust, regulatory harmonization, and long-term institutional coordination. The findings suggest that effective governance mechanisms remain essential for transforming South Asia into a stable and interconnected regional energy market capable of addressing future energy security and sustainability challenges.

8. Geopolitical and Economic Dimensions of Cross-Border Energy Trade

Cross-border energy trade in South Asia has evolved beyond a purely economic activity and increasingly represents an important component of regional geopolitics, strategic competition, and connectivity diplomacy. The development of transnational energy infrastructure, including hydropower projects, electricity transmission corridors, and regional power grids, has become closely linked with questions of political

influence, economic integration, and regional security (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021). As South Asian countries attempt to address rising energy demand and transition toward sustainable energy systems, energy cooperation has simultaneously emerged as a tool of diplomacy and geopolitical engagement.

India occupies a central strategic position in the regional energy architecture due to its geographical location, rapidly growing economy, and expanding energy requirements. As the largest energy consumer in South Asia, India has actively pursued regional energy integration through bilateral agreements, sub-regional initiatives such as BBIN, and broader frameworks like BIMSTEC (Government of India, Ministry of External Affairs, 2023). India's strategy seeks to diversify its energy sources, enhance regional grid stability, and strengthen political and economic ties with neighboring countries through infrastructure connectivity and electricity trade. Hydropower imports from Bhutan and Nepal, along with electricity trade arrangements involving Bangladesh and Myanmar, illustrate India's effort to establish itself as the primary hub of regional energy exchange.

At the same time, India's regional energy diplomacy is shaped by wider geopolitical considerations, particularly the growing influence of China in South Asian infrastructure development. China's investments in energy projects, transmission networks, ports, and transportation corridors under the Belt and Road Initiative (BRI) have significantly expanded its strategic presence across South Asia (Singh, 2022). Countries such as Nepal, Bangladesh, Sri Lanka, and Pakistan have increasingly engaged with Chinese-funded infrastructure projects, including energy facilities and connectivity corridors. This expanding presence has intensified strategic competition between India and China, particularly regarding influence over critical regional infrastructure and trade routes.

The geopolitical significance of cross-border energy trade is further reflected in the emergence of connectivity diplomacy. Energy infrastructure projects are now viewed as instruments for enhancing regional influence, promoting economic partnerships, and securing long-term strategic interests. Initiatives such as the BIMSTEC Energy Grid Master Plan and the India-Middle East-Europe Economic Corridor demonstrate how energy connectivity has become integrated into broader geopolitical and economic strategies (BIMSTEC Secretariat, 2022). India's emphasis on strengthening energy connectivity through its Northeastern Region also reflects efforts to improve access to Southeast Asian markets while counterbalancing external strategic influence in the Indo-Pacific region.

Infrastructure politics plays a particularly important role in shaping regional energy cooperation. Control over transmission corridors, hydropower investments, and regional electricity networks carry both economic and strategic value. Consequently, infrastructure development often becomes intertwined with issues of sovereignty, financing, and political alignment (Asian Development Bank [ADB], 2020). While regional energy projects can enhance cooperation and interdependence, they may also generate concerns regarding external influence, debt dependency, and strategic vulnerabilities. These concerns are especially significant for smaller South Asian countries seeking to balance economic opportunities with national autonomy.

Despite geopolitical competition, the economic benefits of regional energy integration remain substantial. The findings of this study indicate that interconnected regional electricity markets can reduce energy costs, improve efficiency, and optimize the utilization of renewable energy resources across South Asia (Wijayatunga & Fernando, 2013). Countries with surplus hydropower potential, such as Bhutan and Nepal, can generate revenue through electricity exports, while energy-deficient countries such as Bangladesh and India can access cleaner and more reliable sources of electricity. Regional power trade also contributes to improved grid reliability, reduced energy shortages, and lower carbon emissions through greater renewable energy integration.

Furthermore, cross-border energy trade strengthens economic interdependence among neighboring states by encouraging investment, trade, and long-term infrastructure cooperation. Economic interdependence can contribute to regional stability by creating mutual incentives for cooperation and reducing the likelihood of conflict (Keohane & Nye, 2012). However, the success of such integration depends on political trust, transparent governance mechanisms, and equitable distribution of economic benefits among participating countries.

Overall, the geopolitical and economic dimensions of cross-border energy trade demonstrate that regional energy cooperation in South Asia is shaped by a complex interaction of strategic interests, infrastructure politics, and economic objectives. While regional energy integration offers significant opportunities for strengthening energy security and economic development, it also reflects broader geopolitical competition and evolving patterns of regional power politics. Consequently, effective energy diplomacy and balanced regional governance remain essential for ensuring that cross-border energy trade contributes to long-term regional stability and sustainable development.

9. Challenges and Constraints

Despite the growing importance of cross-border energy trade in South Asia, the development of an integrated regional energy market continues to face numerous structural, political, and economic challenges. Although regional energy cooperation offers substantial benefits in terms of energy security, renewable energy integration, and economic interdependence, several persistent barriers continue to limit the effectiveness and expansion of regional connectivity initiatives (Asian Development Bank [ADB], 2020). These challenges are closely linked to infrastructure limitations, regulatory fragmentation, geopolitical tensions, financing constraints, and environmental concerns.

One of the most significant obstacles to regional energy integration is the inadequate development of cross-border energy infrastructure. South Asia continues to suffer from insufficient transmission networks, limited grid interconnectivity, and inadequate energy storage capacity (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021). Many regional power projects require the construction of expensive transmission corridors across difficult geographical terrains, particularly in the Himalayan and Northeastern regions. The absence of modernized and synchronized regional power grids restricts the efficient transfer of electricity between countries and increases transmission losses. Furthermore, infrastructure bottlenecks delay the full utilization of hydropower potential in countries such as Bhutan and Nepal, thereby limiting the growth of regional electricity trade.

Regulatory and policy barriers also remain major constraints to effective cross-border energy cooperation. South Asian countries maintain differing legal frameworks, energy pricing systems, market regulations, and institutional structures, which complicate regional coordination and market integration (Government of India, Ministry of Power, 2021). Although India's Cross-Border Electricity Trade (CBET) Guidelines have introduced greater liberalization and market access, regulatory inconsistencies across neighboring countries continue to hinder seamless electricity exchange. The lack of harmonized technical standards, dispute-resolution mechanisms, and regional governance institutions further complicates the implementation of long-term energy agreements. These challenges demonstrate the continuing gap between policy ambitions and institutional capacity within the region.

Political tensions and security concerns constitute another major limitation to regional energy cooperation. Historical mistrust, border disputes, and geopolitical rivalries among South Asian states often disrupt efforts toward regional integration (Singh, 2022). Energy infrastructure projects, particularly those involving strategic transmission corridors and transnational pipelines, are frequently influenced by broader diplomatic relations and national security considerations. India's regional energy policies, for example,

reflect concerns regarding strategic vulnerabilities, external influence, and dependence on neighboring countries for critical energy supplies. Similarly, the growing involvement of China in regional infrastructure projects has intensified strategic competition and infrastructure politics within South Asia. Consequently, energy cooperation often becomes intertwined with geopolitical calculations rather than purely economic objectives.

Financial and investment-related challenges also significantly affect the expansion of cross-border energy trade. Large-scale energy infrastructure projects require substantial long-term capital investment, advanced technological expertise, and coordinated financing mechanisms (World Bank, 2022). Many South Asian countries face difficulties in mobilizing sufficient domestic resources to support the construction of transmission lines, hydropower facilities, and grid modernization projects. Political instability, regulatory uncertainty, and investment risks further discourage private sector participation and foreign investment in regional energy projects. Although international organizations such as the Asian Development Bank and the World Bank have supported regional connectivity initiatives, financing gaps remain a major obstacle to large-scale implementation.

In addition to economic and political barriers, environmental and social concerns increasingly shape debates surrounding cross-border energy projects. Large hydropower developments, particularly in ecologically sensitive regions such as the Himalayas and Northeast India, may result in deforestation, biodiversity loss, displacement of local communities, and ecological disruption (International Union for Conservation of Nature [IUCN], 2021). Critics argue that the pursuit of regional energy integration should not compromise environmental sustainability or the rights of indigenous and local populations. Furthermore, climate-related risks such as glacial melting, flooding, and changing rainfall patterns may affect the long-term viability of hydropower-based regional energy systems. These concerns highlight the importance of adopting environmentally sustainable and socially inclusive approaches to regional energy development.

The findings of this study suggest that while cross-border energy trade possesses significant potential for strengthening regional energy security and economic cooperation, its success depends upon addressing these multidimensional constraints through coordinated regional governance, political trust-building, infrastructure investment, and sustainable policy planning. Without resolving these structural and geopolitical challenges, the vision of an integrated South Asian energy market may remain limited in both scale and effectiveness.

10. Prospects for Regional Energy Integration

The future of cross-border energy trade in South Asia presents significant opportunities for strengthening regional energy security, accelerating economic integration, and supporting the transition toward sustainable energy systems. As energy demand across the region continues to rise, South Asian countries are increasingly recognizing the importance of cooperative energy strategies based on renewable energy development, integrated infrastructure, and regional electricity markets (Asian Development Bank [ADB], 2020). The growing global emphasis on decarbonization and climate resilience further enhances the strategic relevance of regional energy integration within South Asia.

One of the most promising areas of future cooperation lies in renewable energy integration. South Asia possesses substantial renewable energy potential, particularly in hydropower, solar, wind, and hydroelectric resources distributed unevenly across the region. Countries such as Bhutan and Nepal possess abundant hydropower capacity, while India has rapidly expanded its solar and wind energy sectors (International Energy Agency [IEA], 2023). Cross-border electricity trade can enable these complementary energy resources to be shared more efficiently, thereby reducing dependence on imported fossil fuels and supporting long-term energy sustainability. Regional cooperation in renewable energy development also creates opportunities for technology transfer, joint

investments, and coordinated climate action among neighboring states.

The development of integrated regional grid connectivity represents another major prospect for regional energy integration. Interconnected transmission networks and synchronized power systems can improve electricity reliability, reduce supply shortages, and facilitate efficient energy distribution across national boundaries (BIMSTEC Secretariat, 2022)**.** The expansion of regional power grids under frameworks such as BIMSTEC and BBIN can strengthen energy exchange between South Asia and Southeast Asia while improving grid stability and reducing overall energy costs. Enhanced connectivity would also allow countries with surplus electricity generation to export energy to deficit regions during periods of high demand, thereby increasing the overall resilience of regional energy systems.

Regional energy integration also plays an important role in supporting energy transition and decarbonization strategies. South Asian countries remain heavily dependent on coal, oil, and natural gas imports, contributing to environmental degradation and vulnerability to global market fluctuations (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2021)**.** By promoting cross-border renewable energy trade and low-carbon electricity networks, regional cooperation can assist countries in meeting international climate commitments and reducing greenhouse gas emissions. The integration of renewable energy into regional electricity markets can further encourage investment in sustainable infrastructure and accelerate the transition toward cleaner energy systems.

In this context, the Northeastern Region of India possesses significant strategic potential to emerge as a major regional energy hub. The region's geographical proximity to Bangladesh, Bhutan, Nepal, and Myanmar positions it as an important corridor for regional electricity transmission and connectivity (Government of India, Ministry of Development of North Eastern Region, 2023)**.** Northeast India also possesses substantial hydropower resources capable of supporting both domestic energy requirements and regional electricity exports. Improved infrastructure connectivity through initiatives such as BIMSTEC and India's "Act East Policy" could transform the region into a gateway linking South Asia with Southeast Asian energy markets. Such developments would not only strengthen regional cooperation but also contribute to economic growth, industrial development, and employment generation within the Northeastern states.

Future prospects for regional energy integration also depend upon policy innovation and institutional reform. The success of regional energy markets requires harmonized regulations, transparent pricing mechanisms, efficient dispute-resolution systems, and coordinated investment policies (World Bank, 2022). Emerging technologies such as smart grids, digital energy management systems, and battery storage solutions may further improve the efficiency and flexibility of cross-border electricity trade. In addition, greater participation by private investors and regional energy exchanges can promote market-based cooperation and enhance long-term sustainability.

However, the realization of these opportunities requires sustained political commitment, regional trust-building, and coordinated infrastructure planning. While geopolitical tensions and regulatory barriers remain important challenges, the increasing urgency of climate change, energy transition, and sustainable development creates strong incentives for deeper regional cooperation. The findings of this study suggest that South Asia possesses the potential to evolve into a more interconnected and resilient regional energy system if countries are able to balance strategic interests with collective economic and environmental goals.

11. Conclusion

This study demonstrates that cross-border energy trade (CBET) has emerged as a vital component of regional energy security, economic cooperation, and sustainable development in South Asia. The research highlights that increasing energy demand, dependence on imported fossil fuels, and uneven distribution of energy resources has made regional energy

integration both an economic necessity and a strategic priority for South Asian countries. Through interconnected electricity markets, regional grid connectivity, and renewable energy cooperation, CBET offers significant opportunities to reduce energy deficits, diversify supply sources, improve grid stability, and support long-term regional resilience.

The findings further reveal that India occupies a central position in the evolving regional energy architecture due to its geographical location, economic capacity, and expanding energy requirements. India's leadership through initiatives such as BBIN, BIMSTEC, and the Cross-Border Electricity Trade (CBET) Guidelines has significantly contributed to the gradual transition from bilateral energy arrangements toward broader sub-regional cooperation and market integration. In particular, the Northeastern Region of India possesses strong potential to function as a strategic regional energy hub linking South Asia with Southeast Asia.

At the same time, the study identifies several persistent challenges, including infrastructure deficits, regulatory inconsistencies, geopolitical tensions, financing constraints, and environmental concerns, which continue to limit the full realization of an integrated South Asian energy market. These findings indicate that the success of regional energy integration depends upon stronger institutional coordination, harmonized policy frameworks, political trust-building and sustained investment in cross-border infrastructure.

The research also emphasizes that renewable energy integration will play a crucial role in shaping the future of regional energy cooperation. The effective utilization of hydropower, solar, and other renewable resources through regional electricity trade can support decarbonization efforts, reduce carbon emissions, and help South Asian countries achieve their climate and sustainability goals.

Consequently, CBET should not be viewed solely as an economic arrangement but as a broader mechanism for promoting regional stability, energy transition, and sustainable development.

In conclusion, the study affirms that deeper institutional cooperation, strategic policy innovation, and balanced regional diplomacy are essential for transforming South Asia into a stable, interconnected, and sustainable regional energy market. If effectively implemented, cross-border energy trade can significantly strengthen India's energy security while simultaneously fostering long-term economic integration, environmental sustainability, and regional cooperation across South Asia.

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