

# Chapter 6

## The Way Forward

August 2023

**This chapter should be cited as**

ERIA study team (2023), 'The Way Forward', Saswata Chaudhury, Raktimava Bose, Debanka Samanta, and Venkatachalam Anbumozhi (eds.), *Renewable Energy Transition in South Asia: Role of Regional Energy Trade*. ERIA Research Project Report FY2023 No. 10, Jakarta: ERIA, pp.63-71.

# Chapter 6

## The Way Forward

### 1. General Remarks on Renewable Energy Trade and Cooperation Policy

Every region in the world has its own renewable energy policies. The South Asian region is no different. Each country has its own policy instruments with various targets and commitments. Before any new policies are formulated, it is advisable that the existing policy instruments are identified and categorised under the umbrella framework. This has been the practice followed during peer review of existing literature. The policymakers choose the instruments to be adopted based on their area of implementation.

- Regulatory instruments
  - a. Unified, yet decentralised laws and regulations.
  - b. Codes and standards pertaining to institutional, strategic planning, sectorial standards, vehicle-fuel economy, and emission standards.
  - c. Parliamentary resolutions.
  - d. Monitoring and auditing.
- Economic instruments
  - a. Direct investment in infrastructure, procurement, and generation.
  - b. Fiscal/financial stimuli in the form of loans, grants, aids, subsidies, and even feed-in tariffs/premiums.
  - c. Market-based impetus (tradable certificates) such as Green Certificates and GHG Certificates.
  - e. Liability mechanisms in the form of renewable energy trade contracts.
- Voluntary instruments
  - a. Research and development.
  - b. Technology development, deployment and distribution.
  - c. Public voluntary schemes.
  - d. Negotiation in public-private or only private initiatives.
- Information and education instruments
  - a. Comparison label to induce a healthy spirit of competition.
  - b. Information sharing to promote healthy renewable energy trade.
  - c. Endorsement.
  - d. Transnational awareness and training and aid-in-implementation.

The above-identified policy instruments should be assessed to address the barriers and accelerate the enablers of cross-border renewable energy trade and cooperation. The analysis can be based on certain criteria that could decode the feasibility and viability of such instruments in the context of South Asian regional renewable energy cooperation. These are as follows:

- **Economic Criteria** based on past regional or other countries' policy experience.
- **Environmental Effectiveness**, whether such policies have the actual ability to achieve such vision.
- **Fiscal/Budgetary criteria** based on the depth of the Exchequer.
- **Policy Effectiveness** based on other region's experience with policy changes.
- **Policy Implementation** based on the interaction between policy existence and the government effectiveness index (World Bank, 2018).
- **Stakeholder Support.**

It is necessary to identify the areas of implementation and execution along with associated renewable energy cross-border trade infrastructure. The protocols for renewable energy generation and trade also need to be defined for the fulfilment of renewable energy targets. This had to be done not only for individual countries but collectively for the entire region. This report recommends a policy mix of different instruments, along with the opening of avenues for new policy suggestions. This is because a single policy cannot address the issues of regional renewable energy cooperation, especially in the context of South Asia, as every country in the region has a diverse energy economy.

## **2. Risks Associated with Renewable Energy Trade and Cooperation in South Asia**

Cross-border renewable energy trade in South Asia has the potential to foster significant benefits in the region. This includes increased access to green and affordable energy, improved energy security, and reduced GHG emissions. However, a few associated risks should be carefully considered by policymakers and stakeholders:

- (1) **Political risks:** The South Asian region is known for its history of political disputes and unrest. These can be a huge negative externality in their renewable energy projects and infrastructure. Therefore, they have to be effectively dealt with when considering cross-border renewable energy trade and cooperation.
- (2) **Regulatory risks:** Lack of harmonised and consistent regulatory frameworks can cause uncertainty and information asymmetry for investors and infrastructure developers. No umbrella framework exists; hence, different national policies involving land acquisition and disputes over tariffs can cause delays and disruption in the critical path of cross-border projects including prospective renewable energy trade.
- (3) **Environmental risks:** The cross-border renewable energy trade has both positive and negative impacts, depending on its location and design. Renewable energy cooperation can address such adversities. However, the vulnerable ecosystems can cause a crisis in one area, which can spill over to the entire region if not protected properly beforehand.
- (4) **Financial risks:** The renewable energy trade and cooperation are marked by medium- and long-term contracts. These require a proper business-conducive environment for the investors. When it comes to cross-border involvements of multiple investors and stakeholders, financing such projects is a huge commitment.
- (5) **Technical risks:** Renewable energy trade and projects require complex technologies and sophisticated infrastructure. The lack of technical expertise and renewable energy awareness can create cross-border renewable energy cooperation challenges, particularly

in areas with lesser T&D infrastructure. These include grid instability and interoperability that can even transmit crises across the entire region.

Grid operation in the context of transnational renewable energy trade in South Asia requires attention and is associated with country-specific risks that can adversely affect the stability and reliability of the power system and future renewable energy projects. Here are some country-specific risks associated with cross-border grid operability and renewable energy trade in the South Asian region.

- (1) India: India has a large and rapidly growing renewable energy sector that has the potential to drive the development of cross-border renewable energy trade initiatives. However, India's power grid faces technical challenges such as limited transmission capacity, high transmission and distribution losses, and frequency fluctuations. For example, in 2020, grid instability in the Southern states of India caused power disruptions affecting millions of people. The country faced challenges in maintaining grid stability due to the integration of intermittent renewable energy sources, such as wind and solar. During the COVID-19 lockdown, the demand for electricity reduced significantly. The reduced demand was addressed by less generation from coal due to the 'must run' status of renewable plants and the low cost of production. The major challenge against the complete reliability on renewable generation is its variability and seasonality in generation. Unless the renewable basket is appropriately diversified and properly integrated, generation only from renewables can lead to grid instability. In its long-term strategy, India thus wants to focus on non-conventional (nuclear in addition to renewable) sources rather than only renewable sources.
- (2) Bangladesh: In Bangladesh, the main risk associated with grid operation is system overload. Rapid economic growth and urbanisation have enhanced the demand for electricity, leading to the overloading of the power grid. Further overloading can create voltage fluctuations, resulting in equipment damage and blackouts. For example, in 2020, a transformer failure caused a major power outage in Dhaka. Other than the lack of significant progress in energy transition, there is the possibility that grid instability may persist even in renewable energy-based electricity generation.
- (3) Nepal: Nepal faces grid stability challenges owing to its mountainous terrain and inadequate transmission infrastructure. The integration of intermittent renewable energy sources, such as hydropower, can create challenges for grid stability, particularly during the dry season when hydropower generation is low. In 2019, Nepal faced power outages due to a decrease in hydropower generation during the dry season. Unless diversity in the renewable basket is ensured, this problem will persist.
- (4) Bhutan: Bhutan has inadequate grid infrastructure and transmission mechanisms, along with disputes over ownership of hydropower projects. This can act as an obstacle to regional renewable energy cooperation.
- (5) Sri Lanka: Sri Lanka has ambitious renewable energy targets but faces technical issues such as integrating grid-based intermittent renewables while minimising technical losses. In Sri Lanka, the main risk associated with grid operation is the greater cost of electricity generation. The reliance on fossil fuels for electricity generation has led to higher

generation costs, which are passed on to consumers through high electricity tariffs. The high cost of electricity can impact the competitiveness of Sri Lankan businesses and the affordability of electricity for households. Along with the progress in energy transition, this issue needs to be addressed.

- (6) Pakistan: Pakistan faces significant challenges in consistently maintaining grid stability due to a lack of transmission infrastructure and high levels of electricity theft. These challenges can impact the credibility, reliability, and quality of the power supply, particularly in rural areas. For example, in 2019–2020, Pakistan experienced widespread power outages due to a breakdown in the transmission system. As a result of limited domestic financial capability, public–private partnerships and/or foreign funding are required to address such infrastructural issues. China is already taking advantage of this issue. For a successful South Asian regional energy initiative, this issue should be addressed properly.

Managing these country-specific risks requires careful planning, risk management, investment in transmission infrastructure, minimising T&D losses, and adoption of advanced grid management technologies. Stakeholders can choose to invest in transmission and distribution infrastructure, energy storage facilities, grid modernisation, and demand-side management to tackle grid instability. Countries in the region need to collaborate and develop mutually beneficial frameworks for cross-border renewable energy trade to tackle grid operability and ensure reliable and affordable renewable energy supply for businesses and households.

### **3. Conclusion**

With growing concerns over climate change, countries across the world have given their individual targets and commitments to achieve net-zero carbon emissions. Thus, this is a joint effort to combat the huge usage of fossil-fuel sources of energy and substitute the same with clean energy sources. The countries in the South Asian region, being rich in diversified and scattered sources of renewable energy, have the scope of making the most of their indigenous advantages while depending on cross-border cooperation to reconcile with their comparative disadvantages. However, the current legal framework and incentive mechanisms are not properly developed to minimise the barriers to renewable energy cooperation and accelerate their enablers.

This study has identified the different barriers and enablers of renewable energy trade in the South Asian region and tried to assess whether there is significant regional renewable energy trade potential and whether such potential is affected by bilateral or multilateral or any region-specific characteristics. Other than that, the risks identified in the previous section also need to be addressed for the effective success of regional renewable energy trade and cooperation.

The following conclusions can be inferred from the results of the study:

- Although the actual intra-regional trade of renewable energy is low in South Asia, it has significant renewable energy trade potential. The region is endowed with untapped renewable energy resources that can be utilised on a need basis to generate a greater scale of benefits for the entire region.

- It seems that political unrest and lack of credibility in the region are the major barriers to trade because of which renewable energy trade and cooperation are also affected. Rational analysis has shown that even after the ideal resolution of the issue of cross-border turmoil and trust deficit, there is no sufficient cross-border infrastructure to integrate the entire region for regional renewable energy trade and cooperation.
- The seasonality and variability of the renewable energy demand–supply complementarity of the South Asian region is a key enabler of renewable energy trade and cooperation. However, seasonality has to be supplemented by individual NDCs and climate commitments. Various regional energy cooperation case studies show the importance of such complementarity for regional cooperation.
- The already existing energy trade agreements in the South Asian region have rendered national and regional benefits but limited to participating nations. Such negotiations can be eventually extended to trilateral and multinational agreements, which are not only capable of generating greater economies of scale (in terms of GDP and welfare) but also fostering a much greater degree of energy cooperation, security, and interregional relations in South Asia.

#### 4. Recommendations and Lessons Learned

On the basis of GTAP-based empirical analysis, identified barriers, and enablers and stakeholder consultation (both during the study and from the final dissemination event held on 21 December 2022), the study has the following recommendations:

- **Electrification of end-use applications and greening of power generation is the primary requirement for renewable energy trade in every country:** Electrification of end-use applications and generating that electricity from renewable sources are the two most important and almost necessary conditions for decarbonisation. Except for a few end-use applications (such as furnaces in industries) and a few hard-to-abate activities (such as air transport), the above two strategies can help ensure low-carbon green transition, as well as enable green electricity trade across borders.
- **Effective grid integration with all types of renewable generation to reduce renewable generation variability and intermittent supply issue:** Grid integration of renewable energy is necessary for effective utilisation of available supply. However, due to the inherent nature of generation (variable and intermittent generation), grid integration with renewable energy supply makes grid operation unstable. However, integrating various renewable energy sources in the grid can reduce such issues of intermittent supply and help ensure the stability of the grid. For example, when solar supply is not available, wind or bioenergy can continue to feed into the grid to keep it operational.
- **Strengthening of grid infrastructure within and across countries to ensure absorption of flexible renewable energy supply:** Upgradation and strengthening of grid infrastructure are of utmost importance to enable renewable energy trade within and across regions. For example, to enable renewable energy trade between India and Sri Lanka/Maldives, under-sea network development is necessary. Similarly, to strengthen the network infrastructure

between India and Nepal/Bhutan, a network needs to be developed in dense forest. In either case, the network needs to be cost-effective and eco-friendly. Moreover, existing grid systems are mostly prepared for thermal and hydro generation. But, integrating renewable energy supply, which is characterised by variable and intermittent supply, grid infrastructure within and across border needs to be upgraded to accommodate renewable energy supply to maintain grid stability.

- **Reduce T&D loss and promote effective demand management (through efficiency) for effective utilisation of available power supply:** Reducing T&D loss is an important step for effective utilisation of supply. On the other hand, promoting effective demand management (for example through the adoption of energy-efficient appliances) can also help to reduce domestic demand and enhance exportable electricity.
- **Promote manufacturing of renewable generation to reduce import dependency on renewable machineries:** All South Asian countries are heavily dependent on the import of renewable machineries/manufacturing (for example, solar module and its components including battery storage). However, globally, renewable energy manufacturing is concentrated (mostly in China), which can have severe energy security issues. To address this problem, the development of indigenous renewable energy manufacturing capability is important.
- **Development of a regional database to carry out proper economic cost of power trade in the region:** The creation and updating/maintenance of a regional database (for cross-border power trading) is an important step for estimation of economic cost and benefit and its cross-border sharing. This is important to increase awareness and promote regional integration and cooperation in renewable energy in the South Asian context.
- **Effective regional integration and inter-regional power trade can effectively address the following issues:**
  - **Diversified and complementary renewable energy generation potential:** One of the advantages of renewable energy trade among South Asian countries is its diversified renewable sources. While Bhutan and Nepal have enormous hydropower generation potential, India is endowed with solar and wind energy; and Pakistan has considerable potential for wind power generation in the coastal belt of Sindh and Baluchistan. Similarly, Sri Lanka is blessed with biomass, solar, and wind. With these vast variations and complementarity in renewable energy generation sources, regional renewable energy trade can address the problem of intermittent and variable supply of renewables. For example, during the winter season when hydro (due to freezing of water resources) and solar (due to low radiation) are not effective, wind or bioenergy can provide power supply. Owing to India and Pakistan's nuclear capability, power generation through nuclear source can also help to meet the decarbonisation target of non-fossil fuel generation during this season.
  - **Intra- and inter-regional demand variation:** There is a wide intra-regional demand variation across countries within South Asia. Bhutan and Nepal have excess power generation during summer and monsoon seasons, but deficit during the winter season and as a result have to import electricity from India. On the other hand, during

summer, India experiences excess demand while relatively lower demand during winter. The countries can work toward expanding the cooperation and trade in renewable energy with their nearby countries/regions (like ASEAN) to explore and improve this trade potential.

- **Regional trade in power is an alternative to the application of expensive energy storage:** Renewable energy generation is intermittent while demand is continuous along with the possibility of demand-supply mismatch existing. To address this issue, one alternative is the utilisation of energy storage. But that would make the total cost of supply significantly high. The alternative to energy storage integration is regional integration. Across the region, demand and supply mismatch can be traded through a common power exchange mechanism, which will effectively address the above issue.
- **Energy trade needs to be accompanied by technology development in both trading countries to reap more benefits:** Either demand or supply or upgradation of technology in both countries can only ensure more exportable electricity through demand-side management or supply enhancement. However, technology and infrastructure improvement are also important for the effective utilisation of imported supply by the importing country and reducing T&D loss.
- **Realisation of cross-border energy trade agreement through bilateral/multilateral initiatives:** Though there has been an existing framework for energy cooperation, such as SAARC, it has failed to generate sufficient benefit at bilateral or multilateral levels. The Myanmar-Bangladesh-India gas pipeline, the Bangladesh-Bhutan-India-Nepal sub-regional framework for energy cooperation, and the Turkmenistan-Afghanistan-Pakistan-India are some examples of bilateral and multilateral power trade agreements that have failed due to the absence of suitable dialogues between the stakeholders and appropriate inter-governmental intervention. For any such regional initiative to be fruitful (for instance, the 'One Sun One World One Grid' initiative by India), strong inter-governmental actions and intentions are required. In this context, the ASEAN Plan of Action for Energy Cooperation or Lao PDR-Thailand-Malaysia-Singapore Power Integration Project initiatives could provide important lessons to South Asian countries.
- **Estimate operational viability of technologies for intra-regional transmission through sea-route (for Sri Lanka and Maldives) and dense forests (for Nepal and Bhutan) through eco-friendly and sustainable technology and low-cost/cost-effective (relative to benefits) technology.**
- **Multilateral trade is more beneficial than bilateral trade, but multilateral arrangement can start with bilateral and trilateral arrangements.**
- **Financing is always an issue, hence public-private partnership and private initiatives can be effective alternatives:** Private sector investment is crucial for a secure energy framework. In Bangladesh, India, and Pakistan, private funding contributed 44%, 48.5%, and



53% respectively, in the distribution sector, especially for residential consumers.<sup>4</sup> Many countries including Nepal and Bangladesh are welcoming private investment even in renewable energy generation to expedite the decarbonisation journey. Hence, one can conclude that private investment is required over and above conventional financing methods of government and public-private partnership funding.

- **Being related to renewable energy in the context of developing countries, international funding (e.g. climate fund, clean energy fund) for the promotion of renewable generation and transmission can play an important role:** Given the financial crunch of most South Asian countries, international and multilateral funding is also required for successful implementation and development of regional renewable energy trade and cooperation. ADB is already providing relevant financing in this regard. Thus, one can conclude that there is a need to increase the awareness about potential benefits of regional integration in renewable energy trade at both government and industry levels.
- **Need to learn from the successful implementation of regional energy trade in other economic regions (such as ASEAN, the EU):** Strong inter-governmental intention and proactive dialogue and actions (as seen in other successful regional energy cooperation, including between ASEAN and the European Union) can be utilised to modify and expedite the regional renewable energy trade initiative in the South Asian context, e.g. the Lao PDR-Thailand-Malaysia-Singapore Power Integration Project in ASEAN, which already includes a wheeling charge methodology that is applicable for a harmonised regional energy trade framework.
- **Preparation of common regional protocol for power exchange:** Due to diversified domestic regulations on renewable energy generation, renewable purchase obligation and distribution, cross-border power exchange may be difficult unless there is a common regional protocol. Such a protocol is currently missing in the South Asian context. However, recently the landmark Motor Vehicles Agreement for the Regulation of Passenger, Personnel and Cargo Vehicular Traffic among the four South Asian neighbours (that is Bhutan, Bangladesh, India, and Nepal) has been signed. Similar regional protocols are required to promote and facilitate regional renewable energy trade in South Asia.

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<sup>4</sup>Details available at <https://www.thehindu.com/opinion/op-ed/the-goal-of-an-energy-secure-south-asia/article65354570.ece>

## **Lesson Learned**

### **Learning for South Asia from Southeast Asia**

Southeast Asia has already shown remarkable progress in regional energy cooperation, whereas South Asia has just started the journey. Despite several differences in the geopolitical situation and the nature of energy and economic structure between these two regions, South Asia can learn from Southeast Asia on many aspects of regional energy cooperation. The most important aspects are in infrastructure development, arrangement of financial resources, and development of the appropriate regulatory framework. These three aspects are very important to enable regional energy cooperation; in particular, the development of a common energy protocol is a necessary requirement for the success of regional energy trade/cooperation. South Asia already has similar protocols in place for transport movement in the BBIN network. To develop such an energy protocol, the Southeast Asian experience can provide valuable input for South Asian countries. Moreover, despite having bilateral political trust issues between the two neighbouring countries, they can engage in energy cooperation to reap the economic benefits, keeping aside the distribution of benefits among the partners. This initiative can open the channel for further collaboration in other fields also.

### **Learning for Southeast Asia from South Asia**

Southeast Asia is already much ahead of South Asia in terms of regional energy trade and cooperation. The region has already successfully implemented multilateral energy cooperation by progressing from bilateral agreements. However, the identification of demand complementarity, which is more pronounced in South Asia, can be useful even for Southeast Asia. For example, Lao PDR, Myanmar, and Viet Nam are primarily agriculture-based economies, while Thailand is service sector-oriented. The main source of electricity demand in Indonesia is mining and related industries, while Singapore and Malaysia are primarily industry-based countries. So, it may be possible that even demand complementarity may be present in Southeast Asian countries. The effective tapping of such an opportunity could add value and further interest in the enhancement of energy cooperation. Moreover, for the sustainability of energy cooperation with a targeted transition from fossil fuel, the development of supply complementarity (in the South Asian context) in renewable energy sources will be important in the near future. Once the Southeast Asian region moves away from fossil fuel-based energy cooperation, diversification of renewable energy sources will be the key aspect of grid stability and reliability of power supply.