STRATEGIES TO PROMOTE REGIONAL POWER GRID CONNECTIVITY
AND CROSS-BORDER ELECTRICITY TRADE (CBET)
IN SOUTH AND SOUTH-WEST ASIA

Vijay Kumar Kharbanda

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Foreword

The Development Papers Series of the UNESCAP South and South-West Asia Office (UNESCAP SSWA) promotes and disseminates policy-relevant research and analysis on the development challenges facing South and South-West Asia (SSWA). It features research conducted by UNESCAP SSWA staff as well as by outside experts from within the subregion and beyond. The objective is to foster an informed debate on development policy challenges facing the subregion and sharing of development experiences and best practices.

This paper by Vijay Kumar Kharbanda explores the potential of regional cooperation for sustainable energy in the SSWA subregion, particularly focusing on the possibilities of Cross-Border Electricity Trade (CBET) through an integrated power grid. The paper is prepared in the context of the increasing urgency for collective actions by the countries in the subregion to find ways for its sustainable energy transition. Share of fossil fuels in total energy consumption has been rising sharply in the subregion over the last three decades, threatening to drive up the subregion’s GHG emission rates. Though all countries have set out ambitious targets for renewable energy generation, a reversal in the growth of non-renewable energy consumption remains a challenge without a substantial shift in the way energy is generated and distributed in the subregion.

CBET can emerge as an important catalytic force for sustainable energy transition in SSWA. It would substantially improve the chances of increasing renewable energy generation and distribution through a regionally integrated power grid system. The subregional countries have mutual complementarities in terms of the composition and intra-regional distribution of their energy endowments, implying high potential for CBET. In fact, there are existing infrastructural facilities and legal frameworks for electricity trade at bilateral levels between several of the SSWA countries. What is lacking is the regulatory harmonization and institutional architecture needed for broader CBET at the subregional level.

Exploring existing frameworks under SAARC, BIMSTEC and ECO as well as various bilateral power trading arrangements, the paper finds scope for scaling up and broadening current frameworks for operationalizing a subregion-wide CBET system. Based on learnings from initiatives for integrating power grids, the paper prescribes ways and means for pricing frameworks, market mechanisms, institutional support and other technical and regulatory reforms for a cohesive approach for grid connectivity and multilateral power trade in the subregion.

We hope that the policy prescriptions offered by this paper will guide well-informed decision making for operationalizing CBET in the SSWA subregion.

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Strategies to Promote Regional Power Grid Connectivity and Cross-Border Electricity Trade (CBET) in South and South-West Asia

Vijay Kumar Kharbanda

Abstract

Countries of the South and South-West Asia subregion have mutual complementarities in terms of their energy resource endowments as well as their aggregate energy supply-demand patterns, providing ideal conditions for implementing CBET at the subregional level. The levels of energy integration through an interconnected power grid in the subregion has been suboptimal so far due to various constraints by way of capacity limitations and lack of political consensus. However, there have been several bilateral and plurilateral initiatives for grid connectivity and trade in electricity, which can potentially become building blocks for broader CBET in the subregion. This technical paper takes stock of various initiatives in the SSWA subregion for promoting power grid integration and trade in electricity with the aim of exploring framing a forward-looking agenda for CBET in the subregion. It reviews existing legal and institutional frameworks on energy cooperation under the subregional intuitions of SAARC, BIMSTEC and ECO as well as various bilateral and plurilateral power purchase agreements (PPAs) and transmission service agreements (TSAs). The paper finds that existing frameworks at the subregional level provides several valuable overarching provisions which can guide broader CBET, while bilateral PPAs and TSAs can be scaled-up for creating a transparent, mutually beneficial and market oriented regulatory environment for promoting it. However, concerted actions from all member countries are needed in adapting their respective domestic policies and practices with respect to the energy sector and in harmonizing regulations at the regional level to cater to the needs of free trade in electricity. They also need to work together to improve coordination with each other and to create a conducive institutional architecture for CBET.

JEL Codes(s): F60, H54, K32, L52, L94

Key words: South and South-West Asia, sustainable energy, cross-border electricity trade, regional cooperation.

1 Vijay Kumar Kharbanda is a consultant on sustainable energy at UNESCAP SSWA, and former Project Director of South Asia Regional Initiative for Energy Integration (SARI/EI). The paper benefitted from comments and inputs by Matthew David Wittenstein, Senior Economic Affairs Officer, Energy Division, UNESCAP and Rajan Sudesh Ratna, Deputy Head and Senior Economic Affairs Officer, UNESCAP SSWA. Joseph George, Research Associate, UNESCAP SSWA, provided editorial assistance. The views expressed in this paper are those of the author and do not necessarily reflect the views of the United Nations Secretariat.
1. Introduction: Potential for Enhanced Grid Connectivity and Electricity Trade in South and South-West Asia

1.1 Profile of energy resources in South and South-West Asia

The South and South-West Asia (SSWA) subregion comprising of 10 countries - Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan, Sri Lanka, and Turkey - is home to about 2.20 billion people, amounting to almost 25 % of world’s population and around 43 % of the population of Asia and Pacific Region as of 2020. The subregion is blessed with huge energy resources including coal, natural gas, oil and various renewable energy sources (Table 1). India and Pakistan, two of the largest countries in the subregion, are rich in energy sources such as coal, oil, hydropower, whereas countries like Iran (Islamic Republic of), Bangladesh and Turkey are dependent more on natural gas for their power generation. However, the natural gas reserves in countries such as Bangladesh are fast depleting.

Both Nepal and Bhutan have huge hydropower potential in excess of their current domestic consumption and is a source of their export earnings. Sri Lanka’s energy mix is primarily based on biomass, petroleum and hydroelectricity, but resources are limited. Maldives is dependent heavily on diesel for its domestic needs which is largely imported as its own domestic resources comprise primarily of biomass. Afghanistan, Sri Lanka and the Maldives have limited energy resources available to them.

The SSWA subregion is also blessed with huge solar power potential of around 1139 GW, out of which hardly 3.8% has been developed so far. Similarly, the subregion has wind power potential of around 481 GW, out of which only about 3.05% has been developed so far.4 As such, the dominance of certain fuel types such as coal in India, gas in Bangladesh, Iran and Turkey, petroleum in Pakistan, and hydro power in Bhutan and Nepal leads to over-dependence on these resources at the country level. This leaves them vulnerable to supply side risks.

It is important to have diversity in the energy supply mix as well as to improve energy access for large populations of the region which are deprived of the benefits of access to electricity. Further, there is a need to balance the conventional sources with renewable energy for mitigating climate change impacts in the subregion. Optimization of energy resources through interconnected power systems across the region can address these challenges to a large extent. The SSWA subregion, with its diverse energy resources spread across a mix of net energy surplus and deficit countries, possesses ideal conditions for energy cooperation through the establishment of a regional power grid.

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2 https://databank.worldbank.org/source/world-development-indicators
3 http://www.asiapacificenergy.org
By enhancing regional energy cooperation and trade of energy/electricity among SSWA countries can help them to exploit the complementarities in their energy portfolios. Trade in energy/electricity can potentially be a main driver for economic growth as in the case of Bhutan and Nepal. As per a recent study carried out by SARI/EI on economic benefits of power trade between India-Nepal, “With an accelerated power trade scenario between India and Nepal, Nepal’s gross domestic product could reach NPR 13,100 billion (over US $120 billion) in 2045, which is 39 percent more than with existing trading mechanisms.”5 As per estimates, Bhutan’s GDP growth is likely to increase three-fold from NPR 310 billion in 2030 to NPR 1,069 billion in 2045 in terms of revenue earned from electricity trade only. This shows that cross border trade of energy/electricity can significantly contribute to sustainable development of the subregion as it can provide affordable, reliable, sustainable and modern energy supplies to the subregional economies, driving their socio-economic progress.

Enhancing development of clean energy resources and renewable energy grid integration can help in reducing health and environmental impacts associated with fossil energy, mitigating greenhouse gas emissions and delivering climate benefits. Moreover, CBET can potentially reduce power

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generation capacity investments, particularly building renewable energy projects viz. solar and wind power, and thereby can provide access to clean power with lower-cost electricity generation. Further, regional energy cooperation and multilateral cross border trade of energy/electricity can help in improving relationships between countries, contributing to political stability and peace in the region in the long run.

1.2 Current status of grid interconnectivity and electricity trade in SSWA subregion

The SSWA subregion has a long history of power trade and grid interconnection between countries. Geographically, India is located at the center, sharing land borders with other South Asian countries except the island nations of Maldives and Sri Lanka. India offers many power interconnection opportunities with these neighboring countries as an energy/electricity importer, exporter or transit country. Bangladesh, Bhutan, India and Nepal (BBIN) have developed a series of high voltage (HV) and low voltage (LV) interconnections for trade in electricity.

The North Eastern Region (NER) of India - comprising of eight States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura - is a gateway to Southeast Asia and is of strategic importance as each state shares an international border with at least one of the five eastern neighbors of the country. Furthermore, the NER is considered one of the most ethnically and linguistically diverse regions in Asia with each State characterized by a diverse range of cultures and traditions. As per the NER District SDG Index Report and Dashboard 2021-22, the score for Goal 7 (Affordable and clean energy) ranges between 100 and 0 for the 103 districts in the rankings. Seven districts (Changlang [AR], Dibang Valley [AR], East Siang [AR], Longding [AR], Namsai [AR], Tirap [AR], and West Kameng [AR]) have scored 100 and they fall in the category of achievers. 64 districts fall in the category of front runners and 24 in the category of performers, while 8 districts are in the category of aspirants with scores less than 50. Grid interconnection with neighboring countries can enhance energy availability across the northeast region as well as among the neighboring countries.\(^6\)

On the western side, Pakistan is connected with Iran, and Afghanistan is connected to the Central Asian countries of Uzbekistan and Tajikistan for import of electricity. Presently, Sri-Lanka, Maldives and Turkey are not directly connected with other SSWA member countries. Further, under CASA-1000, Pakistan is set to be connected to Central Asian countries in the future. Feasibility study has been conducted long back to interconnect two large economies of the region viz. India and Pakistan, however no progress has been made so far. There is no direct grid connectivity between the eastern part and western parts of the SSWA subregion.

Presently, CBET in the SSWA subregion is mostly bilateral in nature. CBET in the BBIN subregion has been increasing over the years. Currently around 3700 MW is being traded among BBIN countries. As of 2021, around 17497 MUs of electricity is being traded in BBIN countries which was 7705 MUs in the year 2014, i.e., an increase of 127.086 %. Figure 1 shows details of units traded during 2020-21 in the BBIN Countries of SSWA\(^7\). Further, it is expected that cross-

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\(^6\) [https://www.niti.gov.in/sites/default/files/2021-08/NER_SDG_Index_NITI_26082021.pdf](https://www.niti.gov.in/sites/default/files/2021-08/NER_SDG_Index_NITI_26082021.pdf)

\(^7\) Source: [https://posoco.in/download/monthly_report_february_2021/?wpdmdl](https://posoco.in/download/monthly_report_february_2021/?wpdmdl)
border electricity trade is likely to grow to 12,200 MW in the year 2030\(^8\). On the western side, Pakistan is importing about 150 MW electricity from Iran. Under CASA-1000, Pakistan is set to get connected with Central Asian countries for import of 1000 MW hydropower to meet its short fall. Further, Afghanistan is already connected with Central Asian countries and is importing about 900 MW from them.

Figure 1: South Asia CBET (BBIN Region) in MUS

Status of interconnectivity and trade of electricity in the SSWA subregion is given in Tables 2A and 2B.

Table 2A: Interconnection details on the eastern side of SSWA region are as follows

<table>
<thead>
<tr>
<th>Interconnection</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutan – India</td>
<td>❖ Presently, Bhutan exports around 2100 MW from Tala, Chukha, Kurichhu, Dagachu and Mangdechhu.</td>
</tr>
<tr>
<td></td>
<td>❖ Transmission and associated infrastructure for Punatsangchhu I &amp; II (2220 MW) HEPs under construction</td>
</tr>
<tr>
<td></td>
<td>❖ Capacity of 10,000 MW for export to India to be developed in Bhutan under the Umbrella Agreement signed between two countries.</td>
</tr>
<tr>
<td>Bangladesh – India</td>
<td>❖ 1000 MW power is being supplied from India via 400 kV Berhampur- Bheramara line with HVDC station at Bheramara.</td>
</tr>
</tbody>
</table>

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\(^8\) Source: https://www.mea.gov.in/Speeches-Statements.htm?dtl/33611/Foreign+Secretarys+Remarks+at+the+Inauguration+of+the+South+Asia+Group+on+Energy+at+the+Research+and+Information+System+for+Developing+Countries
Through Tripura – Comilla transmission line, India exports around 100-160 MW power to Bangladesh

Presently, India exports to Nepal in the range of 400-500 MW capacity.

Multiple interconnections at 11 kV to 132 kV with capacity of around 150 MW

400 kV Muzaffarpur- Dhalkebar line will ultimately have capacity of around 1000 MW

Table 2B: Interconnection details on the Western side of SSWA sub-region are as follows

<table>
<thead>
<tr>
<th>Interconnection</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan- Iran</td>
<td>Pakistan imports about 150 MW from Iran</td>
</tr>
<tr>
<td></td>
<td>Pakistan in future will be connected for import of 1000 MW hydro power from Central Asia viz. CASA 1000. The Transmission line is under construction.</td>
</tr>
<tr>
<td>Afghanistan-Iran - Uzbekistan, Tajikistan, the Islamic Republic of Iran, Turkmenistan</td>
<td>Afghanistan is importing around 900 MW from Central Asian Countries and from Republic of Iran</td>
</tr>
</tbody>
</table>

Table 3 provides details of Afghanistan’s import of electricity from Iran, Tajikistan, Uzbekistan, and Turkmenistan.

Table 1: Afghanistan’s electricity imports from Central Asian countries⁹

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Country</th>
<th>Unit</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Iran</td>
<td>Mn kWh</td>
<td>742.59</td>
<td>757.97</td>
<td>817.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mn Afs</td>
<td>4052.43</td>
<td>3729.50</td>
<td>3935.10</td>
</tr>
<tr>
<td>2</td>
<td>Tajikistan</td>
<td>Mn kWh</td>
<td>914.29</td>
<td>1461.84</td>
<td>926.79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mn Afs</td>
<td>2712.86</td>
<td>4747.00</td>
<td>2987.57</td>
</tr>
<tr>
<td>3</td>
<td>Uzbekistan</td>
<td>Mn kWh</td>
<td>2592.43</td>
<td>2023.33</td>
<td>2674.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mn Afs</td>
<td>11934.06</td>
<td>7813.40</td>
<td>10371.01</td>
</tr>
<tr>
<td>4</td>
<td>Turkmenistan</td>
<td>Mn kWh</td>
<td>737.10</td>
<td>688.42</td>
<td>733.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mn Afs</td>
<td>2124.72</td>
<td>2107.88</td>
<td>2236.54</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>Mn kWh</td>
<td>4986.41</td>
<td>4931.56</td>
<td>5151.88</td>
</tr>
</tbody>
</table>

⁹ DABS
This scenario is going to change in future as many interconnections are being proposed on the eastern (BBIN) and southern side (with Sri-Lanka), which will enable greater integration of power systems thereby enable a broader multilateral power trading system in the SSWA subregion. In future, two countries of the subregion without a common border could also trade electricity through a third country acting as a transit provider. India has taken lead in this regard and has come up with forward looking guidelines and procedures such as Import/Export (Cross-Border) of Electricity-2018. Procedure for approval and facilitating Import/Export (Cross-Border) of Electricity by the designated authority allows for transaction of electricity through Indian Grid under a tripartite agreement.

1.3 Potential benefits of enhancing grid interconnectivity in the SSWA subregion

Countries in the SSWA subregion have tremendous diversity in power system profile, power generation mix, CBET diversity, energy resources endowments and clean/renewable energy resources, load profile and season load diversity etc. Countries such as India are dependent more on coal, whereas Iran, Bangladesh, Turkey are dependent more on natural gas for their power generation. Both Nepal and Bhutan dependent on hydro power generation. Some countries are net exporters of electricity such as Bhutan, India and Iran whereas other countries like Pakistan, Bangladesh, Turkey, and Nepal are net importers of electricity. Further, the eight States of North Eastern Region (NER) of India - Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura - geographically share boundaries with the countries such as Bangladesh, Bhutan, China and Myanmar and are thus strategically important linkages for cross-border trade of energy/electricity. NER States are blessed with diverse energy resources; Assam and Tripura are rich in petroleum resources, Arunachal Pradesh has substantial hydro-power potential, Meghalaya has coal and uranium resources, Mizoram has rich biomass, and Sikkim also has hydro-power potential. Besides, these States also have solar power potential. NER has opportunities to develop its available energy resources and trade with adjoining countries. Moreover, the advantages of economic integration amongst NER States and with neighboring countries and regions stem from political and historical linkages, geographical proximity, socio-cultural commonalities, and economic complementarities. The main opportunities for cross-border trade of energy/electricity lies in hydropower and gas pipelines, in addition to pooling and the interconnection of electric power grids. The electric power supply and demand situations in the rainy season and dry season in 2030 in the BBI (Eastern and Northeastern part of India) NM countries are shown in figure below, which shows the potential for trade and grid interconnection based on surplus capacities.

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Through regional power trade, these diversities will complement each other by sharing of power generation resources by taking the advantage of time difference, peak load diversity, holiday patterns, seasonal peak load differences etc. As per a World Bank report, seasonal peaks in the different countries in the region do not coincide, implying a potential for cost-effective meeting power demands across the year through cross-border trading of seasonal surpluses in different countries (Figure 2).

Figure 3: Seasonal diversity

Sources: Authors’ calculation based on CEA (2014) (India); Ali, Iqbal and Sharif (2013) (Pakistan); Kunwar (2014) (Nepal); Bangladesh Power Development Board (2013) (Bangladesh).

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13 https://openknowledge.worldbank.org/handle/10986/22224
This gives rise to the possibility of power exchange with various potential technical, operational, economic, financial, environmental and market development benefits of regional power trade in the Region as exhibited in Figure 3. Therefore, there is a strong need of deepening regional energy cooperation and advancing CBET among the SSWA countries.

CBET can significantly contribute to regional sustainable development of the SSWA subregion as it can provide affordable, reliable, sustainable, and modern energy supplies to the economies of the region there by driving socio-economic progress, including helping to achieve the SDGs as exhibited in Figure 4. As brought out in the previous section, CBET can enhance access to clean energy resources and renewable energy grid integration and thereby helping to address climate change concerns of the region. It helps in reducing health and environmental

**Figure 4: Potential benefits of CBET in the SSWA Subregion**


**Figure 5: CBET and sustainable development in the SSWA subregion**
impacts associated with fossil energy, mitigating greenhouse gas emissions, and delivering environmental benefits. A World Bank study estimated that CBET in South Asia could reduce emissions by 9 per cent compared to the baseline during 2015-2040. The same study also indicates that in the case of the implementation of a regional emissions trading scheme, power grid connectivity increases the level of abatement achieved for a given carbon price, as it provides access to lower cost mitigation options.

CBET of hydro power and renewable energy, can also help countries in meeting their Nationally Determined Contributions (NDCs). Further, CBET can potentially reduce the power generation capacity investment requirements thereby can provide access to lower-cost electricity generation, to meet the electricity needs of fast-growing population of the region.

1.4 Existing regional institutions in SSWA and their role in advancing CBET

Countries in the SSWA subregion have recognized the potential benefits of the cooperation and are working together through various regional/subregional forums/initiatives such as South Asian Association for Regional Cooperation (SAARC), The Bangladesh, Bhutan, India, Nepal (BBIN) Initiative, CASA 1000, Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) and Economic Cooperation Organization (ECO) to promote collaboration and mutual assistance in the field of energy.

(i) South Asia Association of Regional Cooperation (SAARC): Comprises of eight member states viz. Afghanistan, Bangladesh, Bhutan, India, Nepal, Maldives, Pakistan & Sri-Lanka. The Process of energy cooperation began in January 2000 with the establishment of a Technical Committee on Energy and later by the creation of a specialized Working Group on Energy in January 2004. The concept of an Energy Ring was framed by the 12th SAARC summit in 2004 and a road map for developing the SAARC power market for electricity (SAME) was also developed. The SAARC framework agreement for Energy Cooperation (Electricity) was signed at the Eighteenth SAARC Summit (Kathmandu, 26-27 November 2014), which paved the way for trade of electricity in the region. While several initiatives have been undertaken under the SAARC framework, the CBET focus has shifted to the BBIN sub-group because of the bilateral arrangements and interconnection grid that exists between India and Bhutan, India and Bangladesh, and India and Nepal. The existing and proposed interconnections offer the opportunity to build an interconnected grid which will allow for implementation of a regional electricity market.

(ii) Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC): BIMSTEC came into existence on 6th June 1997 through the Bangkok Declaration and is a subregional grouping of seven countries in South Asia and South East Asia, comprising of Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand. The regional group constitutes a bridge between South and South East Asia and represents a reinforcement of relations among these countries. BIMSTEC has also established a platform for intra-regional cooperation

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14 (Timilsina and others, 2015)
[https://openknowledge.worldbank.org/bitstream/handle/10986/22224/How0much0could0operation0and0trade00.pdf?sequence=1&isAllowed=y](https://openknowledge.worldbank.org/bitstream/handle/10986/22224/How0much0could0operation0and0trade00.pdf?sequence=1&isAllowed=y)
between some SAARC and ASEAN members. The memorandum of understanding (MoU) for establishment of the BIMSTEC Grid Interconnection has been signed at the fourth BIMSTEC Summit held in Kathmandu in 2018\textsuperscript{15}. The MoU envisages the establishment of BIMSTEC Grid Interconnection Coordination Committee (BGICC) to undertake the BIMSTEC Grid Interconnection Master Plan Study. The MoU will open up avenues for energy trade in the region. Operationalization of BIMSTEC Energy Centre in India will also advance energy cooperation agenda including the sharing of experiences and best practices as well as capacity-building of the Member States in this sector.

(iii) One Sun, One World, One Grid: India’s Prime Minister, during the first assembly of the International Solar Alliance in 2018, initiated the concept of “One Sun, One World, One Grid” (OSOWOG) viz. supplying solar power across the globe through trans-national electricity grid connectivity. Recently, United Kingdom and India, at the COP 26 meeting held at Glasgow, Scotland during 1-12 November 2021, jointly pushed the concept of “Green Grid-OSOWOG” to promote transfer of solar power through grid interconnectivity at the global level. OSOWOG is planned to be completed in three phases. The first phase will entail interconnectivity within the Asian continent; the second phase will add Africa and the third phase will globalize the whole project.\textsuperscript{16} To achieve the goal, International Solar Alliance (ISA) has been given the responsibility to draw a road map for global interconnectivity, based on the OSOWOG initiative. Further, ISA has appointed EDF France for building a road map for global interconnectivity.

(iv) Economic Cooperation Organization (ECO): ECO is an intergovernmental regional organization encompassing countries from Europe, Caucasus and Central Asia, Middle East, and South Asia with more than 460 million inhabitants and over 8 million square kilometers connecting Russia to the Persian Gulf and China to Europe.\textsuperscript{17} According to Article XIII of the Treaty of Izmir, “Any State enjoying geographical contiguity with the ECO region and/or sharing the objectives and principles of ECO may apply to become a member of the Organization.” Currently ten countries from West and South Asia, Caucuses and Central Asia are Members of the Organization, Afghanistan, Azerbaijan, Iran, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan, Turkey, Turkmenistan and Uzbekistan. Enhancing energy security and sustainability through wider energy access and trade within the ECO region and beyond is among the top priorities of ECO. To develop and consolidate common efforts to ensure regional energy sustainability and resilience, ECO Decade for Enhanced Energy Cooperation (2013-2022) and projected ECO Plan of Action for Energy/Petroleum Cooperation (2016-2020) have been developed along with other energy related activities and projections envisaged in the ECO Vision 2025.

(v) United Nations Economic & Social Commission for Asia Pacific (UNESCAP): UNESCAP is playing an important role in promoting grid interconnectivity in Asia-Pacific region. It has developed a road map for connectivity in Asia-Pacific region.\textsuperscript{18} As an arm of United Nations and as a neutral agency, UNESCAP can play a critical role by collaborating with various regional

\textsuperscript{15} https://mofa.gov.np/nepal-and-bimstec/
\textsuperscript{17} http://www.eco.int/general_content/86055-History.html?general-content
\textsuperscript{18} https://www.unescap.org/sites/default/d8files/event-documents/CE_2021_4.pdf
institutions and multilateral institutions for a cohesive approach to achieve the goal of grid connectivity in each of the subregions of Asia-Pacific as a first step and subsequently for whole region. Further, UNESCAP will be part of the Green Grid Initiative (GGI) Working Group to enhance energy transition by enabling access to lower cost resources, increased integration of renewable energy, and enhanced energy security in the region. GGI initiative will help in improving efforts to integrate renewable energy resources across borders by bringing together different stakeholders to share ideas for accelerating sustainable power system connectivity and learning from experiences in other parts of the world\textsuperscript{19}.

(vi) **Multilateral Institutions** such as World Bank, ADB, USAID are also working to enhance grid interconnectivity across the regions. In particular, USAID under the South Asia Regional Initiative for Energy Integration (SARI/EI) Program has been working since the year 2000 to promote energy cooperation and grid connectivity across the region. Like USAID’s SARI/EI Program, the National Renewable Energy Laboratory (NREL) has also carried out a useful study, a first-of-its-kind research on assessment of opportunities for grid-scale energy storage in South Asia. This study has shown that developing energy storage is one of the key avenues for increasing India’s power system flexibility and its share of renewables, ultimately enabling India’s decarbonization\textsuperscript{20}. GEIDCO, China is also one such institution working at the global level to promote development of renewable energy and global power grid connectivity.

**2. Learnings from the CBET Provisions of Select Intergovernmental Energy Cooperation Agreements**

The Energy Charter Treaty (ECT) is one of the most comprehensive international agreements which establish a multilateral framework for cross-border cooperation in the energy industry. The Treaty covers many crucial aspects of CBET including trade, transit, investments and energy efficiency. The Charter recognizes the sovereignty of each member State over its energy resources, and its rights to regulate energy transmission and transportation within its territory respecting all its relevant international obligations. It calls for efficient, stable and transparent energy markets at regional and global levels based on the principle of non-discrimination and market-oriented price formation.

According to the agreed principles, development of CBET should be consistent with major relevant multilateral agreements such as the WTO Agreement and its related instruments. It should be achieved by means of; (a) open and competitive market for energy products, materials, equipment and services; (b) cross-border access to energy resources, and exploration and development thereof on a commercial basis; and (c) indiscriminate access to national, regional and international markets. The principles also stand for promoting compatibility of national and regional energy systems and encourages creation of a common energy space for participating countries.

Most of the multilateral legal frameworks for energy trade, such as European International Treaty/Charter closely follows these principles, in terms of consistency with relevant WTO agreements, adhering to the norms of non-discrimination, transparency and market orientation.

\textsuperscript{19} https://www.unescap.org/speeches/launch-event-green-grids-initiative-climate-parliament

\textsuperscript{20} https://www.nrel.gov/news/program/2021/nrel-study-shows-bright-future-energy-storage-south-asia.html
The MOU for establishing BIMSTEC grid interconnection promotes “power flow among participating member states on a non-discriminatory basis taking cognizance of available grid capacity, power supply position and steps to harmonize technical, planning, operational standards of the grids of the connected parties.” Similarly, the SAARC Framework Agreement for Energy Cooperation envisions non-discriminatory access to the respective transmission grids of member States (Box 1). However, both SAARC and BIMSTEC initiatives are broad frameworks with provisions respecting the sovereign rights of member States over their domestic energy resources and regulatory systems governing their energy sectors.

**Box 1**

**Select Provisions of the SAARC Framework Agreement for Energy Cooperation (Electricity)**

SAARC member States signed the “Framework Agreement for Energy Cooperation (Electricity)” on 27 November 2014, at the 18th SAARC Summit. The objectives of the Framework Agreement were: (a) To facilitate integrated operation of regional grid across SAARC region and cross border trade and; (b) To enable member states for cross-border trade of electricity among themselves on voluntary basis subject to the laws, rules and regulation of the respective Member States.

Some of the important Provisions/Articles of the Framework Agreement, particularly relating to multilateral trade, are as follows:

**Article 1 Definitions: Buying and Selling Entities:** Buying and Selling Entities means any authorized public or private power producer, power utility, trading company, transmission utility, distribution company, or any other institution established and registered under the laws of any one of the Member States having permission of buying and selling of electricity within and outside the country in which it is registered.

**Article 2: Objective:** Member States may enable cross-border trade of electricity on voluntary basis subject to laws, rules and regulations of the respective Member States and based on bilateral/trilateral/mutual agreements between the concerned states.

**Article 6: Promoting competition:** Member States shall encourage the process of opening up of electricity sector guided by respective national priorities with the aim of promoting competition.

**Article 7: Planning of Cross-border interconnections:** Member States may enable the transmission planning agencies of the Governments to plan the cross-border grid interconnections through bilateral/trilateral/mutual agreements between the concerned states based on the needs of the trade in the foreseeable future through studies and sharing technical information required for the same.

**Article 12: Transmission Access:** Member States shall, for the purpose of cross-border trade, enable non-discriminatory access to the respective transmission grids as per the applicable laws,
Besides the initiatives at the regional level, India-Nepal, India-Bhutan and India-Bangladesh are some of the key bilateral agreements on energy cooperation. Recently, a process of trilateral trade in SSWA region has been initiated for direct sale of 500 MW hydro Power from Nepal to Bangladesh by using Indian transmission system for transit. GMR, a private sector entity, is developing 900 MW Upper Karnali Hydro power Project in Nepal, and has finalized negotiations, commercial terms and conditions with Govt. of Bangladesh for sale of 500 MW. To facilitate the process of power sale and purchase, Govt. of Bangladesh has signed an MOU with an Indian trading company viz. National Viduyat Vitran Nigam Ltd (NVVN) for purchase of 500 MW of hydropower from GMR Upper Karnali Hydro Power Project in Nepal. Similarly, GMR has also signed a Power Sale Agreement with NVVN. As per the latest news published in Kathmandu Post on 2nd September 2021, GMR and Govt. of Bangladesh are close to signing a Power Purchase Agreement (PPA) for 500 MW power from Upper Karnali Hydro Power project. Further, it is stated that Bangladesh Power Development Board (BPDB) has sent the PPA to the Bangladesh Prime Minister’s Office for approval. If this is successfully concluded, it will be the first case of a trilateral power trade arrangement in South Asia, wherein electricity will be produced at Nepal and transported through Indian power grid for import of electricity by Bangladesh. This will set an example for more such trilateral/multilateral trade in the future in the SSWA subregion.

Presently, Iran and Turkey are not part of SAARC Agreement on Energy Cooperation, though Iran is interconnected with and exporting electricity to Pakistan. Turkey is not yet connected to any of the South Asian countries. For promoting energy cooperation and grid connectivity between SSWA countries, it is important to extend the SAARC Framework Agreement to include both Iran and Turkey.

3. Essential Principles of Power Purchase Agreements (PPAs) and Transmission System Agreement (TSAs): Examples from Various Initiatives in SSWA

A Power Purchase Agreement (PPA) is a contractual written document signed between two parties – seller and buyer - enforceable by law. PPAs typically contain various obligations to be performed by each party, and nonperformance by the party(ies) entails financial implications in the form of penalties/liquidated damages etc. PPAs define all the commercial terms and conditions for CBET between the two parties, covering various aspects such as period of contract, schedule of delivery, quantity/volume of contracted capacity, penalties for delay in delivery, payment mechanisms, termination etc. Presently, there is no model or standard for a PPA or a Power Sale Agreement (PSA) in the South Asia subregion, containing standard terms and conditions relating to payment security mechanisms, conditions to be full-filled by buyer and seller, force majeure conditions, termination etc. which can be used by the bulk consumers/discos/generators/traders for smooth trade of electricity.

However, there are important elements of model PPAs and TSAs built into subregional CBET frameworks developed under SAARC, BIMSTEC and ECO. Furthermore, India has developed a standard bidding document (SBD), including a PPA for procurement of power through competitive bidding tariff route. The terms and conditions therein are balanced for both buyers and sellers, and they have helped to achieve financial closure of agreements without minimal difficulties, also helping avoidance of disputes between parties to a great extent.

The SAARC Framework Agreement has overarching provisions that lays out some of essential building blocs for PPAs and TSAs (Box 2). Together they address topics of building, operation and maintenance of cross-border grid infrastructure. While Article 9 of the Framework Agreement directly invites member States to engage in TSAs, Article 13 provides for facilitating participation of buying and selling entities, which is perhaps the most critical aspect of any PPA.

**Box 2**

**Key provisions relating to PPA and TSA** in the SAARC Framework Agreement on Energy Cooperation

**Article 7: Planning of Cross-Border Interconnections**
Member States may enable the transmission planning agencies of the Governments to plan the cross-border grid interconnections through bilateral/trilateral/mutual agreements between the concerned states based on the needs of the trade in the foreseeable future through studies and sharing technical information required for the same.

**Article 8: Build, Operate and Maintain**
Member States may enable the respective transmission agencies to build, own, operate and maintain the associated transmission system of cross-border interconnection falling within national boundaries and/or interconnected at mutually agreed locations.

**Article 9: Transmission Service Agreements**
Member States may facilitate authorized Buying and Selling Entities to enter into transmission service agreements with the transmission service providers for the purpose of cross-border electricity trade.

**Article 13: Facilitating Buying and Selling Entities:**
Member States shall enable Buying and Selling Entities to engage in cross-border electricity trading subject to the laws and regulations of the concerned Member States.

Similarly, the BIMSTEC MOU on Grid Connectivity contains essential provisions relating to PPAs and TSAs. Article 2 (Principal and Objectives) provides for recovery of costs and sharing of benefits equitably. The MoU has provisions also for developing transmission tariff framework for trading of electricity among the parties and it calls for opening up new avenues of cooperation to promote electricity trade. Further, Article 3 (Institutional Arrangements) deals with establishment of a Grid Interconnection Coordination Committee to determine the modalities to

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23 [https://drive.google.com/file/d/1G4WyTzTEg7i6WK4WXaL8j_4wHXYb5WCo/view](https://drive.google.com/file/d/1G4WyTzTEg7i6WK4WXaL8j_4wHXYb5WCo/view)
implement the BIMSTEC grid master interconnection plan and regional trading arrangements.

The ECO Framework Agreement on Energy Cooperation, while laying the foundations for framing PPAs and TSAs, is accompanied by resolutions for initiating specific facilitative agreements between member States. As per the ECO Vision 2025, “efforts will be made for harmonisation and alignment towards regional power/electricity market within the ECO region for harnessing benefits of larger integrated systems.”24 As per the Draft Roadmap on Realization of Regional Electricity Market Project of interested ECO Member States (ECO-REM) 2021-2022,25 in reference to the objectives of Vision 2025 and ECO Strategy 2030, ECO member States have decided to enhance cooperation for setting up a regional power market initiative with possibility of establishing power exchanges and a regional balancing market. The ECO framework envisages to deploy the best use of the already existing power exchanges, also inviting other initiatives in the region to support the regional electricity market development.

It is clear that PPAs and PSAs containing provisions acceptable to various stakeholders viz. buyer, sellers, traders, lenders etc. are important criteria for enhancing CBET among countries in the subregion. Particularly as mutually benefiting commercial engagements between countries is of paramount importance, well drafted PPAs and TSAs with equitable and balanced terms and conditions containing essential provisions taking care of interest of both buyers and sellers are needed to promote CBET. It has been generally observed that in the absence of balanced PPAs and TSAs there are bound to be disputes for various reasons due to ambiguity in the terms and conditions of the agreements. For example, India being a large power system, though have developed competitive power market structure where multiple buyer/sellers/traders trade electricity on long/medium/short term basis regularly, a number of disputes are also occurring due to lack of clarity of certain terms and conditions of relevant legal frameworks.

It is therefore important to develop a standard/model set of PPAs and PSAs for different categories viz. long/medium/short term basis for power procurement through competitive tariff based bidding route, cost plus basis etc. through stakeholder’s consultations to avoid any misunderstanding and disputes at later stages. For example, Govt. of India developed a standard/model bidding document (SBD) covering terms and condition for invitation of bids, PPAs and TSAs for procurement of power by discos/bulk consumers through competitive tariff based bidding route after a series of consultations/discussions with various stakeholders (Annex). There are many elements from the Indian model legal frameworks that can be applied at the regional level by regional institutions such as SAARC as well as in framing PPAs and PSAs at bilateral or plurilateral levels within the subregion.

4. Harmonization of Policies/Regulations for CBET

As the electricity Sector is highly regulated, security of interconnected grid is of critical importance. Prevailing regulations are fundamentally oriented towards domestic market and are

24http://www.eco.int/parameters/eco/modules/cdk/upload/content/general_content/3624/1506486491201cflnbttm0acra83f5arho4dgc65.pdf
25http://www.eco.int//parameters/eco/modules/cdk/upload/content/general_content/3903/1629972433218l3d8vukv7kpgf7rnjq6bivuf3.docx
not specifically from the CBET perspective for most of the SSWA countries. Non-transparent policies/regulations are a challenge for promoting energy cooperation and bringing investment to the sector. For CBET, coordination/harmonization of policies, regulations, grid codes framework etc. is critical. Countries in the SSWA subregion have varied level of sector evolution and, institutional/power market structurers as presented in Table 4.
<table>
<thead>
<tr>
<th>Policy</th>
<th>Afghanistan</th>
<th>Bangladesh</th>
<th>Bhutan</th>
<th>India*</th>
<th>Nepal</th>
<th>Maldives</th>
<th>Pakistan</th>
<th>Sri Lanka</th>
<th>Iran</th>
<th>Turkey</th>
</tr>
</thead>
</table>


| Generation                  | Da Afghanistan BreshnaSherkat (DABS) | Bangladesh Power Development Board (BPDB) and its subsidiaries companies, IPPs | Public sector (DGPC), IPPs | Public sector (NTPC, NHPC etc) , State owned generation utilities, IPPs | Nepal Electricity Authority, IPPs | State Electric Company, Island Development Committees (IDCs), and private companies | State owned generation companies for thermal, WAPDA for hydel and IPPs, Karachi ESCO | Ceylon Electricity Board (CEB) and IPPs | Iran Power Generation, Transmission & Distribution Management Company (Tavanir) | EUAS |


Table 2: Institutional structure of power sector in SSWA Countries
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| System operation | DABS | NLDC of PGCB | BPC | POSOCO (NLDC & 5 RLDCs); SLDCs of states | NEA | - | NTDC | CEB | Iran Power Generation, Transmission & Distribution Management Company (Tavanir) | TEIAS |
| Distribution | DABS | BPDB and subsidiary distribution companies | BPC | State distribution companies (discoms), Pvt discoms, franchisees | NEA | Electric provider is also responsible for distribution | Govt owned electric supply companies (ESCOs) and KESCO, a pvt company | CEB & Lanka Electricity Company Ltd (LECO) | Iran Power Generation, Transmission & Distribution Management Company (Tavanir) |
| Trading | DABS | BPDB | BPC | Discoms, Traders (PTC, NVVN, Pvt traders, captive plants, Bulk purchasers, IPPs) | NEA | - | - | CEB | Iran Power Generation, Transmission & Distribution Management Company (Tavanir) | TETAS |
Power trade in the SSWA subregion is mostly bilateral in nature. For instance, national regulators in the BBIN region are aligning their policies and legal frameworks bilaterally to the extent it is important for grid integration and import/export of electricity. Without transparent and harmonized regulatory guidelines, rules and framework in place, the opportunity for investment and large-scale trade of electricity in the SSWA subregion remains limited. The risks associated with CBET projects could be minimized to a large extend if each of the SSWA countries adopts complementary regulatory guidelines, rules, and framework to facilitate cross border interconnection and electricity trade. India has taken the lead in the region and have come up with detailed cross border guidelines, regulation and procedure for import/export of electricity.

4.1 Highlights of India’s relevant guidelines and regulations for CBET

In order to facilitate and promote cross border trade of electricity with greater transparency, consistency and predictability in regulatory approaches across jurisdictions and to minimize perception of regulatory risks, the "Guidelines on Cross Border Trade of Electricity- 2016" were issued by Ministry of Power, Government of India, in December 2016 in consultation with various stakeholders. After receiving inputs from various stakeholders, a need was felt to revise the same. Accordingly, new "Guidelines for Import/ Export (Cross Border) of Electricity – 2018” was issued by the Ministry of Power in 2018. The objectives of the guidelines are elaborated in the Table 5 below.

Table 3: Objective of Guidelines for Import/ Export (Cross Border) of Electricity- 2018

<table>
<thead>
<tr>
<th>Facilitate import/ export of electricity between India and neighbouring countries</th>
<th>Evolve a dynamic and robust electricity infrastructure for import/ export of electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote transparency, consistency and predictability in regulatory mechanism pertaining to import/ export of electricity in the country</td>
<td>Reliable grid operation and transmission of electricity for import/ export</td>
</tr>
</tbody>
</table>

Subsequently, in 2019, the CERC (Cross Border Trade of Electricity Regulations) was issued with specific regulations for CBET, addressing various aspects for import/export of electricity as given in the Table 6 below.

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26 https://powermin.gov.in/en/content/guidelines-importexport-cross-border-electricity-2018
Table 4: Issues Dealt in CERC (Cross Border Trade of Electricity Regulations), 2019

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Open Access in Transmission</td>
<td>Dispute Resolution</td>
<td>Declaration of Transfer Capability</td>
<td>Cyber Security, Data Communication Facilities</td>
</tr>
<tr>
<td>Implementation of Cross Border Transmission Link</td>
<td>Treatment of Delays in Transmission and Generation</td>
<td>Operationalising Transmission Access</td>
<td>Scheduling, Energy Accounting, Metering Arrangements</td>
</tr>
</tbody>
</table>

Procedure for approval and facilitating import/export (cross border) of electricity by the designated authority (as per the guidelines for import/export (cross border) of electricity-2018) was issued by central electricity authority, Government of India, in February 2021. The objectives of the procedures are; (a) to facilitate coordination with nodal agencies/Authority of Neighboring Countries (ANC) for transmission system planning, joint system studies, surveys, preparation of feasibility study reports, system development, construction, erection, monitoring, testing, commissioning, operation, and maintenance of transmission system for Import/Export (Cross Border) of electricity in transparent manner, etc.; (b) to lay down procedure for safety, security and coordinated operation of the interconnected national grids; (c) to facilitate grant of approval to eligible entities to participate in cross-border import/export of electricity; and (d) to lay down procedure for grant of approval to an Indian generating station, supplying electricity exclusively to neighboring country for building a dedicated transmission line for connecting to the transmission system of neighboring country.
4.2 Key challenges/risks associated with harmonization of policies/regulations

Cross border projects tend to be risky due to various factors such as political and regulatory risks, financial risks, and commercial risks etc. Political uncertainty and lack of stable government and trust among the member countries in the SSWA subregion have impacted energy cooperation, and grid connectivity. Further, the subregion has been impacted by intra-regional geographical boundary disputes, ethnic conflicts. Some of the subregional countries have experienced political and security threats in the recent past.

Further, the relationship between India and Pakistan has been under stress due to lack of mutual trust. Nepal, though has huge hydropower potential of 83 GW, could exploit hardly 1% of its potential due to lack of political uncertainties for the last two decades. Similarly, Afghanistan is not able to add capacities due to political instability. On the other hand, Bhutan is earning about 20% of its national revenue from sale of hydro power aided by strong political commitment. 500 MW HVDC link between India-Bangladesh has not only helped to meet the shortages of power in Bangladesh but also improvement in political relationship between the two countries. Challenging political landscape in Iran has impacted energy trade in West Asia. The sectoral evolution and uneven level of power sector and market development among SSWA countries have adversely impacted the process of harmonization of regulations. While India has come up with extensive and detailed guidelines, regulations, procedures on CBET, other countries in the region are yet to make progress in this regard.

4.3 Suggested set of policies/regulations for implementing CBET

Based on the learnings/experience of existing power trade in the SSWA subregion as well as global practices, a suggested set of guidelines/policies/regulations framework for smooth trade of electricity is shared below:

(a) Recognize CBET in the national electricity laws and promulgate CBET specific policies and
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guidelines.  
(b) Develop regional/subregional framework, guidelines, regulation on non-discriminatory open access in transmission.  
(c) Develop regional/subregional transmission master plan for facilitating coordination, planning and operation of the interconnected transmission network.  
(d) Develop regional/subregional common framework and guidelines for a harmonized grid code for CBET including protection scheme for transmission interconnection and to coordinate with national regulators for its acceptance and implementation.  
(e) Develop regional/subregional framework, guidelines, regulation on declaration of transfer capability, capacity allocation mechanism.  
(f) Develop regional/subregional framework, guidelines, regulation on tariff determination and transmission pricing framework.  
(g) Develop regional/sub-regional coordinated system operation framework viz. scheduling & dispatch mechanism etc. for CBET and for integrated power grid operation.  
(h) Develop regional/subregional imbalance settlement mechanism.  
(i) Develop regional/subregional dispute settlement mechanism.  
(j) Frame regional/sub-regional principles regulations/guidelines on Harmonization of taxes and duties for CBET to address uncertainty around unilateral imposition of taxes and duties as export tax or transit tax in regional electricity trade could pose significantly more challenges with the emergence of a more complex multilateral regional trade platform.  

5. Principles of Power Pricing Framework for CBET

Power pricing for CBET should be cost reflective and needs to be designed in such a way that infrastructure remains viable and sustainable across the entire electricity value chain. While deciding the price for CBET, following principles should be taken into consideration:  

(a) Encourage competition, economical use of the resources, good performance;  
(b) Balance the interest of generators on one hand & beneficiaries on the other side;  
(c) Encourage efficiency & economy that ensure financial viability of the project;  
(d) Encourage investments for building strong infrastructure for reliable power supply;  
(e) Ensure transparency, consistency, and predictability in pricing approach across jurisdictions which minimize the perceptions of pricing risk; and,  
(f) Establish an incentive-based system for performance.  

It is therefore important that, for robust development of the power sector, generation, transmission and distribution utilities across the value chain should be able to recover cost of capital investment, cost of operation, supplies and maintenance of equipment, cost of metering equipment, billing, collection and miscellaneous services, and generate satisfactory return on the total capital investments.  

5.1 Existing power procurement and pricing framework of CBET in SSWA

Power pricing framework in Bangladesh, which is importing electricity from India, is a mix of government to government (G2G), negotiated and competitive tariff-based bidding systems. In the
case of Bhutan, India is providing a mix of grant and soft loans to Bhutan for developing various hydro power projects. As India is providing necessary financial assistance for development of hydro power projects, the power pricing framework for such hydro projects is based on G2G, negotiated power pricing frameworks. Besides G2G based hydro power projects in Bhutan, some hydro projects are being developed by private developers and through joint ventures which Government of Bhutan and private entities are developing jointly.

In case of such projects which are being developed by private entities and through joint ventures, the power pricing mechanism is based on commercial rate basis. In case of India- Nepal power trade, Nepal is importing electricity at present on negotiated tariff-based pricing through Indian power exchanges. On the western side, in 2002, Iran and Pakistan signed the first agreement for the import of 34 MW.\(^{29}\) As per NEPRA’s State of Industry report 2020, Pakistan imported about 513.74 GWh from Iran during 2019-20\(^{30}\). Pakistan is procuring power from Iran through negotiated tariff route. Further, under CASA-I, Pakistan is set to be connected to Central Asian countries in the future for procurement of surplus hydropower and the pricing framework is based on negotiated tariff. Afghanistan is presently connected to Iran and Central Asian countries viz. Tajikistan, Uzbekistan and Turkmenistan, and is procuring electricity of about 1400 MW on G2G negotiations through their respective nodal agencies/utilities. Turkey is not connected to any South Asian country so far.

However, in future it is important for the countries of the SSWA subregion to move towards competitive power market structure, viz. procurement of power on long/medium term on competitive tariff based bidding, short term power trade through e-platforms and day-ahead/term-ahead trading through power exchanges. This will bring transparency in the system, will facilitate investment in the sector, while consumers will be benefited for having cheaper/competitive power pricing.

5.2 Experiences of India in transforming from cost plus structure to competitive power market structure

Though India initiated the process of liberalization in 1991, a substantial growth its power sector took place only after passing the Electricity Act of 2003. Post Electricity Act 2003, India initiated major reforms such as delicensing of generation, development of guidelines for competitive tariff based bidding, concept of traders, concept of open access, discoms to mandatory procurement of power through competitive tariff bidding except hydropower, establishing power exchanges, various incentive schemes to improve performance of discoms, unbundling of electricity boards etc. Presently, India has well established policies/regulations for power market where multiple buyers/sellers/traders trade electricity on long/medium/ short term bases, and prices are determined by the market forces. Government has no role in particular relating to price fixing. India, on 19\(^{th}\) January 2005, through gazette notification, issued the resolution on “Guidelines for “Determination of Tariff by Bidding Process for Procurement of Power by Distribution Licensees.”

\(^{29}\) https://en.imia.ir/news/84092407/Pakistan-hoping-to-extend-electricity-imports-from-Iran
\(^{30}\) https://nepra.org.pk/publications/State%20of%20Industry%20Reports/State%20of%20Industry%20Report%202020.pdf
As per the notification, the guidelines for tariff based bidding to apply for power procurement of base-load, peak-load and seasonal power through competitive bidding mechanisms as follows:

(i) Case 1: Such Projects where the location, technology, or fuel is not specified by the procurer;
(ii) Case 2: Location based specific projects with fuel allocation such as captive mine or hydropower projects, load center projects, which the procurer intends to set up under tariff based bidding process.

However, the process of award of hydropower projects on competitive tariff based bidding route keeps on being extended by India viz. it is on cost plus basis. Under the above notification of the Government of India for competitive tariff based bidding framework, during the year 2006, the concept of Ultra Mega Power Projects (UMPP) under case II, by setting up coal based power projects with capacity of more than 4000 MW at specific locations. Initially, two UMPPs under Case 2 were identified for award under competitive tariff based bidding route viz. Sasan UMPP along with allotment of fuel (captive coal mine block) and Mundra UMPP Coastal based (imported coal based) respectively. For both the above UMPP project under case 2, Government of India created a shell company, acquired the land, obtained various clearances for the project and then invited the bids for the developers to quote on competitive tariff based bidding. As land acquisition and obtaining clearances takes substantial time, Case 2 was necessary to avoid delay in completion of the projects.

The result of the competitive tariff based bidding was very encouraging. For Sasan UMPP (Madhya Pradesh), where captive coal mine block was also allotted, the levelized tariff of the lowest bidder discovered was Rs 1.19 per Kwh, whereas tariffs for cost plus thermal generation projects prevailing at that time was in the range of Rs 4 to 4.50/- per Kwh. Similarly, for Mundra UMPP, which was coastal based (imported coal based), tariff discovered was just Rs. 2.26/per Kwh, compared to other imported coal based tariff of around Rs. 5/- per unit prevailing at that time.

Subsequently, States viz. Punjab, Haryana, UP, Jharkhand, Chhattisgarh also followed awarding of coal based power projects on competitive tariff based bidding in different years. For example, Punjab invited bids for Talwandi Sabo coal based Power project for the capacity of 1980 MW in the year 2008 and the levelized tariff of lowest bidder was Rs 2.86/- per Kwh and for Rajpura coal based power project of capacity 1320 MW in the year 2010 was Rs 2.88 per Kwh under competitive tariff based bidding case2, as compared to around Rs. 4.50/- per Kwh prevailing on cost plus basis at that time.

Under competitive tariff based bidding (case 1), where developer has to identify and acquire land and to obtain various clearances for the project themselves (government is not responsible), tariff discovered for such coal based power projects are given in the table below:
The table above shows that the prices discovered were much cheaper and competitive compared to cost plus negotiated basis contracts prevailing during the corresponding years. Since 2011, India has made it mandatory for the discoms to procure electricity through competitive tariff based bidding (except hydro power) under case 1 or case 2 as the case may be. Further, all the discoms/bulk consumers are procuring renewable energy viz. solar and wind etc. through competitive tariff based bidding route and the results of such are also very encouraging. There are many examples, however in the recent competitive tariff based bidding for 330 MW (total bid invited for 500 MW) solar plants to be built at Neemuch in Madhya Pradesh, price discovered was Rs 2.14 per unit.

From the above examples/learnings, it is clear that power procurement through competitive tariff based bidding mechanism is transparent and prices discovered are much competitive/cheaper than procured from other mechanism viz. cost plus basis, negotiated basis etc. Looking forward, the SSWA subregion may adopt cross-border power procurement through competitive tariff-based bidding mechanisms for cross-border power procurement on long/medium term from all the resources, except hydropower, for the benefits of consumers.

5.3 Suggested model frameworks that can be adopted from existing bilateral PPAs

All countries of South Asia have framed their own power pricing procurement policies/laws, depending upon size of power systems, power sector reforms and demand-supply positions. It is therefore important to have standard practices for power procurement and pricing frameworks for cross-border trade of electricity to encourage investment and grid connectivity in the region. It is also important that while framing such suggested pricing framework existing frameworks for power procurement and pricing within each nation should not get unduly affected.

The suggested power procurement and pricing framework for cross-border trade of electricity should be able to address concerns such as mode of procurement, period for which power is contracted, most suitable mechanism for power pricing, transmission/wheeling pricing framework etc. For transparent power pricing mechanism, there should be clear cut roles and responsibilities to be defined for various stake holders viz. government, regulators, power utilities etc. Though presently Afghanistan, Pakistan, Maldives and Sri-Lanka are not interconnected with other South Asian countries, keeping in view of future prospects, suggested power pricing framework may be considered for these countries as well.

5.4 Suggested power pricing mechanisms for CBET in the SSWA subregion

a) In view of the existing trend of import/export of electricity on G2G negotiated power pricing
mechanisms in South Asia and to support countries’ good will gesture for each other, it is suggested to continue to procurement of all types of generation resources - thermal, hydro etc. on bilateral, G2G negotiated basis, in two part or single part as the case may be, as per the existing trend.

b) Looking at existing power pricing mechanism of import/export of electricity in the SSWA subregion, and considering that hydro power projects are capital intensive and have long gestation period associated with large risks such as geological and hydrological risks etc., it is suggested that power procurement and pricing mechanism for hydropower be on cost plus/negotiated long term and single part tariff basis.

c) With the existing trend of purchase and sale of electricity in South Asia subregion and based on the learnings/experience of competitive tariff-based bidding, it suggested that SSWA subregion may move towards competitive tariff based bidding for all the other cross border power procurements and trade such as thermal, renewables etc. either on two part or single part tariff basis for long or medium term as the case may be for the benefit of consumers.

d) To promote new dedicated joint ventures between the governments and joint ventures between government owned power utilities and private power developers, cross-border power projects may be designed on long term, cost plus, negotiated contracts in two part or single part tariff basis as the case may be.

e) Based on the existing classification, power procurement on long term basis be considered as more than 5 years, medium term be considered as 1 to 5 years, and short term be considered as less than 1 year.

f) For optimum utilization of all power resources, countries may opt for trade of short term (less than 1 year) electricity on e-platform, power exchanges etc. for discovery of transparent and competitive power pricing mechanism.

g) With the declining cost of renewable energy, sustainable development of large-scale renewable resource within the region offers significant cost saving. This will also help in facilitating, clean energy transition, enhanced energy affordability at competitive price and sustainability and energy security for the region. This also gives rise the potential for trade of renewable energy across region in an economical manner as well as to avoid such generation plants operating on fossil fuel and are expensive in nature.

h) Efforts should be made to move from cost plus basis negotiated route to competitive tariff based bidding for long and medium term power procurement, and short term trade of electricity on power exchanges/e-bidding platform. Further, for transparent power pricing mechanism, there should be clear cut roles and responsibilities to be defined for various stake holders viz. government, regulators, power utilities etc.

6. Potential Role and Contributions of Private Sector Entities in CBET

The existing trend of CBET in South Asia shows that there have been continuous efforts, in
particular in the BBIN subregion, to increase the bilateral trade of electricity. To enhance cooperation and interconnectivity, India has come out with guidelines and regulations for cross-border trade of electricity. This will strengthen the framework for bilateral electricity trading arrangements between the BBIN countries in the short to long term, and make progress towards regional interconnectivity, multilateral trade, and integrated electricity market in the subregion. Regional integration involves robustly interconnected regional transmission system network planning with well-defined power systems operation rules for seamless supply of electricity between countries.

As power projects and associated transmission systems are capital and time intensive, many of these countries are unable to effectively harness the available natural resources due to lack of large capital requirement, lack of strong policy frameworks etc. The growing economies in South Asia would face challenges in mobilizing huge investments required for building the generation projects and regional transmission networks. Therefore, the involvement of private sector and multi-lateral funding agencies assumes high significance for building for new cross-border infrastructure development.

6.1 Current Status of structure of investments in the BBIN subregion

**India - Bhutan**

Majority of generation and transmission interconnection projects between India and Bhutan have been executed on the basis of intergovernmental agreements signed between the two countries. Dagachhu hydropower project was the first one built under joint venture (JV) agreement between Druk Green Power Corporation, a Bhutan government owned generation company and Tata Power, a private owned generation company in India. In addition, Bhutan has planned to develop five hydro power projects on public-private partnership (PPP) model, similar to Dagachhu HEP. During the year 2014, India and Bhutan signed an intergovernmental agreement to develop four hydropower projects of around 2,100 MW capacity through JV route involving Druk Green Power Corporation (DGPC) Bhutan Govt. owned Power Utility and between Indian public sector undertakings such as SJVNL, THDC and NHPC Ltd.

Major transmission interconnections between the two countries for evacuation of generation from Tala Hydropower project, has also been developed as a JV between two Indian entities; the government owned Power Grid Corporation of India Limited (PGCIL) and private sector owned Tata Power Limited. The rest of the interconnections have been built by PGCIL.

**India - Nepal**

In 2014, Nepal, through competitive bidding process awarded two export oriented hydropower projects to Indian developers as per following details:

- SJVNL was awarded Arun III HEP having capacity 900 MW at an estimated cost of US$ 825 Million
- GMR was awarded Upper Karnali HEP having capacity of 900 MW at an estimated cost of US$ 1.4 Billion
➢ The India – Nepal transmission interconnection transmission line viz. Dhalkebar-Muzaffarpur was developed on PPP mode viz. following two JV companies were established as follows:
➢ From Nepal side, Power Transmission Company Nepal (PTCN) with shareholdings through Nepal Electricity Authority (NEA (50%), Power Grid Corporation of India PGCIL (26%), HIDCL of Nepal (14%) and IL&FS (10%)
➢ From India Side, Cross border Transmission line having shareholding of IL&FS (38%), PGCIL (26%), SJVNL Ltd (26%) and NEA (10%)

**India - Bangladesh**

CBET between Bangladesh and India was made operational in October 2013 with the commissioning of Bheramara (Bangladesh) – Baharampur (India) 400 KV back-to-back HVDC link of 500 MW capacity comprising of following elements:

➢ Bangladesh side: 27 kM of Baharampur (India) – Bheramara (Bangladesh) 400 KV double circuit line, a 3 km loop-in, loop-out of Ishurdi – Khulna South 230 KV double circuit line at Bheramara and a 500 MW HVDC back-to-back station and 230 KV switching station at Bheramara
➢ India side: 71 kM of Baharampur (India) – Bheramara (Bangladesh) 400 KV double circuit line, a 3 kM loop-in, loop-out of Farakka – Jeerat 400 KV single circuit line at Baharampur and 400 KV switching station at Baharampur.

The Indian portion of the transmission line and associated infrastructure was built by PGCIL, India while the Bangladesh portion of the transmission system was developed by Bangladesh Power Development Board (BPDB) with funding support from Asian Development Bank (ADB). Phase 2 of the project for the additional 400 KV,500 MW HVDC transmission link at the same place viz. Baharampur – Bheramara was commissioned in September 2018. Bangladesh and India are also jointly developing the 1,320 MW Maitree Super Thermal Power Project with equal partnership from BPDB, Bangladesh and NTPC, India. The project has been financed by India’s EXIM Bank which has provided loan at concessional rates for the project. The project has got tax exemption in Bangladesh for a period of 15 years.

6.2 Key challenges/risks of CBET and learnings from past experiences

Broadly, key challenges/barriers/risk associated with CBET in the subregion are:

a) **Political uncertainties, lack of trust in bilateral relationships**

Political uncertainties and lack of trust among the member countries of the subregion have impacted energy cooperation and development in the region in a major way. Further, the subregion has been impacted due to intra-regional border conflicts and security threats. Nepal, despite having huge hydropower potential of 83 GW, could only exploit hardly 1% of its hydropower potential due to domestic political uncertainties over the last two decades. Similarly, Afghanistan has been unable to add capacities due to internal conflicts. On the other hand, Bhutan is earning about 20% of its
national revenue from sale of hydropower, backed by strong political commitment. 500 MW HVDC link between India-Bangladesh has not only helped to meet the shortages of power in Bangladesh but also to improve their bilateral political and economic relationships.

b) Policy, regulatory and legal challenges

Security and safety of interconnected grid across countries, protected through a common grid code, is of paramount importance for trade of electricity. Each South Asian country has its own policies/regulations for power market depending upon the size of the country, domestic reforms undertaken etc. Lack of coordination/harmonization of policies/regulations is one of the key impediments for promoting energy cooperation and attracting investment to the sector. Presently, CBET in the SSWA subregion is mostly bilateral in nature, with national regulators in the BBIN region making efforts to align their policies bilaterally to some extent.

c) Investment/financing challenges

In the SSWA subregion, with the existing plans for development of generation and transmission projects, private sector participation will be critical in the coming years. Although public finance plays a major role in infrastructure development, national governments would face difficulties in financing all projects alone, given the high up-front costs incurred for capital investments. Creditworthiness of developers and investors, financial closure, interest rate, currency risk etc. are some of the risks associated with investments in power projects. Support in the form of requisite guarantees, equitable and balanced power purchase agreements between the sellers and buyers, transmission service agreements (TSAs), robust and transparent dispute resolution mechanisms etc. provides confidence to the lenders. Investor confidence would also be positively influenced by strong commitments from the governments.

d) Project implementation and commercial risks

SSWA countries also face challenges in terms of environmental clearance and land acquisition for developing power projects and transmission lines. Besides this, commercial risks such as off take risks, currency risks, contract enforcement risks, arbitration and dispute resolution mechanisms, taxes and duties are also needs to be mitigated and addressed for promoting CBET.

6.3 Learnings from PPAs between GMR Energy and the Government of Bangladesh

Government of Nepal, on 24th January 2008, signed an MOU and with GMR ITD for establishing the 900 MW Upper Karnali Hydro Power Project. Subsequently a Joint Venture Agreement was signed on 24th February 2008 between Nepal Electricity Authority NEA and GMR, ITD. GMR Upper Karnali Hydro Power Ltd as a joint venture was incorporated by the Government of Nepal on 2nd May 2008. Further, the JV Agreement was amended in 2014 covering: a) GMR Energy Ltd; b) GMR Infrastructure ltd; c) Italian-Thai Development Public Company ltd; d) GMR Lion Energy

Ltd; and e) Nepal Electricity Authority. About 6 years after signing of MOU, on 19th September 2014, a Project Development Agreement was signed between (i) Govt. of Nepal represented by Investment Board of Nepal, GON; (ii) GMR Upper Karnali Hydro Power Ltd and (iii) Karnali Transmission Company ltd; which is one of the important documents required for initiating/commencement of work on the project. Some of the key features of Upper Karnali HEP are as follows:

<table>
<thead>
<tr>
<th>Project Cost</th>
<th>NPR 116 Billion (2011) (Equivalent to US$ 1.5 Billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>900 MW</td>
</tr>
<tr>
<td>Land to be acquired</td>
<td>Public: 273 Hectares</td>
</tr>
<tr>
<td></td>
<td>Private: 49 Hectares</td>
</tr>
<tr>
<td>Construction period</td>
<td>5 years after Financial Closure.</td>
</tr>
<tr>
<td>Free Share to GON</td>
<td>108 MW viz. 27%</td>
</tr>
<tr>
<td>Free Rural Electrification</td>
<td>2 MW</td>
</tr>
<tr>
<td>GON to get the project free of cost</td>
<td>After 25 years</td>
</tr>
<tr>
<td>Affected Households</td>
<td>426</td>
</tr>
<tr>
<td>Resettlement Required</td>
<td>57 Households</td>
</tr>
<tr>
<td>Direct Employment</td>
<td>5000</td>
</tr>
<tr>
<td>Concession period</td>
<td>25 years</td>
</tr>
<tr>
<td>Economic Benefits to GON over concession period (Royalty, Dividend, free energy, VAT, income tax, custom duty)</td>
<td>NPR 431 Billion (Equivalent to US$ 5.81 Billion)</td>
</tr>
</tbody>
</table>

**Offtake arrangement (Status of sale of capacity)**

Out of 900 MW capacity of Upper Karnali HEP, GMR negotiated and formalized with the Government of Bangladesh for sale of 500 MW capacity, opening the door for the first time for the trilateral power trade in South Asia. Accordingly, power producer in Nepal will sell electricity directly to the third country, Bangladesh (Bangladesh and Nepal does not share boundaries), by using the Indian transmission system. However, both GMR and Government of Bangladesh have signed PPAs with Indian trading company NNVNL, an arm of NTPC, to facilitate smooth trade of electricity from Nepal to Bangladesh. Subsequently, Bangladesh Cabinet Committee on Public Purchase approved import of power at the rate of 7.71 cents per unit for a period of 25 years.

GMR is expected to receive a letter of intent to this effect from Bangladesh, which will enable GMR to arrange funds from prospective lenders for the construction of the power plant. The PPA will follow after LOI. PPA is an essential document required by lenders for financial closure. However, GMR has been unofficially holding talks with potential lenders including local banks

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35 https://kathmandupost.com/money/2019/12/20/bangladesh-agrees-to-pay-7-7-cent-per-unit-for-upper-karnali-power
and multilateral agencies so as to prepare for financial closure as well as land acquisition. As per the proposal cleared by Bangladeshi officials, the country will pay out a massive Tk381.60 billion (equivalent to Rs511.69 billion) over 25 years to procure 500 megawatts of electricity. Nepal will receive 108 MW out of the remaining 400 MW for free while GMR plans to sell the rest to the Government of the Indian state of Haryana.

While almost 12 years have passed since the signing of the MOU between GMR and GON, the offtake arrangement for sale of power has not yet been signed, though GMR has been able to finalize tariff and terms and conditions of PPA for partial capacity of 500 MW out of the agreed 900 MW capacity for sale of power to Bangladesh. Since the signing of the Project Development Agreement between GON and GMR (2014), the PPA and financial closure terms remains to be finalized. Further, GMR has not been able to complete land acquisition required for establishing the project. As per the PDA, time period for construction of the project is 6 years after GMR achieves financial closure of the project. It shows that, for private power developers, process of land acquisition and offtake arrangements remains as barriers in the existing system for CBET, especially due to lack of multilateral power trade and lack of harmonized policies towards power market in the subregion. Government interventions are critical for land acquisition, whereas for offtake arrangements development of a common set of cross-border regulations for power market is required. Multilateral power trade systems and creation of regional institutions for governing regulations etc. are some of the steps needs to be taken urgently by the subregional countries.

7. Suggested institutional mechanisms for coordination of various activities related to implementation of CBET

As discussed earlier in the paper, CBET in the SSWA subregion has been largely bilateral in nature and also limited to mostly eastern part of the subregion (BBIN countries), despite the fact that regional institutions such as SAARC, USAID, Multilateral Developments Banks such as the World Bank and ADB have been supporting grid connectivity and multilateral trade of electricity in the subregion. Considering the geopolitics and the general lack of trust among South Asian countries, it is important that an independent agency such as ESCAP plays an important role to take forward energy cooperation and integration in the subregion.

Though all the regional intuitions and MDBs share a common vision for CBET, they have been mostly working independently without proper cohesion and information exchange. It is therefore important that ESCAP, being neutral agency may take a lead role and join hands with regional institutions, MDBs, government etc. to establish a working group or a task force for making collective efforts to achieve the goal of regional grid connectivity and to enhance multilateral power trade in the region, especially in pursuit of activities/strategies for implementation of ESCAP’s regional road map for CBET.
For coordination and for providing directions to the working groups, a high-level apex committee may be constituted. The roles and functions of the working groups and the apex committee may be finalized by ESCAP. The working groups may carry out research studies on requirements of grid integration as per assessments and requirements. Further, from a long term perspective, ESCAP may support establishment of a ‘Center of Excellence on Energy and Sustainable Development’, envisioned to act as a catalyst and promoter for the CBET in the subregion.

8. Gender dimensions of CBET

With the growing interest among developers to tap the huge energy resource potential available for electricity generation in the BBIN subregion, several large and small projects have been built or are in the process of being developed. The linkages between energy access, welfare, and gender are well known. Enhanced energy linkages have the direct benefit of employment opportunities for the local community, and investment on the projects have several spillover benefits for education, health facilities and socio-economic empowerment for both men and women. CBET can result in enhanced participation of women in the workforce of the subregion, both directly and indirectly. CBET would enhance accessibility and availability of affordable electricity, creating opportunities for women of the households in terms of their participation in paid labor. An interconnected power grid for South Asia will enhance renewable energy, increase affordability and access while lowering emissions,

36 https://www.sciencedirect.com/science/article/pii/S2214629618306145
which will have a positive bearing through electrification of households, energy usage reduction, cost reduction, savings for women in terms of time spent on unpaid household care. Low-cost electricity supply to women led SMEs, reducing their operating costs, could lead to employment generation and social mobility opportunities to women.

There is a need for detailed research on gender dimensions of CBET and potential areas for such research may include gender surveys on electrification, benefits for women at the household level due to enhanced CBET, and employment potentials for women due to reduced cost and improved availability of clean energy.

9. Conclusions

CBET can potentially create win-win situations for growth and development of all countries of the SSWA subregion. Current trends show that importing countries have been able to cover substantial portions of their energy shortages at competitive prices, while exporting countries have been able to earn revenues. However, despite potential benefits of CBET as well as initiatives taken by various regional institutions, power trade in the SSWA subregion has remained suboptimal till date.

Global experiences show that participating countries of initiatives such as the South African Power Pool and the European Power Market commenced multilateral CBET by building on bilateral arrangements. Subsequently, through various directives and step by step approaches, they moved towards multilateral trading, and established transparent and competitive power market structures.

For the first time in the SSWA subregion, steps have been taken to move from bilateral to trilateral trade of electricity through joint initiatives by Bangladesh, India and Nepal. This will be the first case of trilateral power trade in the subregion, though the modalities for the same including tripartite agreement for using cross-border transmission systems are yet to be finalized.

For moving towards multilateral power trade, it is important that buyers and sellers trade freely, and prices are discovered by market forces at most competitive way without government interventions. Multilateral power trade requires enabling conditions at the regional level, such as developing a common set of policies/regulations, power market regulations, transparent power pricing mechanisms, transmission planning, harmonization of grid codes, technical standards, developing standard PPAs/TSAs, suitable dispute resolution mechanisms, common set of investment guidelines to promote investment in the power sector as well creation of enabling regional institutions for developing a competitive power market structure.

To achieve these objectives, the SSWA subregion require political will and trust building among countries as well as treaties/agreement between governments, power utilities, regulators etc. ESCAP has already developed a road map covering nine strategies viz. i) Build trust and political consensus; ii) Master Grid Plan; iii) Intergovernmental treaties/agreements on energy cooperation; iv) Harmonization of policies/regulations; v) Move towards multilateral power trade; vi) Transmission planning & system operation; vii) Investment framework; viii) Capacity-building; and ix) Cohesiveness of energy initiatives and sustainable development for grid connectivity in
Asia-Pacific region. This can provide important directions for enhanced grid connectivity in the SSWA subregion.

Based on the current status and concerns prevailing in the SSWA subregion to enhance grid connectivity and multi-lateral power trade, some of the actions required for immediate attention are suggested as below:

1. **Expand SAARC Agreement on Energy Cooperation**: To enhance grid connectivity in SSWA region, it is important that SAARC Agreement on Energy Cooperation be extended to include Iran and Turkey as part of the Agreement.

2. **Shift from bilateral to multi-lateral power trade**: To move towards multilateral CBET, it is important to create trust and political will among the countries of the SSWA subregion through continuous dialogue and communication. ESCAP being neutral agency can play an effective role, along with other regional institutions such as SAARC, BIMSTEC, and MDBs such as ADB/USAID/World Bank, and governments, in creating effective coordination and networking for CBET. Global experience shows that grid connectivity across all member countries of a region is important for taking full benefits of power trade through optimum utilization of resources, and discovery of competitive pricing mechanisms. Learnings of CASA-100 and LTMS (APG/ASEAN) are useful examples in developing multilateral power trade in the South Asia subregion in this regard.

3. **Develop offtake arrangements**: Bhutan is selling surplus power to India, while Nepal can potentially be a net exporter and would need a regional power market to sell its surplus power to neighboring countries. While India is a big competitive power market, the country is building huge renewable generation capacity domestically. Bangladesh is a net importer today and will remain in immediate future with its limited energy resources. On the western side, Afghanistan is suffering from huge energy shortages. Off take is a concern for developers to sell hydropower, as presently trade is limited to only four countries and also as the tariff of hydropower is not competitive against the huge capital costs of hydropower and risks associated with such projects.

   However, development of hydropower is critical for balancing the intermittent load of renewables. Enhancing grid interconnectivity across the region and making special policies to promote hydropower by giving incentives, cheaper funding for longer duration, making mandatory obligations for bulk consumers to buy some percentage of hydro power etc. will facilitate development of hydro power as well as will facilitate to resolve off take arrangement. Based on the learnings of Nepal’s trading with Indian power exchanges, other countries may also take steps to trade for taking the benefit of competitive prices, potentially leading to the development of a competitive power market structure at the subregional level.

4. **Cross-border policies/guidelines by subregional countries**: Based on the guidelines/regulations/ issued by the Government of India for CBET, other countries in the SSWA subregion also need to take steps to issue such guidelines/regulation to promote investors/developers confidence to invest in the sector. Further, for harmonization of policies/regulations, it is important to institutionalize the process to create a forum/association or joint committees of technical bodies, forum/association of transmission utilities and system
operators. Such forums can lead coordination, planning and implementation of transmission interconnections among the countries.

5. Establishing coordination mechanisms: For implementation of the ESCAP’s Road Map and for creating trust among countries in the SSWA subregion, it is important that ESCAP takes a lead role in creating suitable coordination mechanism and networking, wherein regional institution such as SAARC, along with governments and various MDBs joint efforts to form working groups or empowered committees. A suitable coordination mechanism has been suggested in Chapter 7 of this paper. Such working groups may take up research studies to achieve the goal of grid integration in the subregion and undertake activities such as developing white papers for policy advisories on CBET.

6. Action plan for implementation of ESCAP road map: Based on the status report, opportunities and challenges prevailing in the SSWA subregion, ESCAP may prioritize strategies/activities identified in the road map for its implementation to successfully achieve the goal of grid integration, establishment of a competitive power market structure and promotion of multilateral CBET in the subregion in a time bound manner.
Annex

Key provisions of Standard/Model Power Purchase Agreement developed by India
(Competitive tariff based bidding under case-I)

Term of agreement: Includes i) Effective date: means this agreement shall come into effect from the date it is executed; ii) Terms of Agreement: This Agreement shall be valid for a term commencing from the Effective Date until the Expiry Date ("Term of Agreement"), unless terminated earlier; iii) Early Termination: This agreement shall terminate before the expiry date, if both buyer and seller exercise the right to terminate or both mutually agree in writing to terminate; iv) Survival: The expiry or termination of this Agreement shall not affect any accrued rights, obligations and liabilities of the Parties under this Agreement etc.

Conditions Subsequent to be satisfied by Seller: i) The Seller shall have obtained all the necessary permission for the long/medium term open access for the intrastate transmission system from the Power Station bus bar to the Injection Point; ii) The Seller shall have obtained all Consents, Clearances and Permits required for supply of power to the Procurer as per the terms of this Agreement; iii) The Seller shall have sent a written notice to all the Procurer indicating the Aggregated Contracted Capacity and total Installed Capacity for each unit and for the Power Station as a whole expressed in MW.

Conditions Subsequent to be satisfied by Procurer: i) The Procurer shall have obtained the order of the State Regulatory Commission for adoption of tariff; ii) The Procurer shall facilitate in coordinating on applicable inter-state/regional transmission linkages required from the Injection Point to the Delivery Point. Further, in case there is substantial delay in meeting the conditions subsequent by seller or procurer, there are penalty clauses.

Supply of Power:
(a) Commencement of Supply of Power to procurer: The Seller shall be responsible to commence supply of power up to the Aggregated Contracted Capacity by the Scheduled Delivery Date in accordance with the provisions of the Agreement.
(b) Sellers Obligations: i) Obtaining all consents, clearances, permits; ii) the commencement of supply of power, up to the Aggregated Contracted Capacity, to the Procurer no later than the Scheduled Delivery Date or the Revised Scheduled Delivery Date; iii) obtaining open access for transmission of Aggregated Contracted Capacity of power from the Injection Point to the Delivery Point etc.
(c) Procurers Obligations: Ensure the availability of Interconnection Facilities and evacuation of power from the Delivery Point before the Scheduled Delivery Date; ii) be responsible for payment of the Transmission Charges and iii) fulfill all obligations undertaken by the Procurer under this Agreement.

Billing & Payment: i) The Procurer shall pay the amount payable under the Monthly Bill on the Due Date to such account of the Seller; ii) In the event of delay in payment of a Monthly Bill by the Procurer beyond its Due Date, a Late Payment Surcharge shall be payable by such Procurer to the Seller; iii) For payment of any Bill before Due Date, the Rebate shall be paid by the Seller to procurer; iv) Payment Security mechanism: the Procurer shall provide to the Seller, in respect of payment of its Monthly Bills and/or supplementary Bills, a monthly unconditional, revolving and irrevocable letter of credit ;v) As a further support for the Procurers’ obligations, the Seller shall execute separate Default Escrow agreement/account through which the revenues of the Procurer shall be routed and used as per the terms of the Default Escrow Agreement ; vi) Third Part sale on default etc.

Force Majeure: A ‘Force Majeure’ means any event or circumstance or combination of events and circumstances that wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations under the Agreement, but to the extent that such events or circumstances are not within
the reasonable control, directly or indirectly, of the Affected Party. i) Natural Force Majeure includes act of God, including, but not limited to lightning, drought, fire and explosion (to the extent originating from a source external to the site), earthquake, volcanic eruption, landslide, flood, cyclone, typhoon, tornado etc.; ii) Non Natural Force majeure includes nationalization or compulsory acquisition by the Governmental Instrumentality, the unlawful, unreasonable or discriminatory revocation of, or refusal to renew, any Consents, Clearances and Permits etc.; iii) Force Majeure exclusions: a) Unavailability, late delivery, or changes in cost of the plant, machinery, equipment, materials, b) Delay in the performance of any contractor/sub-contractor, c) Strikes or labor disturbance at the facilities of the Affected Party etc. iv) No Party shall be in breach of its obligations pursuant to this Agreement except to the extent that the performance of its obligations was prevented, hindered or delayed due to a Force Majeure Event.

**Events of Default and Termination:** i) Seller’s Event of Default includes the failure to commence supply of power to the Procurer up to the Contracted Capacity by the delivery date; ii) Procurer’s default includes procuer fails to pay Monthly Bill or a Supplementary Bill for a period of ninety (90) days after the Due Date and the Seller is unable to recover the amount; iii) Upon the occurrence and continuation of any Seller or Procurer Event of Default the Seller or Procurer shall have the right to deliver to the notice with a copy to the Appropriate Commission of their intention to terminate this Agreement.

**key provisions of Transmission Service Agreement as per India’s Standard/Model bidding document**

- [Competitive tariff based bidding](https://www.tatapower.com/pdf/ppa-procurement.pdf)

**Effectiveness and Terms of Agreement:** The agreement will be effective from the date the selected bidder has acquired the acquisition price, 100% of equity along with all the assets & liabilities as per the share purchase Agreement and also submitted contract performance Guarantee as per the requirements.

**Conditions Subsequent:**
- **Satisfaction of Conditions subsequent by the Transmission Service provider:** Agrees and undertake to duly perform and complete the following activities within 6 months’ time from the effective date: a) To obtain the transmission license for the Project from the appropriate Commission; b) To obtain the order of adoption of transmission charges from the appropriate Commission; c) To submit the Execution plan within 12 days; d) to achieve financial closure; e) To award EPC contract etc.

- **Satisfaction of Conditions subsequent by the Long term customers:** Within 6 months from the effective date, Long term customers shall provide irrevocable letter to the lenders duly acknowledging and accepting rights to the lenders in terms of the Agreement.

If either party does not perform in terms of the agreement, there are provisions for penalty from both sides including termination.

**Development of the Project:**

- **Transmission Service Providers (TSP) Obligations:** TSP at its own cost shall perform, undertake and be responsible for a) for procuring, maintaining in full force all the clearances, permits, consents required in accordance with law for the development of project; b) for financing, constructing owning and commissioning of the project in accordance with Grid Code, CEA Technical Standards; c) for entering into connection agreement with Central Transmission Utility (CTU)/State Transmission Utility (STU) as applicable in line with grid code etc;

- **Long term Transmission Customers Obligations:** At its own cost, Long term Transmission Customers shall undertake to perform a) for assisting and supporting the TSP in obtaining consents, clearances,
permits etc.; b) for arranging and making the interconnection facilities available for TSP; c) for complying with all the obligations of this agreement.

**Construction of the Project:**

**TSP’s Construction Responsibilities:** The TSP at its own cost shall be responsible for designing, erection, construction and commissioning of the each and every element of the project in accordance with Central Electricity Authority’s Technical Standards, Grid codes, Safety standards etc. TSP will be responsible for obtaining all clearances, permits relating to roads/river/canal/power line crossings/right of way/forest clearances etc. Further, TSP will be responsible for land acquisition for specific substations, survey and geo technical investigation etc.

**Inspection by the Lead Long Term Transmission customer:** Lead Long Term Transmission customer shall designate at the most 3 employees from time to time for inspection to see the progress at its own cost. TSP will be responsible to make available necessary access at all reasonable times for their visit.

**Connection & Commissioning of the project:** The TSP shall give Regional Load dispatch center, Central Transmission Utility/State transmission utility, Long term transmission customer at least 60 days’ prior written notice for its intend to connect the element of the project with the interconnection facility when i) it has been completed in accordance with this agreement; ii) meets the grid code; iii) TSP has obtained clearance from the Electrical Inspector certifying that it meets the safety standards and is ready for interconnection. Further, there are liquidated damages clauses in case there is substantial delay in commissioning of the project.

**Billing & payment of Transmission Charges:** Long term transmission customers shall pay monthly transmission charges in Indian Rupees from the date of Commissioning in line with the provisions of this agreement including incentive, if availability was more than the target set forth. In case the availability is less than the target, TSP will pay the penalty in accordance with the agreement.

**Payment Security Mechanism:** Establishing Letter of Credit: Long term transmission customers shall open L/C in favor of TSP not later than 1 month prior to COD for the estimated amount of one month billing for a period of 12 months which is to be renewed annually.

**Force majeure:** A ‘Force Majeure’ means any event or circumstance or combination of events and circumstances that wholly or partly prevents or unavoidably delays an Affected Party in the performance of its obligations under the Agreement, but to the extent that such events or circumstances are not within the reasonable control, directly or indirectly, of the Affected Party. i) Natural Force Majeure includes act of God, including, but not limited to lightning, drought, fire and explosion (to the extent originating from a source external to the site), earthquake, volcanic eruption, landslide, flood, cyclone, typhoon, tornado etc.; ii) Non Natural Force majeure includes nationalization or compulsory acquisition by the Governmental Instrumentality, the unlawful, unreasonable or discriminatory revocation of, or refusal to renew, any Consents, Clearances and Permits etc.; iii) Force Majeure exclusions : a) Unavailability, late delivery, or changes in cost of the plant, machinery, equipment, materials , b) Delay in the performance of any contractor/ sub-contractor, c) Strikes or labor disturbance at the facilities of the Affected Party etc. iv) no Party shall be in breach of its obligations pursuant to this Agreement except to the extent that the performance of its obligations was prevented, hindered or delayed due to a Force Majeure Event.

**Event of Default & Termination:** i) TSP’s Event of Default includes the failure to commission any element of the Project by the date falling six months after the COD. ii) Abandon of the project after taken up construction of the project; iii) if TSP becomes voluntarily or involuntarily bankruptcy or insolvent; iv) TSP goes into liquidation or dissolution; v) revocation of transmission license etc.