Promoting Cross Border Electricity Trade in South Asia

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Overview of South Asia – A unique & dynamic region of world

01
Home to 1.9 bn population
25% of World’s population

02
GDP: ~3.3 Tn
5th largest economy

03
One of the fastest growing region (c6.0%) World GDP Growth rate: ~3%

04
Per Capita Electricity Consumption: 1105
World Average: 3105

Market Structure

- Vertically Integrated
  - Nepal
  - Sri Lanka

- Single Buyer
  - Bangladesh
  - Nepal
  - Sri Lanka
  - Bhutan

- Private Sector Participation
  - Bangladesh
  - Bhutan
  - India
  - Nepal
  - Sri Lanka

- Independent Regulator
  - Bangladesh
  - India
  - Nepal
  - Sri Lanka
  - Bhutan

- Private sector participation in form of Independent Power Producers (IPPs) in Bangladesh, India, Nepal, and Sri Lanka
- T&D remain largely under public ownership of Government across the region.
- Most of the member nations continue to follow a single buyer model

Source: Country specific reports
Overview of South Asia Power Sector - A Snapshot (1/3)

SA countries can complement each other to enable each country to maintain the optimum resource mix

Source: Country specific reports

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Overview of South Asia Power Sector - A Snapshot (2/3)

Growth of RE capacity vis-a-vis total installed capacity in South Asia (GW)

SA country’s accelerated efforts have sharply increased sustainable energy’s share in their electricity generation capacity mix by 7% CAGR.

A robust and coordinated regional cooperation among South Asian countries is imperative to successfully meet their aggressive Energy transition plans

Energy transition plans based on NDC and COP26 commitments

- **BAN**
  - Unconditional RE target of 912 MW by 2030
  - Conditional RE target of 4.1 GW

- **BHU**
  - Continued focus on hydropower projects
  - 48 MW solar and 23 MW wind power by 2028
  - Green Hydrogen Roadmap to be prepared

- **IND**
  - 500 GW clean energy by 2030
  - 50% of RE by 2030 Net zero by 2070

- **NEP**
  - 15,000 MW clean energy by 2030 (inclusive of 5-10% of mini & micro- hydro power, solar, wind and bio-energy)
  - 15% of energy requirement to be met from RE by 2030

- **SL**
  - 70% RE in electricity generation by 2030
  - Carbon neutrality in electricity generation by 2050, and in total by 2060
  - No capacity addition of Coal power plants

Source: Statistical departments / utilities of respective countries

SA country’s accelerated efforts have sharply increased sustainable energy’s share in their electricity generation capacity mix by 7% CAGR.

A robust and coordinated regional cooperation among South Asian countries is imperative to successfully meet their aggressive Energy transition plans
Overview of South Asia Power Sector - A Snapshot (3/3)

To meet the massive future demand growth, optimizing generation capacity will be crucial and require significant capacity addition.

Source: Country specific reports

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Potential Benefits of Regional Energy Infrastructure & CBET in SA

01 Economic & Financial
- Access to Competitive Power
- Export Revenues
- Economic Extension of grid
- Regional Cost Optimization & Economic growth

02 Technical & Operation
- Larger grid, better grid
- Intra-seasonal differences
- Peak Time/Time zone differences
- Better Hydro - Thermal Mix
- Regional Balancing

03 Environment & Social
- Regional Hydro Power Development,
- RE/Clean Energy Development
- Reduced CO2 Emission, RE based CBET
- Improved Energy & Environmental Security

04 Regional Energy Market
- Competitive Energy Market
- Fair & Transparent Price Discovery
- Choice - Different Products
- Consumer Benefits & Social Welfare

05 Mobilising Investment
- New Investment Avenues
- Enhanced feasibility due to larger market
- Return on Investment
- Innovative Financing Mechanism

Source: Country specific reports
Cross Border Electricity Trade in South Asia: Current Scenario

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Source</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>India → Bangladesh (~1160 MW)</strong></td>
<td>250 MW NTPC</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>250 MW Market</td>
<td>Commercial</td>
</tr>
<tr>
<td></td>
<td>160 MW Tripura</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>500 MW Market</td>
<td>Commercial</td>
</tr>
<tr>
<td><strong>Bhutan → India (2260 MW)</strong></td>
<td>1020 MW Tala</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>336 MW Chukha</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>60 MW Kurichhu</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>126 MW Dagachhu</td>
<td>Commercial</td>
</tr>
<tr>
<td></td>
<td>720 MW Mangdechhu</td>
<td>G-G</td>
</tr>
<tr>
<td><strong>India → Nepal (800-1000 MW)</strong></td>
<td>237 MW India</td>
<td>G-G</td>
</tr>
<tr>
<td></td>
<td>660 MW Market</td>
<td>Commercial</td>
</tr>
</tbody>
</table>

Electricity Energy Volume (MU) traded amongst SA countries

- ~3760 MW of power trade in SA region with 70% agreements through G-G mode and 30% through commercial CBET
- Cross Border power trade in the SA region has doubled in the last 6 years
- CBET power transfer potential in SA is expected to grow from 17 Bus to 100 Bus by 2030

Source: Country specific reports

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# Planned Cross Border Infrastructure in SA

<table>
<thead>
<tr>
<th>Name of the Project</th>
<th>Capacity (MW)</th>
<th>Countries involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punatsangchhu I HPP</td>
<td>120</td>
<td>Bhutan/India</td>
</tr>
<tr>
<td>Punatsangchhu II HPP</td>
<td>1020</td>
<td>Bhutan/India</td>
</tr>
<tr>
<td>Kholongchhu HPP</td>
<td>600</td>
<td>Bhutan/India</td>
</tr>
<tr>
<td>Dorjilung HPP</td>
<td>1125</td>
<td>Bhutan/India/Bangladesh</td>
</tr>
<tr>
<td>Arun III HPP</td>
<td>900</td>
<td>Nepal/India</td>
</tr>
<tr>
<td>Dudhkoshi HPP</td>
<td>650</td>
<td>Nepal/India</td>
</tr>
<tr>
<td>Upper Karnali HPP</td>
<td>900</td>
<td>Nepal/India/ Bangladesh</td>
</tr>
</tbody>
</table>

**Multi Country power trade**

- Bangladesh will import 500 MW of power from Nepal using India’s transmission corridor.
- Bhutan’s Nyera Amari and Dorjilung hydropower projects will be developed through trilateral cooperation between Bangladesh, Bhutan, and India

**Increase in Private participation and commercial power trade**

- Gradual evolution of CBET from G-G agreements to Commercial cross border trade (Currently ~30% of the current CBET in SA Region)

**Promote RE integration**

- CBET of hydropower is currently the most viable option to meet the balancing needs of the SA countries which have aggressive renewable energy addition targets

### Countries

<table>
<thead>
<tr>
<th>Countries</th>
<th>Name of the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>India - Bangladesh</td>
<td>Interconnection between Bihar (Katihar), India- (Parbotipur), Bangladesh – (Bornagar) Assam, India at 400 kV D/C and augmentation to 765 kV D/C</td>
</tr>
<tr>
<td>India - Nepal</td>
<td>400 kV D/C Interconnection between Butwal (Nepal) and Gorakhpur (India)</td>
</tr>
<tr>
<td>India – Sri Lanka</td>
<td>500/1000 MW interconnection</td>
</tr>
</tbody>
</table>

**Source:** Country specific reports

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CBET through Indian power exchanges

The participation and transaction of the power on energy exchange for any neighboring nation is governed by “Procedure for Approval and facilitating of import/export (cross border) of electricity by the Designated Authority” issued by CEA in February 2021

In 2021, IEX has launched the CBET on its platform

- On 19 April 2021, Nepal was the first country to participate in Indian energy Market.
- Nepal purchased around 835 MUs from IEX and sold 1357 MUs between April 2022 to February 2023.
- By trading in in DAM, Nepal was able to meet its dry season demand optimally, and sell its surplus electricity generated during monsoon season.
- On 1 January 2022, Bhutan also commenced trade in the day-ahead market through Druk Green Power Corporation Limited (DGCPL) on IEX.
- Till March 2023, ~559 MU was imported through IEX-DAM to meet lean season deficits by Bhutan.

IEX is working closely with stakeholders in Bangladesh to facilitate its participation towards reinforcing the cross-border electricity trade and building an integrated South-Asian regional power market.
SASEC operational plan
Strategic objectives and operational priorities

Strategic Objectives of SASEC Operational Plan in Energy

<table>
<thead>
<tr>
<th>Enhancing connectivity</th>
<th>Low Carbon Alternatives</th>
<th>Diversifying energy supply to meet energy needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancing physical connectivity, developing infrastructure and development of regional power market</td>
<td>Developing low-carbon alternatives, and energy efficiency and conservation measures</td>
<td>Enhancing electricity trade and expanding and diversifying energy supply to meet energy needs and secure power reliability, and</td>
</tr>
</tbody>
</table>

SASEC vision for Energy Sector

- Improve interconnections to access large-scale electricity and natural gas sources
- Harness unused regional indigenous hydropower potential
- Develop low-carbon alternatives including wind and solar
- Facilitate bilateral and regional coordination mechanisms and knowledge sharing

SASEC Operational Plan 2016-2025 was updated in 2020 based on a reprioritisation exercise conducted by ADB in 2018-19 taking into account member nations’ inputs and comprehensive stocktaking on completed and ongoing regional cooperation projects.
SASEC Energy Sector Initiatives

Objectives

- SASEC-wide network integration for power trade
- Promotion of clean, low carbon energy

Progress

- Three transmission projects in NEP for building power export capacity
- Bangladesh Dhaka- Western Zone Grid Expansion
- Regional TA (9584) for energy oversight/ knowledge sharing

Priority Infrastructure funding Projects

Hydro power and transmission projects for trade
- Butwal-Gorakhpur Cross-border Transmission Line Project (400 kV, 135 km – being developed jointly by Power Grid Company Ltd and Nepal Electricity Authority
- Power Transmission & Distribution System Strengthening Project in Nepal – already approved
- Dudh Koshi Hydropower Project in Nepal
- Nyera Amari Hydropower Project in Bhutan

Green fuel development TA
- To assess country/ region-wide resource potentials
- To develop regional strategies to promote alternative fuels (e.g., green hydrogen, biofuels)
TA 9584 - Support SASEC Energy Sector Initiatives - Brief Synopsis

- Regional Support and Technical Assistance (KSTA) was launched in 2018 to promote the projects identified in SASEC Operation Plan 2016-2025
- The broad objective was to promote knowledge sharing activities in the region and conduct capacity building of the member nations to enhance the power trade

Outcomes envisaged by the TA

1. Development of a masterplan and future roadmap for enhancing cross border power trade
2. Maintain and Update the flagship regional projects under the SASEC Operational Plan 2016-2025
3. Capacity building of the policy makers, utilities and regulators in cross border power trade

Thematic Segregation of the TA based activities

1. Assessment of country plans (master plans, investment plans & programs, etc.)
2. Regional Project assessments (feasibility, costing, safeguards, project benefits, etc.)
3. Stakeholder engagement (to identify issues & requirements, gain acceptance of road map, etc.)
4. Ensuring adequate capacity Building through knowledge sharing workshops
Activities carried under the TA

Potential Regional Projects
• Study on India- Sri Lanka interconnection
• Study on India-Bangladesh transmission interconnection project

SASEC Nodal Officer/SASEC PTWG Meetings
• Second Meeting of the SASEC PTWG 2019
• SASEC Nodal Officials and Working Group Meeting 2019
• Support in preliminary structuring of Regional Flagship Projects
• SASEC Nodal Officials and Working Group Meeting 2020
• Country visits to India, Nepal, Bhutan and Bangladesh for briefing key stakeholders on SASEC program

Capacity Buildings
• HR Business Plan for Bhutan Power System Operator (BPSO)
• Capacity building of SAARC Council of Experts of Energy Regulators - Electricity (CEERE)
Key areas for further development of SA CBET (1/2)

Renewable Energy Integration

- Dedicated **transmission corridor** required for RE integration in SA which integrates VRE from India and hydro from Bhutan and Nepal

Bundling of Hydro Power

- Enhance CBET in SA by **bundling hydro power with other renewables**.
- **Competitive rates** benefit both selling and buying countries.
- **Intermediary countries** gain advantages.
- **Policy advocacy** needed for integration with power trade frameworks

Power Market Products

- More **power exchange products** (GDAM, GTAM, RTM etc.) needed for SA nations.
- Spur participation of **generators**.
- Contribute to **OSOWOG** ambition.
- Development of **green electricity export market**
## Key areas for further development of SA CBET (2/2)

| Development of robust CBET pricing mechanism | • JWG & JTT plan for robust CBET transmission infrastructure.  
• Project delays due to **non-standard cost sharing & varying commercial mechanisms**.  
• Need for **robust/uniform cost sharing mechanism** for transmission development |
| --- | --- |
| Hybrid PPAs | • CBET relies on **G-G arrangements**.  
• **Political consensus** is crucial for CBET success.  
• Securing **long-term PPAs** is challenging at present SA scenario  
• **Blended/Hybrid PPAs** can improve financial viability. |
| Infrastructure development | • Address geographical challenges, **transmission congestion** & coordinate **infrastructure implementation** for cross-border power transmission.  
• Need to **Harmonize rules and regulations**, establish a **Regional Transmission Master Plan**, and streamline clearance procedures. |
| Smart Grid infrastructure | • Ensuring **energy security** is must with **robust grid infrastructure**, reducing dependence on fossil fuel-generated imports.  
• Adaption of **smart grid technologies** can be one of the options  
• Benefit from the transition to a smarter grid through **long-term planning** and **regional cooperation** |
| Renewable Energy and Policy Revisions | • Revise **energy policies** to create an enabling environment for **sustainable power trade**.  
• Promote **mutual interdependence** to foster regional **energy security & sustainable power trade**. |