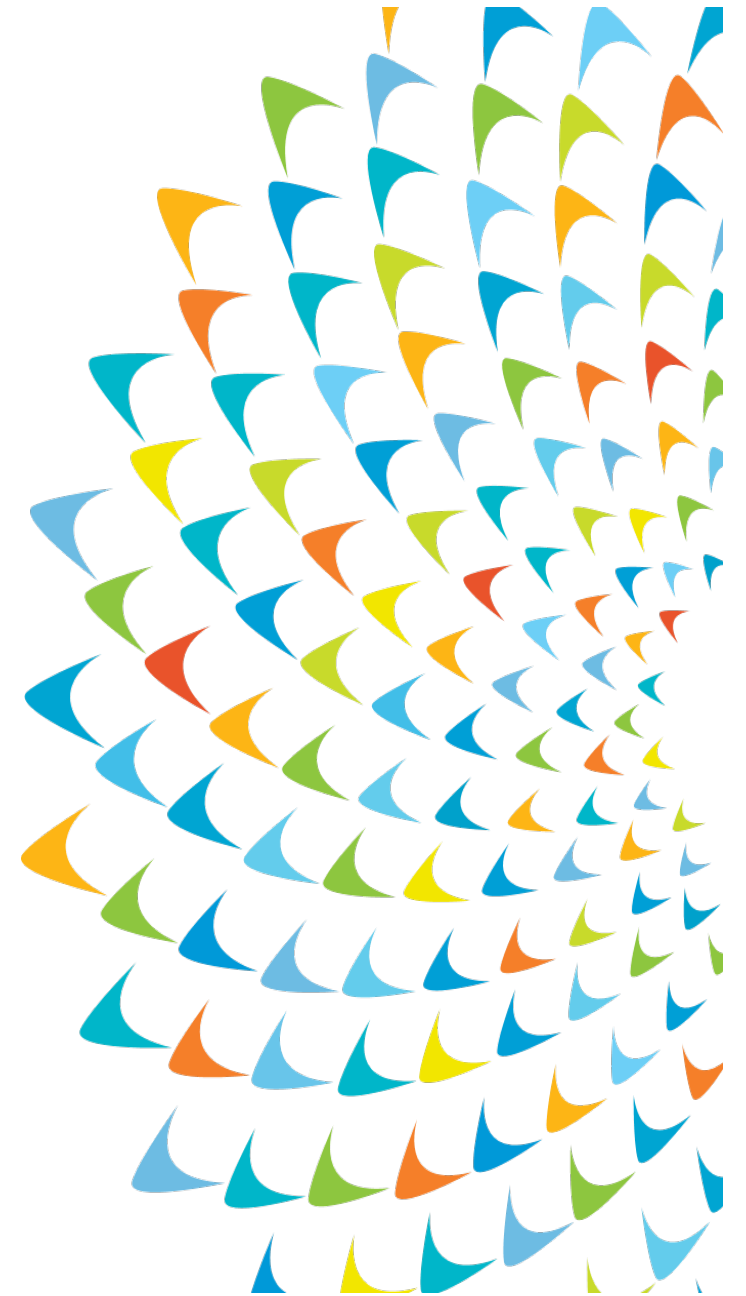




Promoting Cross Border Electricity Trade in South Asia

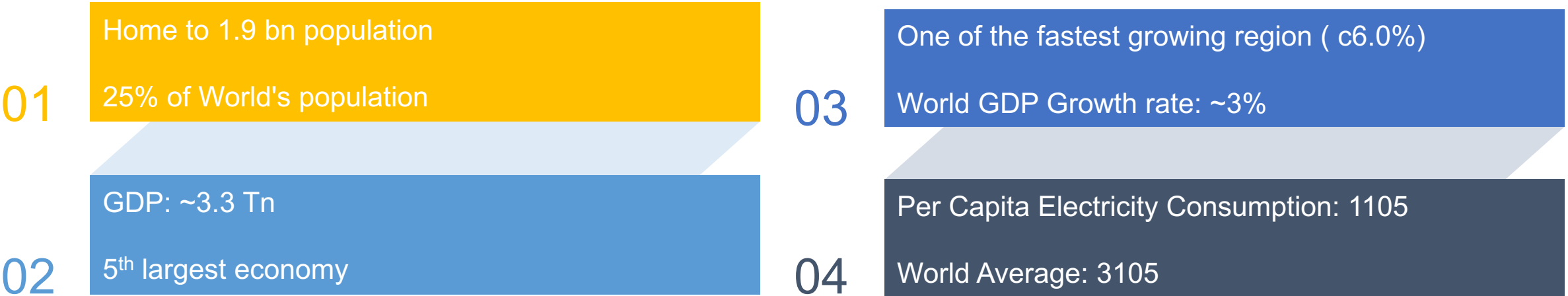
**Jiwan Acharya, Principal Energy
Specialist, South Asia Department**
jacharya@adb.org

June 2023





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

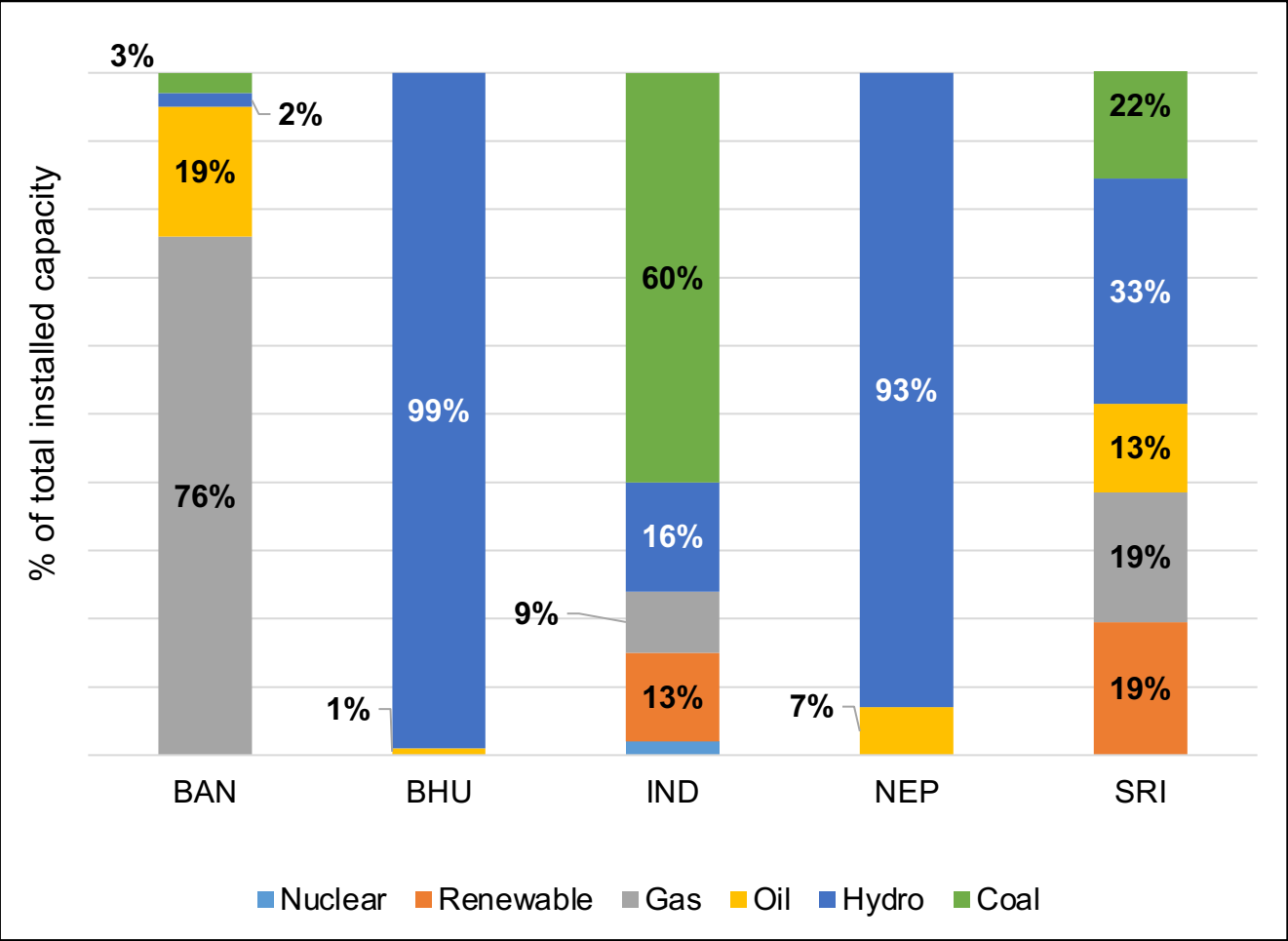


Market Structure	Vertically Integrated	Single Buyer	Private Sector Participation	Independent Regulator	<ul style="list-style-type: none">• Private sector participation in form of Independent Power Producers (IPPs) in Bangladesh, India, Nepal, and Sri Lanka• T&D remain largely under public ownership of Government across the region.• Most of the member nations continue to follow a single buyer model
	Nepal Sri Lanka	Bangladesh Nepal Sri Lanka Bhutan	Bangladesh Bhutan India Nepal Sri Lanka	Bangladesh India Nepal Sri Lanka Bhutan	

Source : Country specific reports



Overview of South Asia Power Sector - A Snapshot (1/3)



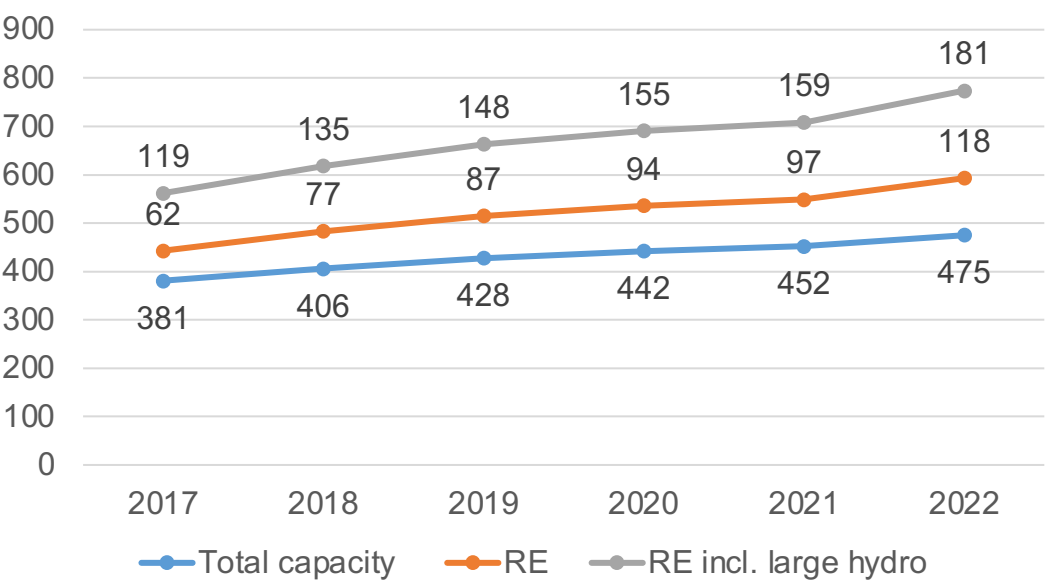
BAN	⇒	High gas dependence	Resource Crunch
BHU	⇒	Hydro dominant	Exporter of hydro energy
IND	⇒	Coal and RE Central to CBET in SA	Competitive Power Market
NEP	⇒	Hydro dependent	Net importer of electricity now but potential to export in future
SL	⇒	Hydro and oil dominated	High Peak-off peak differential

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



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.

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

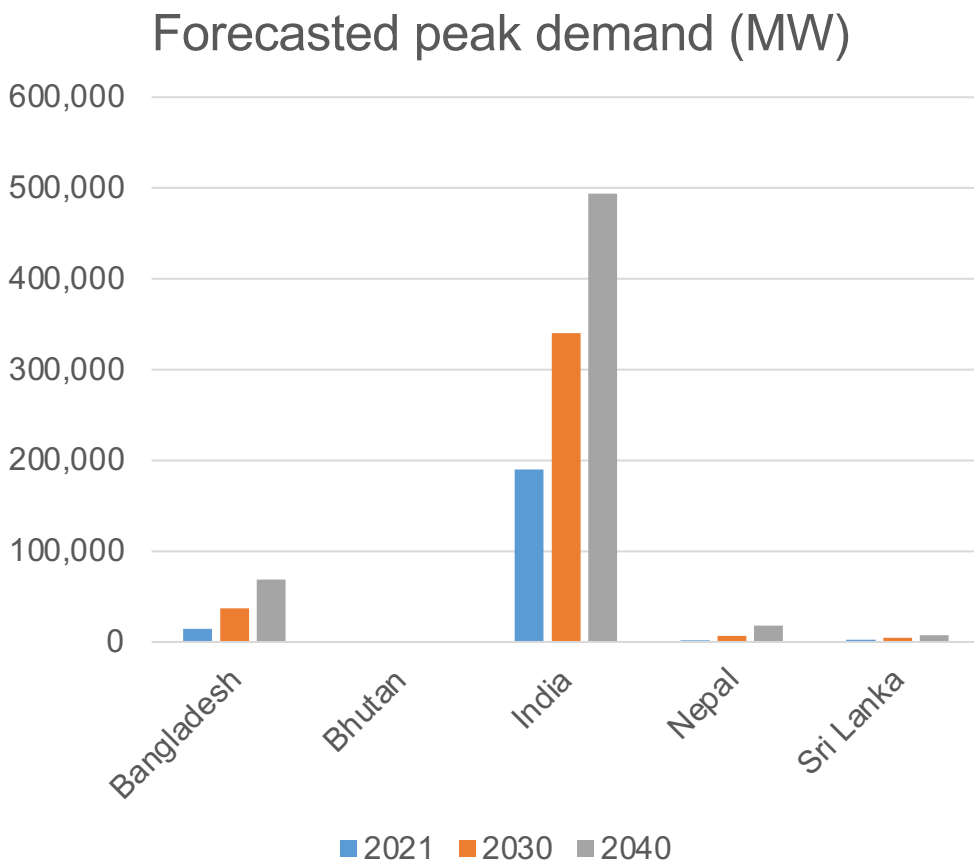
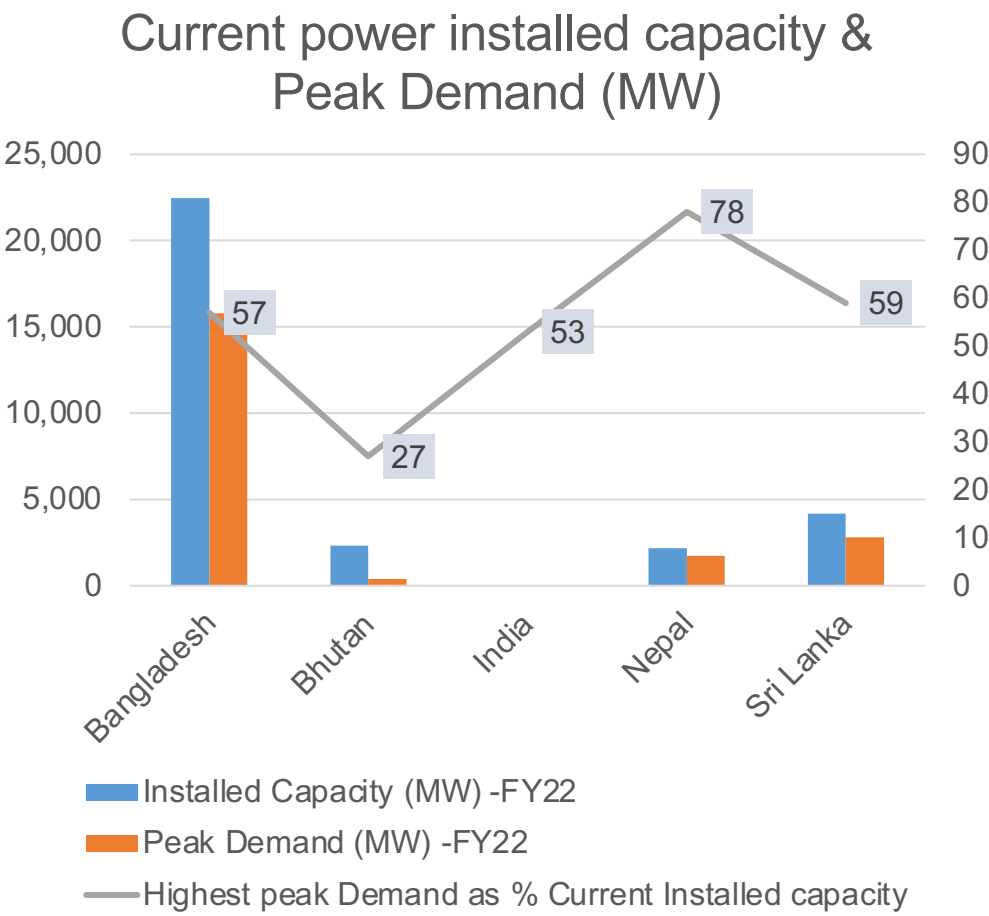
A robust and coordinated regional cooperation among South Asian countries is imperative to successfully meet their aggressive Energy transition plans

Source : Statistical departments / utilities of respective countries

INTERNAL. This information is accessible to ADB Management and staff. It may be shared outside ADB with appropriate permission.



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



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

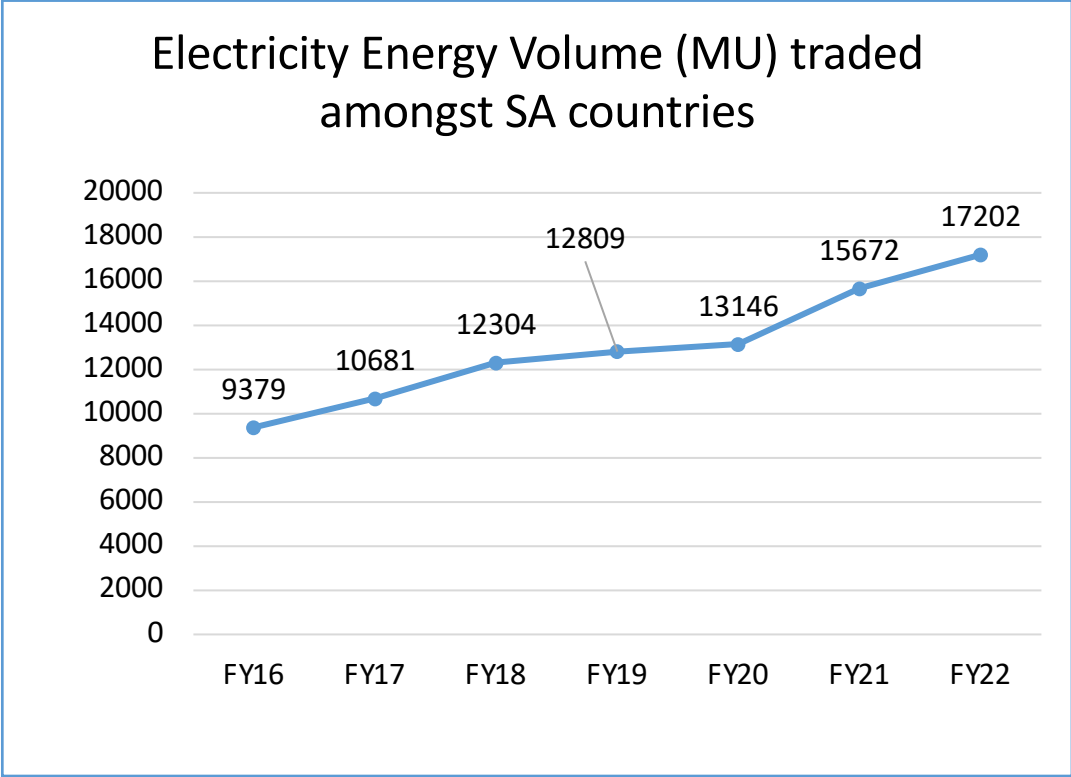
- New Investment Avenues
- Enhanced feasibility due to larger market
- Return on Investment
- Innovative Financing Mechanism

Source : Country specific reports



Cross Border Electricity Trade in South Asia : Current Scenario

Particulars	Source	Type
India → Bangladesh (~1160 MW)	250 MW NTPC	G-G
	250 MW Market	Commercial
	160 MW Tripura	G-G
	500 MW Market	Commercial
Bhutan → India (2260 MW)	1020 MW Tala	G-G
	336 MW Chukha	G-G
	60 MW Kurichhu	G-G
	126 MW Dagachhu	Commercial
	720 MW Mangdechhu	G-G
India → Nepal (800-1000 MW)	237 MW India	G-G
	660 MW Market	Commercial



- ~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



Planned Cross Border Infrastructure in SA

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

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

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

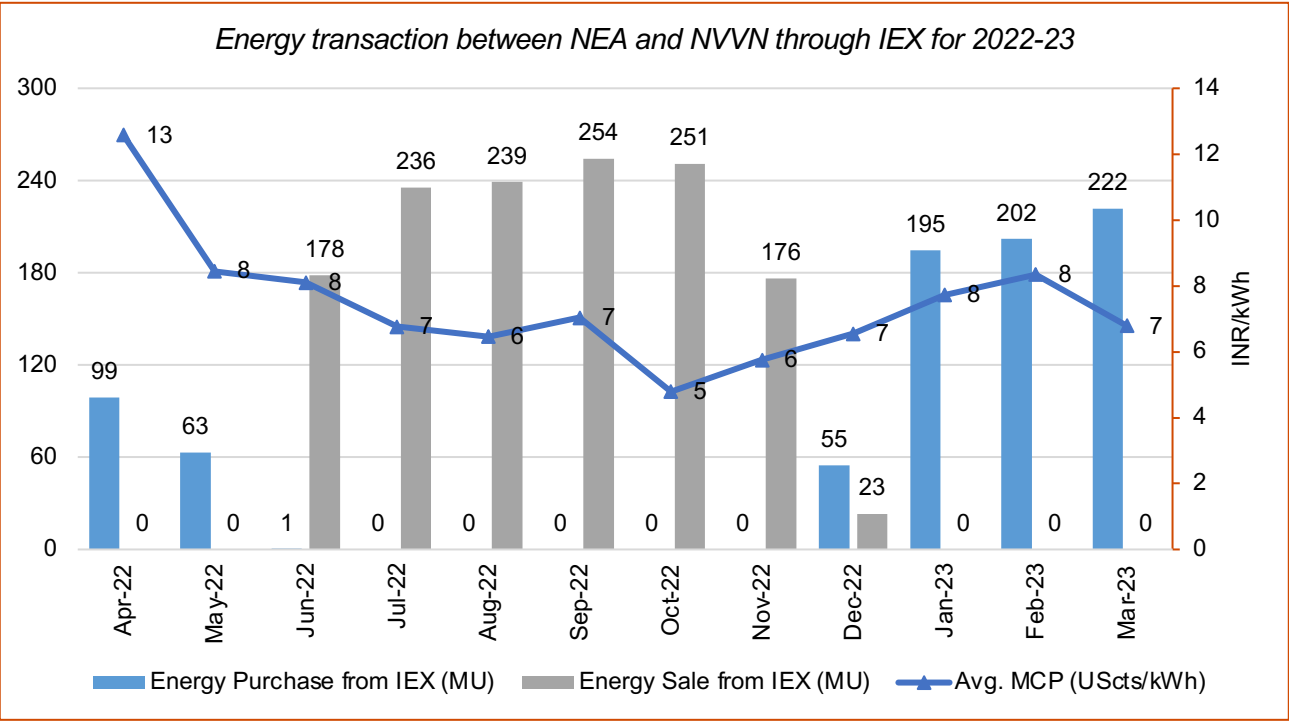
Interconnection capacity in SA Region expected to increase to ~43 GW by 2040



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

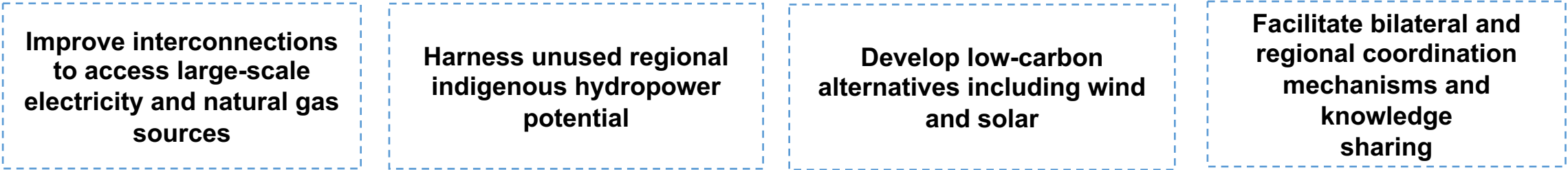
Strategic objectives and operational priorities

Strategic Objectives of SASEC Operational Plan in Energy

	Enhancing connectivity		Low Carbon Alternatives		Diversifying energy supply to meet energy needs
Enhancing physical connectivity, developing infrastructure and development of regional power market		Developing low-carbon alternatives, and energy efficiency and conservation measures		Enhancing electricity trade and expanding and diversifying energy supply to meet energy needs and secure power reliability, and	



SASEC vision for Energy Sector



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

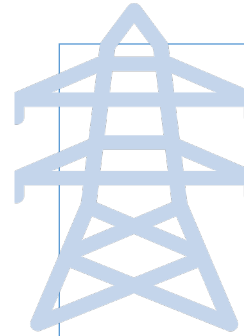
Objectives

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

Progress

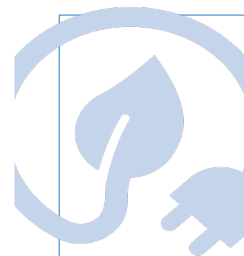
- Three transmission projects in NEP for building power export capacity
- Bangladesh Dhaka- Western Zone Grid Expansion
- Regional TA (9584) for energy oversight/ knowledge sharing

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



Development of a masterplan and future roadmap for enhancing cross border power trade



Maintain and Update the flagship regional projects under the SASEC Operational Plan 2016-2025



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	<ul style="list-style-type: none">▪ 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	<ul style="list-style-type: none">▪ 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	<ul style="list-style-type: none">▪ 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	<ul style="list-style-type: none">▪ 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	<ul style="list-style-type: none">▪ Revise energy policies to create an enabling environment for sustainable power trade.▪ Promote mutual interdependence to foster regional energy security & sustainable power trade.



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