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South Asia Forum For
Infrastructure Regulation

**South Asia Forum for Infrastructure Regulation (SAFIR)
and South Asia Regional Energy Partnership (SAREP)
Regional Regulatory Dialogue**

SAFIR-SAREP Regional Regulatory Dialogue Proceedings
**Enhancing Electricity Regulatory Ecosystem for
Accelerating Clean Energy Transition and
Achieving Net Zero Ambitions in the South
Asia Region**

18th September 2023

Hotel Le Meridien, New Delhi, India



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Prepared by:

USAID's SAREP Program

Ms. Namrata Mukherjee, Deputy Chief of Party, SAREP

Mr. Rajiv Ratna Panda, Power Market Specialist, SAREP

Ms. Maitreyi Karthik, Regional Energy Analyst, SAREP

South Asia Forum for Infrastructure Regulation (SAFIR)

The South Asia Forum for Infrastructure Regulation (SAFIR) was established in May 1999. SAFIR aims at providing high quality capacity building and training on infrastructure regulation & related topics, in South Asia and to stimulate research on the subject by building a network of regional and international institutions & individuals that are active in the field. It also aims at facilitating effective and efficient regulation of Utility and infrastructure industries, initiate beneficial exchange of knowledge and expertise, and set the trend of rapid implementation of global best practices.

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South Asia Regional Energy Partnership (SAREP)

The South Asia Regional Energy Partnership (SAREP) serves as a flagship program of USAID to advance objectives of the U.S. Government's Clean Asia Enhancing Development and Growth through Energy (EDGE) initiative. SAREP is working on developing regional power markets, improving coordination and planning, strengthening national and regional institutions, building consensus on power trade, and institutionalizing a supporting framework and mechanisms. SAREP activities are supporting expansion of cross-border power trade by supporting stakeholders to participate in trilateral, multilateral, and exchange-based markets.

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I. Programme Schedule

Agenda			
18th September 2023			
09.30-10.00 Hrs.	Registration		
10.00-11.00 Hrs.	Session-I: Inaugural Session		
10.00-10.05 Hrs.	Lamp Lighting Ceremony		
10.05-10.10 Hrs.	Welcome Address by Mr. John Smith-Sreen, Director, Indo Pacific Office, USAID/India		
10.10-10.20 Hrs.	Special Address by Ms. Deki Choden, Chairperson of South Asia Forum for Infrastructure Regulations (SAFIR) & Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan		
10.20-10.30 Hrs.	Special Address by Shri Jishnu Barua, Chairperson, Central Electricity Regulatory Commission (CERC), India.		
10.30-10.45 Hrs.	Special Address by Shri Pankaj Agarwal, Secretary (Power), Government of India		
10.45-10.50 Hrs.	Vote of thanks by Mr. Harpreet Singh Pruthi, Secretary, SAFIR and CERC		
10.50-11.00 Hrs.	Group Photograph and Tea Break		
11.00-13.00 Hrs: Roundtable Dialogue: Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region			
The roundtable will focus on:			
<ul style="list-style-type: none"> • South Asia (SA) Regional Clean Energy Transition Scenarios and Future Outlook • Emerging International Trends in Regulatory Approaches for accelerating Clean Energy Transition (CET) and in achieving Net Zero Goals (NZG). • Role of Cross Border Electricity Trade (CBET) and Regional Power Market in accentuating clean energy transition and achieving net zero goals in an optimal and sustainable manner. • Role of coordinated and harmonized regional regulatory framework and mechanisms for deepening CBET, enhancing regional energy and climate security, accentuating clean energy transition, and facilitating net zero goals. • Role of Regional Institutions and Institutional Mechanism in developing regional regulatory frameworks and complementing regulations for facilitating Clean Energy Transition and Climate Ambitions in the Region. 			
11.00-11.15 Hrs	South Asian Regional Perspective	Presentation on “Regional Clean Energy Transition in South Asia: Current Scenario & Future Regional Outlook”	Mr. Rajiv Ratna Panda, Power Market Specialist, South Asia Regional Energy Partnership
11.15-11.30 Hrs	Southern African Regional Perspective	Presentation on “Regional energy Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in Southern Africa Region- SAPP Pool Plan for facilitating regional renewable energy deployment & clean energy transition in SAPP Region”	Mr. Alison Chikova, Chief Engineer (Planning and Operations), Southern African Power Pool, Harare, Zimbabwe

11.30-11.45 Hrs	ASEAN Regional Perspective	Presentation on “Regional energy Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in ASEAN Region- ASEAN Power Interconnection”.	Mr. Prihastya Wiratama, Project Manager of ASEAN Power Interconnection, ASEAN Energy Center, Jakarta, Indonesia
11.45-13.00 Hrs: Round Table Dialogue			
11.55-13.00 Hrs.	<p>Moderator: Dr. S.K. Chatterjee, Chief (Regulatory Affairs), Central Electricity Regulatory Commission (CERC), India</p> <p>Key Questions:</p> <ul style="list-style-type: none"> • What role Regulators and Regulatory Initiatives can undertake in South Asia to accelerate Clean Energy Transition and facilitate achieving Net Zero Goals? • Taking in account Clean Energy Outlook of South Asia, what key experiences and lessons from international regional experience can be useful for the region? • What are prospects of Cross Border Electricity Trade (CBET) for accelerating clean energy transition in an optimal and sustainable manner? • What kind of cross border electricity trade model would be suitable for South Asia? • Roadmap and Action Plan for South Asian Regulators for accelerating Clean Energy Transition and facilitate in achieving Net Zero Goals? <p>Discussants:</p> <ol style="list-style-type: none"> 1. Ms. Deki Choden, Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan. 2. Mr. Md. Nurul Amin, Chairman, Bangladesh Electricity Regulatory Commission, Bangladesh. 3. Shri I S Jha, Member, Central Electricity Regulatory Commission (CERC), India. 4. Mr. Dilli Bahadur Singh, Chairman, Electricity Regulatory Commission, Nepal. 5. Prof. M A R M Fernando, Chairman, Public Utilities Commission of Sri Lanka (PUCSL), Sri Lanka 6. Mr. Arvind Kumar, Chairperson, Uttar Pradesh Electricity Regulatory Commission 		
13.00-13.05 Hrs.	Summarization by Session Moderator		
13.05-13.10 Hrs.	Vote of Thanks by Ms. Monali Zeya Hazra, Regional Energy and Clean Energy Specialist, USAID		
13.10-14.15 Hrs.	Lunch		

2. Introduction

2.1. Background

Power system and its regulation is undergoing rapid transformation across the globe due to various socio, economic, technological, and climate change factors, and the South Asia (SA) region is also impacted by this change. From integrating new technologies and renewable energy sources to responding to consumers and climate change, electricity systems are constantly evolving to address environmental and social goals thereby bringing more complexity. The SA region is highly vulnerable to the adverse impact of climate change and decarbonising the energy sector is critical in the fight against climate change. Increasing population, rising energy demand, growth in the manufacturing sector, extreme weather conditions such as heatwaves in India and Pakistan, climate change vulnerabilities, regional and global geopolitical events have intensified regional energy security concerns. A regional approach to meet the energy challenges will be beneficial for SA region.

Cross Border Electricity Trade (CBET) possesses an immense opportunity and can trigger rapid decarbonising of the energy sector and would also help foster energy and climate security in the region through development of large-scale sustainable energy infrastructure. Increased regional electricity cooperation on a sustained basis among SA countries can bring economies of scale, strengthen financing capability, enhance competition, support market development, improve sector efficiency and enhance greening of the SA power grid. Development of an integrated regional power market will also help in mobilising investment in untapped energy resources. A vibrant regional power market will make the SA power sector competitive and streamline investments, making it lucrative for investors who seek fair, steady, and risk-mitigated short/long-term returns on their capital. Recognizing energy security challenges and climate change vulnerabilities, SA country governments are intensifying their clean energy targets to minimize emissions and have come up with net zero goals. India, Maldives, Nepal, and Sri Lanka have announced net zero target years of 2070, 2030, 2045 and 2060, respectively. Bhutan has committed to remain carbon neutral. On the regional front, South Asia has witnessed a many-fold increase in Cross Border Electricity Trade, from 1,400 MW in 2012 to 4,500 MW in 2023. With an increased cross-border transmission interconnection, power trade is expected to increase to about 43.8 GW by 2040. One Sun One World One Grid will further accentuate the regional grid integration in SA Region. Honourable Prime Minister of India, Shri Narendra Modi during the G20 Energy Ministers' Meet in Chennai, India in July 2023 said "Trans-national grid interconnections can enhance energy security. Realizing the vision of inter-connected green grids can be transforming."

Regulation is the management of complex systems according to a set of rules, standards, and trends. While electricity regulation depends on the political economy of the jurisdiction that creates it, for ensuring just clean energy transition and achieving net zero goals, regulators would have to play an important role in ensuring a smooth and balanced transition in a manner that is affordable and sustainable with minimal environmental and socioeconomic repercussions and it requires regulatory leaders to navigate the difficult trade-offs. Regulators can present a level playing field and provide businesses the certainty they need to invest in clean energy transition and net zero projects while protecting the interest of consumers. While SA countries are at different stages of regulatory evolution, a coordinated and harmonized regional regulatory framework and complementary mechanisms in SA shall help in deepening cross border electricity trade, enhancing regional energy and climate security, accentuating clean energy transition, and facilitating net zero goals achievement.

Considering the long-term nature, scale of change and ramification of clean energy transition, there is a need to enhance the electricity regulatory ecosystem and develop coordinated and complementary regulatory framework among SA regulators for accelerating clean energy transition and in achieving net zero ambitions. The first edition of the SAFIR-SAREP Regional Regulatory Dialogue on "Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the

South Asia Region” was organised on September 18, 2023, from 10.00-13.00 hrs at Hotel Le Meridien, New Delhi, India. The Regulatory Dialogue saw participation from the state regulatory commission across India, members from SAFIR Steering Committee and Executive Committee and International speakers. The list of speakers has been attached in **Annexure-I**. The Concept Note is attached as **Annexure-II**.



3. Inaugural Session

- **Lamp Lighting Ceremony**
- **Welcome Address** by Mr. John Smith-Sreen, Director, Indo Pacific Office, USAID/India
- **Special Address** by Ms. Deki Choden, Chairperson of South Asia Forum for Infrastructure Regulations (SAFIR) & Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan
- **Special Address** by Shri Jishnu Barua, Chairperson, Central Electricity Regulatory Commission (CERC), India
- **Special Address** by Shri Pankaj Agarwal, Secretary (Power), Government of India
- **Vote of Thanks** by Mr. Harpreet Singh Pruthi, Secretary, SAFIR and CERC
- **Group Photograph**



Mr. John Smith-Sreen, Director, Indo Pacific Office, USAID India



Mr. Sreen delivered the welcome address of the first edition of the Regional Regulatory Dialogue and expressed gratitude to Mr. Jishnu Barua, Chairperson, Central Electricity Regulatory Commission (CERC), India, Mr. Harpreet Singh Pruthi, Secretary, SAFIR and CERC, India, South Asia country representatives from Bangladesh, Sri Lanka, Nepal, attendees from the state regulatory commission across India and other stakeholders for attending the conference. He highlighted the significance of the regional dialogue, emphasized shared goals related to clean energy, climate resilience, and economic development. The address underscored the successful collaboration witnessed during the G20 process, resilient energy infrastructure, cross-border electricity trade, energy security, economic growth, social development powered by electricity, energy access for all. Rapid scale up and deployment of clean power generation which included renewable energy, energy efficiency, and recognizing the need for a Just Energy Transition were some of the significant points of discussion during the summit. He said, President Biden and Prime minister Mr. Modi met on the sidelines of the G20 summit and issues bordering clean energy and climate change were discussed.

The energy sector in SA promotes green growth and development, drives economic growth, creates opportunities for the people of the region, and promotes renewable energy thereby reducing the greenhouse gas emissions which is arguably the most important environmental concern currently. The dialogue aims to explore and discuss long-term prospects for the regulation of the evolving power system and power market within South Asia, recognizing the diverse regulatory landscapes of participating nations, he said. Mr. Smith-Sreen emphasized the importance of harmonization and a coordinated approach to address the region's energy challenges which could be facilitated through dialogues, creation of a regulatory framework with associated mechanisms for its implementation.

He said that USAID believes that regional institutions, such as the South Asia Forum of Infrastructure Regulation (SAFIR) plays an important role in designing a cohesive framework for expanding the region's power market and subsequently increasing the power trade within the region. SAFIR can also strengthen cross-border electricity trade, enhance regional energy and climate security, accelerate clean energy transition and mobilize the goals to achieve net zero emissions. The collaboration between SAFIR and USAID, as well as the enduring partnership between USAID and CERC (Central Electricity Regulatory Commission), was acknowledged. He thanked officials from the SAFIR secretariat which included Mr. Pruthi, Dr. Chatterjee and Ms. Nair and the USAID SAREP team for organizing the event. He looked forward to insightful discussions on accelerating the clean energy transition in a sustainable manner within the SA region, concluding with gratitude to the participants.

Ms. Deki Choden, Chairperson of South Asia Forum for Infrastructure Regulations (SAFIR) & Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan



Ms. Choden expressed gratitude for the invitation to this dialogue forum. She welcomed the participants to the first edition of the Regional Regulatory Dialogue and acknowledged the support of USAID, SAFIR secretariat and SAREP, emphasizing the critical role of regulators in facilitating the clean energy transition. She welcomed all the participants to the SAFIR-SAREP Regional Regulatory Dialogue on Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition, and Achieving Net-Zero Ambition in the South Asia Region. She thanked USAID and SAREP for providing support to the Regional Regulatory Dialogue which brought together regulators and other stakeholders on a common platform and for striving continuously to provide timely and need-based assistance to the nations within the region.

Speaking on the net-zero condition in Bhutan, she said that the nation is currently carbon negative and have pledged to remain carbon neutral according to the intended nationally determined contributions. Based on the economic developments happening in the region, and the increased utilization of energy, instances of emissions have increased, which needs to be acted upon. The countries of India, the Maldives, Nepal, and Sri Lanka have set up ambitious net zero goals and are also working towards setting up their national action plans to meet such ambitious goals. India has set an example globally through their endeavours in the clean energy transition. She said that concerted efforts at the

regional level would help to achieve the net zero goals in an economical and an accelerated manner. The regulators play an important role in making it a reality. She looked forward to a meaningful engagement complete with understanding on the regulatory developments, emerging regulatory perspectives, and the development of a regional level roadmap to achieve the net zero goals. She thanked the organizers for inviting her to the event and looked forward to an enriching and fruitful discussion over the day.

Mr. Jishnu Barua, Chairperson, Central Electricity Regulatory Commission (CERC), India



Mr. Barua in his opening remarks during the session acknowledged Mr. John Smith-Screen, Ms. Deki Choden, Mr. Dilli Bahadur Singh, Professor M A R M Fernando, Mr. Md. Nurul Amin, Mr. Harpreet Singh Pruthi, and other participants in the event. Thanking SAFIR and USAID's SAREP for organizing the event, he extended his gratitude for to be a part of the conference focussing on the topic of "Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region".

India had originally submitted its Intended Nationally Determined Contribution (NDC) to UNFCCC on 2nd October 2015. In its updated version, India now stands committed to achieve 50 percent of its cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030, and a long – term goal of reaching net zero by 2070. The Prime Minister of India had announced at COP26, to achieve 500 GW of installed electricity capacity using non-fossil sources of energy by 2030. While the policy makers play a critical role in advancing energy transition to a green economy, the regulators play an active role in development of mechanisms and frameworks for regulation and incentivising the adoption of clean energy technologies and innovations. For improving the RE integration within the country, various technological solutions such as smart energy technology, energy storage, development of a hydrogen economy, integrated power system operation and innovations in the regional electricity market would play an important role.

The electricity regulators are required to maintain balance between the power utilities (which are competitive in nature) and the consumer interest. CERC strives to maintain balance in a fair, transparent and an equitable manner. A number of initiatives have been taken up to bolster up the efforts to foster a green economy within the country such as regulations for the determination of generic tariffs for various RE technologies, creation of a framework for forecasting, scheduling and deviation settlement for intermittent RE sources such as wind and solar, introduced ancillary services to take care of the balancing requirements of RE, creation of enabling frameworks for market instruments such as real-time market, green term ahead market, and day ahead market to facilitate the participation of RE generators in the market. To manage the inconsistencies of the availability of RE sources within a state and the necessity of obligated entities to meet the Renewable Purchase Obligation (RPO), market-based instrument known as the Renewable Energy Certificate (REC) was established to promote non-conventional sources of energy and to facilitate the compliance of RPO. The CERC issued "Terms and conditions for dealing in energy savings certificate" Regulations in 2016 with Bureau of Energy Efficiency (BEE) acting as the administrator to specify the detailed procedure for various activities in pursuance of the Perform, Achieve, and Trade (PAT) rules. The Central Electricity Regulatory Commission (Indian Electricity Grid Code) Regulations, 2023 contains provisions to enable integration of renewables among other provisions.

As a carbon market regulator, CERC would also help in facilitating the development of India's first domestic regulated carbon market under the 'Carbon Credit Trading Scheme, 2023'. The South Asia region is bestowed with abundant hydropower potential that can provide the necessary flexibility for grid balancing which can be utilized through CBET. Regional institutions such as SAFIR provides a platform for advancing regional integrated grid and includes member nations from Bangladesh, Bhutan, Nepal, Sri Lanka, and Pakistan. He said that there are huge prospects for cross border electricity trade within the region that can elicit the decarbonization of the energy sector in South Asia through the development of extensive clean, green, and sustainable energy infrastructure. The South Asia region presents significant hydropower potential (~350 GW), solar potential (~939 GW), and wind power potential (~967 GW). While the region is enriched with huge hydropower potential (~ 350 GW), only about 20 percent of the potential has been utilized thus far thereby providing immense scope to promote RE within the region. The Cross Border Trade of Electricity Regulations 2019, by Central Electricity Regulatory Commission allows sale and purchase of power between India and the neighbouring nations through mutual agreements between local entities and the neighbouring nations entities in the form of bilateral agreements between the two nations or through mutual agreements between the entities in line

and conformity with the provision of the Ministry of Power's Guidelines for Import/Export (Cross Border) of Electricity- 2018.

Nepal had ushered in market based CBET through import of electricity from the Indian Energy Exchange beginning in April 2021. With the successful import of electricity, Nepal has started export of hydro power in the Indian Power Exchange. A harmonized policy, legal and regulatory framework would help to create an enabling environment and systemic conditions for a sustainable power market. He said that SAFIR plays an important role in the policy and the regulatory domain supporting investments for the growth of the unexploited energy resources and the development of a harmonized policy, legal and regulatory framework for the operation and expansion of the grid. He urged all the South Asian member countries to work jointly to make the region safe, resilient, and sustainable for the future generation.

Mr. Harpreet Singh Pruthi, Secretary, SAFIR and CERC, India



Mr. Pruthi gave the vote of thanks during the session. He appreciated the inaugural session of the SAFIR – SAREP Regional Regulatory Dialogue and said the session provided a platform for the interaction among the regulators through discussions to achieve net zero goals within the SA region. The session on “Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia region” was relevant in the perspective of the recently concluded G20 Summit, in which the G20 nations committed to accelerate their measures to address the environmental concerns including climate change mitigation. He extended gratitude on behalf of SAFIR and CERC, to all the participants assembled for the event. He appreciated Mr. John Smith Sreen, USAID for speaking on the necessity for sharing ideas through regulatory dialogues, the outcomes of the G20 summit and the regulatory harmonization and coordination within the South Asia region,

Mr. Jishnu Barua for the insights on the initiatives of CERC to promote clean energy transition and on cross border electricity trade and Ms Deki Choden for initiating the discussions of the event. The presence of the regulatory authorities working towards promotion of harmonized policy, legal and regulatory framework for CBET within the region would further enrich the deliberations, he said. He thanked the USAID-SAREP team for conceptualizing the topic and for making the event successful. He thanked Ms Monali, USAID for the excellent work done and Dr. Chatterjee, CERC and Ms Rashmi, CERC for their dedication and the efforts in organizing the event. He thanked the stakeholders for participating in the event and expressed hope for drawing up solutions to the issues identified during the discussions. He wished that the dialogue would act as an impetus to accelerate the clean energy transition for future generations. He thanked all the participants for attending the event and wished all to work together, share knowledge and take relevant strides for a cleaner and brighter future.





4. Regional Perspective-Roundtable Dialogue: Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region (South Asia, Southern Africa (SAPP) and ASEAN Perspectives)

- **Session Panellists:**

- Mr. Rajiv Ratna Panda, Power Market Specialist, South Asia Regional Energy Partnership
- Mr. Alison Chikova, Chief Engineer (Planning and Operations), Southern African Power Pool, Harare, Zimbabwe
- Mr. Prihastya Wiratama, Project Manager of ASEAN Power Interconnection, ASEAN Energy Center, Jakarta, Indonesia

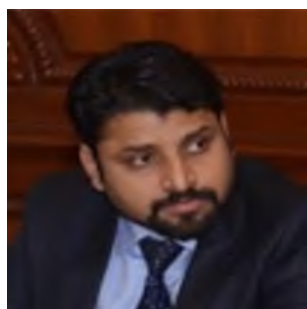
- **Key Focus area**

- South Asia (SA) Regional Clean Energy Transition Scenarios and Future Outlook
- Emerging International Trends in Regulatory Approaches for accelerating Clean Energy Transition (CET) and in achieving Net Zero Goals (NZG)
- Role of Cross Border Electricity Trade (CBET) and Regional Power Market in accentuating clean energy transition and achieving net zero goals in an optimal and sustainable manner
- Role of coordinated and harmonized regional regulatory framework and mechanisms for deepening CBET, enhancing regional energy and climate security, accentuating clean energy transition, and facilitating net zero goals
- Role of Regional Institutions and Institutional Mechanism in developing regional regulatory frameworks and complementing regulations for facilitating Clean Energy Transition and Climate



Ambitions in the Region

Mr. Rajiv Ratna Panda, Power Market Specialist, SAREP, India



Mr. Panda in his presentation on “Regional Clean Energy Transition in South Asia: Current Scenario & Future Regional Outlook” gave details on the macro-economic overview, the current scenario of regional clean energy transition in South Asia, the future regional outlook of the clean energy transition in the South Asia region, G20 consensus and suggestion and way forward. Looking at the macro-economic situation within the region, he said that South Asia is one of the fastest growing economies in the world. Despite a number of economic headwinds, the intra-regional trade share within SA is only about 6 percent (2021) as compared with other regions globally and the region continues to be the least integrated region in the world. The installed power capacity within the region has increased about 2.6 times since 2010 and the peak demand is about 283 GW as of today. The per capita power consumption is quite low at about 1105 kWh when compared with the world average of 3105 kWh. The fossil fuel emissions within the region show a rising trend with the power sector contributing about 45 percent of the total fossil CO₂ emissions. Transformational actions in the power and the transport sector would be key to decarbonisation, greening the power and electrifying the transport is the mantra for energy sector transformation. The renewable energy capacity has tripled in the region since 2010 (63 GW) and has a current installed capacity of 201 GW. The region is largely fossil fuel dependent (~60 %) for its power supply while the remaining is RE based. The CBET within the SA (BBINM) region has nearly tripled since 2010 (6 BUs) reaching about 18.7 BUs in 2021 and the CBET for the entire SA region was 24.41 BUs. Nearly 4.3 BUs of electricity has been traded through the power exchange platform. He said that for the energy transition, the trend is to rely on competition and market instruments under the policy and regulatory oversight mechanism for optimal allocation of cost and benefit of clean energy transition preferably with the existence of a vibrant, well-functioning integrated regional power market. The carbon market and carbon credit instruments are in the development stages but will play a defining role in near future in flight against climate change and ensuing just clean energy transition.

Most of the countries have come up with net zero targets within the region. The SA region has an ambitious plan to achieve 584 GW of RE by 2030. The region is undergoing various transformational actions across the energy value chain to achieve clean energy transitions. Cleaner and efficient public transport system in the form of electric vehicles and charging infrastructure would reduce emissions and at the same time would enable the adoption of sustainable modes of transportation. This would help in electrifying and greening life within the region.

The projected peak power demand within the region would be about 810 GW by 2040 which is almost three times the projected peak demand in 2030. The cross-border interconnection would reach about five times the current to 43.8 GW by 2040. He said that if India has to achieve the net zero target by 2060 the installed power capacity would reach about 7601 GW. According to a report on Getting India to Net Zero, India would need about USD 10.1 trillion as cumulative economic investment from the current stage to achieve 2070 net zero target of India. As part of the One Sun One World One Grid initiative, the integration would include South Asia with the Middle east and Southeast Asia (MESASEA) in Phase I and later connecting the MESASEA grid with the African power pools culminating in the connection with the global grids. An integrated, complementary regional energy integration has its advantages in terms of economic and financial, technical and operation, climate, and net zero, regional energy market and mobilization of the investments. The regional grid integration comes with its own challenges such as energy security, interdependency, resource nationalism, prioritization of regional-national objectives, competitive versus cooperative spirit, market access, and geopolitical realities which if addressed in a sustainable manner would help to exploit the enormous renewable energy potential that would in turn help to replan the future climate pledge under the NDC thereby contributing to the global climate abatement challenge. During the recently held G20 Leaders Declaration in the summit held between 9th – 10th September 2023, in New Delhi, India, a consensus was held by the countries to achieve net zero by or around the mid-century and recognition of the role of grid-interconnection, resilient energy infrastructure and cross border power integration to enhance the energy security thereby fostering economic growth and promoting energy access for all.

Coordinated and complementary regional regulatory frameworks are required for clean energy transition within the region. The regulators can play an important role through the promotion of a level playing field for a balanced energy transition which is Resilient, Economical, Sustainable, and Inclusive (RESI) in nature. He suggested. a comprehensive South Asia Regional Economy wide Assessment (SAREA) needs to be conducted to identify the scope for optimizing

through Deepening Regional Energy Cooperation and Cross Border Electricity Trade to meet the net zero and the climate related targets. A high-level Regulatory Working Group on Energy and Climate Prosperity (RWG-ECP) needs to be created to develop RESI compatible Long Term Energy Regulatory Pathways & Roadmap 2070 to achieve clean energy transition and net zero in the South Asia (BBIN) region which would be updated and reviewed at regular intervals to maintain consistency with the technological development within the region. The development of Innovative Regulatory & Market Instruments (IRMI) for the regional energy market needs to be advanced and a Biennial knowledge report on “South Asia Clean Energy Transition & Net Zero Outlook (SACETO)” needs to be authorized. Finally, a South Asia Annual Regional Training Program on “Regulatory Innovation for Accelerating Clean Energy Transition and Achieving Net Zero Goals” needs to be commissioned and institutionalized which would play an important role in the clean energy transition within the region, which is resilient, economical, sustainable, and inclusive in nature in a sustainable manner over a long period of time as climate transition are long term in nature. The detailed presentation has been attached in Annexure 3.

Mr. Alison Chikova, Chief Engineer (Planning and Operations), Southern African Power Pool (SAPP), Harare, Zimbabwe



Mr. Chikova gave a presentation on “Regional energy Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in Southern Africa Region- SAPP Pool Plan for facilitating regional renewable energy deployment & clean energy transition in SAPP Region ”. Introducing SAPP Mr. Chikova said that it comprises of 12 countries, and 400 million people with a combined installed power capacity of 80 GW in the Southern African region. The Southern African Power Pool was formed in 1995 under the Southern African Development Community (SADC) based on an intergovernmental Memorandum of Understanding (MoU). It comprises of a southern thermal network of countries while the northern network of countries are hydro dominant. The synergies between the northern and the southern systems to exchange power paved the way for the establishment of the SAPP. SAPP envisions “To be a fully integrated, competitive energy market and a provider of sustainable energy solutions for the SADC region and beyond ”. It has a mission to provide energy associated services within the region and beyond it.

The continent of Africa has a combined installed generation capacity of 230.4 GW dominated by natural gas (107 GW) and coal (52 GW) and a significant RE capacity consisting of solar CSP and wind have been installed in the last few years. Coal based generation capacity takes up almost 59 percent of the total 80 GW installed capacity of southern Africa. Developments have been made in solar PV, CSP and wind technologies in the past three years.

Speaking on the regulatory initiatives undertaken by the SAPP, he said that in 2010 the regulatory guidelines for cross border power trading was introduced by the Regional Energy Regulatory Association for Southern Africa. In 2015 supportive frameworks were developed for mini grids. A market and investment framework were developed in 2016. The framework for Regulatory Oversight for Regional Energy Market was developed in 2021 and the regional grid code was introduced in 2022. He said that a well-designed power pool market would lead to low cross border enforcement actions. SAPP started off initially trading electricity through bilateral contracts. The short-term energy markets (STEM) were introduced between 2001 to 2009, the day ahead market in 2009, forward physical and intraday market in 2016, and balancing market in 2022. The future additions in energy market development include ancillary service market, financial markets, and renewable energy markets.

The energy landscape of the SAPP market is undergoing rapid transformations. New solar and wind technologies are being commissioned in many countries. Transmission investments are required in new large scale renewable energy projects. The concept of net metering for solar rooftop PV has been introduced wherein consumers can sell balance power to the power utilities. SAPP pool aims to develop new generation capacity of around 75 GW at a cost of about USD 117.7 billion on the generation investments and about USD 3.3 billion on transmission investments. A regional integrated approach would enable savings of USD 37 billion over a 40-year timeline. Regional power integration would ensure technical, planning, and financial benefits within the electricity sector and economy-wide benefits which include freed up resources for investments in the productive sector, low electricity tariffs leading to competitiveness in industries, electrification of households, enhanced employment, and improved national income. SAPP seeks to increase

the share of RE by 2030. It has set a target to achieve 39 percent of on grid electricity consumption through RE and 7.5 percent of off grid electricity consumption by RE by 2030. By 2040, the region has set a goal to achieve 60 percent of RE.

He said that the challenge of balancing VRE on the SAPP power market is manageable and many countries are implementing such projects. It is ensured that the regional transmission infrastructure would enhance the sharing of resources and the ability for third party access to the SAPP physical markets would be increased. The SAPP has developed the SADC Regional grid code which helps the countries to identify five key objectives. Within the SAPP, interconnection with the eastern African power pool is ongoing. Challenges of technical performance of the transmission interconnector, operation and planning for the effective operation of the transmission interconnector and broad recommendation of power pool trading governance structures, agreements, MoUs, market trading rules and platforms need to be addressed during the first part of integrating Africa. There are five power pools in Africa which include Southern Africa Power Pool, Eastern Africa, Western Africa, Central Africa, and Northern Africa. The objective of the African Union is to develop a single electricity market for the entire Africa. RE is poised to play a pivotal role in this move as it would increase the electricity trade among the member countries to achieve their net zero targets.

He spoke on the building blocks of the power pool and the type of trade contracts available within the SAPP. The power pools were built independently within the region. Transparency and trust ensured the success of the power pools. Starting small and learning from experience of the power markets also paved the way for the establishment of the power pools. For most of the trading arrangements, the members trade the net requirements. Bilateral contracts dominate the trading arrangements thereby providing security to some of the trading contracts. But 30 percent of the trading being executed currently is through the competitive markets. He said that the bilateral contracts are transitioning towards the competitive market. So, the trading arrangements are the net requirements of the members who can buy the power through the four power market products.

Speaking on the type of dispute settlement mechanism followed within the power pool he said that SAPP uses consensus mechanisms for dispute settlement. Another mechanism includes the involvement of political wings though attempts made to resolve the disputes through consensus. He said that 3 percent of the SAPP wind power generation is offshore based but the wind power potential is more in the eastern coast. The technologies are insufficient to tap wind power for onshore. Comoros, Seychelles, Madagascar, and Mauritius implement new technologies such as ocean technology. Consumers are allowed to sell power to the utilities based on the net metering approach. The detailed presentation has been attached in Annexure-4.

Mr. Prihastya Wiratama, Project Manager of ASEAN Power Interconnection, ASEAN Energy Center, Jakarta, Indonesia



Mr. Wiratama gave a presentation on “Regional energy Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in ASEAN Region- ASEAN Power Interconnection”. He said that the ASEAN Centre for Energy (ACE) was established in 1999 as an intergovernmental organization within ASEAN representing ten ASEAN member states. ACE acts as a catalyst to unify and strengthen the ASEAN energy cooperation. It also acts as a knowledge repository for ASEAN member states (AMS) in the form of data management, publication, and dissemination roles. ACE assists AMS in conducting research and identifying practical and specific solutions on policies, legal and regulatory frameworks as a think tank. The key activities

on energy at the regional level are guided by the regional energy cooperation initiative called the ASEAN Plan of Action for Energy Cooperation (APAEC). Majority of the ASEAN member states plan to achieve a carbon neutral or net zero target by 2050, except the Philippines. Cambodia, Malaysia, Myanmar, and Thailand aim to become carbon neutral by 2050. Brunei Darussalam, Lao PDR, Singapore, Vietnam have set a net zero target to achieve by 2050. Indonesia, and Thailand have set net zero targets by 2060 and 2065, respectively. Thailand is the only country in ASEAN to have both carbon neutral and net zero targets.

The APAEC Phase I (2016 – 2020), set out ambitious targets and initiatives to enhance energy security and sustainability while supporting the United Nations Sustainability Development Goal (SDG) 7. The APAEC Phase II (2021-2025), is built on the theme of “Enhancing energy connectivity and market integration in ASEAN to achieve Energy Security, Accessibility, Affordability and Sustainability for All” through “Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation”. There are four Outcome Based Strategies (OBS) envisaged for the APAEC Phase II which includes first, accelerating the completion of ASEAN Power Grid (APG) project, and initiating the expansion of multilateral electricity trading. Second, work on the institutional framework and regulatory capacity as the minimum requirement to advance the multilateral electricity trading. Third, work on harmonizing the minimum technical requirements to advance multilateral electricity trading. Fourth, to explore integrating the RE and other digital developments into the APG.

Speaking on the need of APG in the south-east region, he said that based on ASEAN Energy Outlook VII, it is predicted that about 60 percent of the new installed capacity (2021-2025) would be sourced from RE. This would mean that 155 GW of the RE installed capacity would be required by 2025. The efforts by the ASEAN member states would improve the contribution of RE to 39 percent by 2025. The pathway to regional (multilateral) power trading could be achieved in three different ways with the most progress achieved in bilateral cross border trading. ASEAN currently has 7720 MW interconnection capacity in the form of bilateral trade. There are three sub-regional systems existing within ASEAN comprising the North System which includes Cambodia, Lao PDR, Myanmar, Thailand and Vietnam, the South System consists of Indonesia, Malaysia and Singapore and the East System consists of Brunei Darussalam, Indonesia, Malaysia, and Philippines.

The ASEAN Interconnection Master Plan Study (AIMS) was initiated in 2003 which proposed a regional electrical power transmission network i.e., the ASEAN Power Grid. The AIMS II came up in 2010. AIMS III was started in 2020 with an update released in 2022 focussed on the updated APG plans under AIMS II. The scope of Phase I of the AIMS III includes the capacity expansion plan which was initiated in 2020 and updated in the year 2022. The scope of Phase II of AIMS III includes the grid performance analysis of each transmission line in the ASEAN power grid starting in the year 2020 and updated in the year 2022. The scope of Phase III of AIMS III was initiated in the year 2023 and includes multilateral market analysis. Briefing on the history of the ASEAN Power Grid based on APAEC he said that between 1999-2004, identifying and planning of the grid was done, followed by monitoring the potential transmission lines in which fourteen potential lines were identified. From 2005 – 2009, two of the transmission lines were commissioned as one of the first projects of the ASEAN power grid. From 2010-2015, development of eleven transmission lines were expedited. The 2016-2020 APAEC Phase I involved the advancement in three priority projects of Sumatra – Peninsular, Serawak- Sabah – Brunei and Lao PDR – Cambodia. Electricity trading was established in at least one of the sub-regions. The 2021 – 2025 APAEC Phase II would involve RE optimization of potential transmission lines for the ASEAN power grid.

The LTMS-PIP is a pathfinder project to show that multilateral power trading in the ASEAN perspective is possible. The interconnection of the Lao PDR, Malaysia, Thailand (LTM) Power Interconnection Project (PIP) Phase I (2018-2019) consisted of power purchase capacity of up to 100 MW with total electricity distribution of about 30.2 GWh. The power trade existed between Lao PDR, and Malaysia through Thailand via the existing interconnections. The second phase of the LTM PIP project was commissioned in 2019 with its operation period between 2020-2021. The power purchase capacity has been extended to 300 MW in the second phase of the project with a total of 2.6 GWh of electricity traded by December 2021. The current phase of LTMS PIP includes Singapore with a contract timeline of two years (2022-2024). The power purchase capacity is up to 100 MW. A total of 265.73 GWh of electricity has been traded under the phase till April 2023. The multilateral power trading within the region is between Lao PDR, Malaysia and Thailand with Thailand acting as the wheeling nation. Harmonized grid codes & standards, harmonizing the transparency and oversight & governance are the main building blocks for a harmonized regulatory framework for multilateral power trade. ASEAN is one of the fastest growing regions globally and is expected to contribute rapid economic growth. He said that the challenge of balance of energy trilemma (security, affordability, and environmental sustainability) needs to be addressed within the region.

He said that a consensus mechanism is followed within ASEAN for dispute settlement. ASEAN Energy Regulatory Network (AERN) comprises regulators from each of the ASEAN member states. Meetings are conducted within the network 3-4 times in a year to develop standards, discussions are held for dispute resolutions, and workshops are conducted for knowledge sharing for each member of the AERN. The detailed presentation has been attached in Annexure-5.



5. Panel Discussion-Roundtable Dialogue on Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region

- **Session moderator:** Dr. S.K. Chatterjee, Chief (Regulatory Affairs), Central Electricity Regulatory Commission (CERC), India
- **Session Panellists:**
 - Ms. Deki Choden, Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan
 - Mr. Md. Nurul Amin, Chairman, Bangladesh Electricity Regulatory Commission, Bangladesh
 - Shri I S Jha, Member, Central Electricity Regulatory Commission (CERC), India
 - Mr. Dilli Bahadur Singh, Chairman, Electricity Regulatory Commission, Nepal
 - Prof. M A R M Fernando, Chairman, Public Utilities Commission of Sri Lanka (PUCSL), Sri Lanka
 - Mr Arvind Kumar, Chairperson, Uttar Pradesh Electricity Regulatory Commission
- **Key Focus area:**
 - Role of regulators and the regulatory Initiatives that can be undertaken in South Asia to accelerate Clean Energy Transition and facilitate achieving Net Zero Goals
 - Taking into account Clean Energy Outlook of South Asia, the key experiences and lessons from international regional experience that can be useful for the region.
 - The prospects of Cross Border Electricity Trade (CBET) for accelerating clean energy transition in an optimal and sustainable manner
 - The cross-border electricity trade model suitable for South Asia
 - Roadmap and Action Plan for South Asian Regulators for accelerating Clean Energy Transition and facilitate achieving Net Zero Goals



Dr. S.K. Chatterjee, Chief (Regulatory Affairs), Central Electricity Regulatory Commission (CERC), India



Dr. Chatterjee moderated and summarized the discussions of the session and dialogue. He said that the necessity for regional energy cooperation was reiterated by the member nations during the discussions. In terms of dependency on energy resources, Bhutan and Nepal are dominated by hydropower resources and during their lean season they require additional power from the neighbouring countries to meet their demands. The diversity in the demand profiles within the South Asia nations with the complementary nature of the generation profiles of their energy resources address the concern that a single nation within the region is not self-sufficient on its own energy generation resources through regional energy cooperation. Each of the member nations within the region are taking

steps to ensure energy security and make investments in the energy resources to address the intermittency challenges caused due to demand or seasonality of power generation resources. Regional energy cooperation would help the nations to minimize the costs of the energy supplies. In this perspective regional transmission interlinks act as the facilitator for the development of regional energy cooperation. He said that reviewing the international best practices of ASEAN and SAPP shows the need to establish a power market mechanism. There are other regional power pools operating across the globe working on the concept of net power pool rather than gross power pool concept in which the net electricity demand is met through regional power markets. Net pool operation exists within the South Asia region with India having three power exchanges and CBET is happening through power Exchange. The DAM and RTM platforms offered by the Indian Power Exchange have been extended to the neighbouring countries to participate and optimize their marginal costs in real time. Nepal has also urged a transition to a competitive regional electricity market similar to SAPP. Though the process to transition to a competitive power market may take some time to operationalize, the design of such a regional electricity market should be initiated jointly owned by all the participating nations within the region. There should be a provision for a long-term vision of a regional platform to accommodate both the bilateral contracts between the nations for resource adequacy and a net power pool based regional electricity market to help each country optimize their short run marginal costs. Mr. Chatterjee concluded the session by extending acknowledgement to each of the eminent panellists for their thoughts and perspectives on the important issue of regional cooperation and the role of the regulators in facilitating energy transition within the South Asia region.



Prof. M A R M Fernando, Chairman, Public Utilities Commission of Sri Lanka (PUCSL), Sri Lanka



Speaking on the electricity consumption of Sri Lanka, Mr. Fernando said that the daily electricity demand of the country is about 2500 MW relying mainly on fossil fuels for generation of electricity. Imported coal from other countries generates almost 900 MW while the peak demand is met through diesel run thermal power plants (2500 MW). The generation mix comprises 20-30 percent renewable energy (wind and solar) which can be tapped in the northern and southern part of the country and limited hydropower. The Government has set a target to achieve 70 percent of renewable power by 2030 which comes with its own set of challenges. The country is set to electrify the transportation sector in the future, which would increase the electricity demand.

The proposal for transmission interlinkages between India and Sri Lanka was introduced in the early 2000. The Government has plans to review and have an interconnected transmission network from the northern part of Sri Lanka with the southern part of India (~1000 MW). Sri Lanka has plans to join the regional network which is currently in the planning stage. By 2050 the nation has set a target to achieve net zero/carbon neutral emissions (completely fossil fuel free) which can be achieved through an interconnected regional grid. PUCSL is the regulatory body for Sri

Lanka working in the electricity sector. He said that in an interconnected system, the power market consists of various generators, and distribution systems. The transmission network forms the backbone for the interconnected network. With the transition towards one sun, one world, one grid happening, the regulatory framework for regional cooperation within the SA region needs to be contemplated.

Plans for building energy storage within the transmission network are ongoing which would help in the resolution of the intermittency challenges of utilizing RE while the larger plan exists of joining an inter-regional grid to mitigate such challenges.

Mr. Md. Nurul Amin, Chairman, Bangladesh Electricity Regulatory Commission, Bangladesh



He said that in Bangladesh the electricity demand is about 15000 MW. About 1195 MW of the total electricity generation in the country is based on RE sources. According to an announcement by the Prime Minister of Bangladesh, about 40 percent of electricity to be sourced from RE by 2041. With this objective in view, the power department is pursuing government & private programmes for RE generation. Bangladesh has committed to using clean energy and reducing the emissions. Targets would be set to reduce the emissions based on the assessment of the current emissions scenario in the country, through harmonized national policies and regulations, setting of clean energy targets and exploring carbon pricing mechanisms.

It is anticipated that a plan for grid integration, to promote investment and to include an energy storage system would be developed. Importance is being provided to research and innovation in the power sector through collection of data on energy and emissions which would pave the way for progressing towards the goals. Plans are ongoing for knowledge and resource sharing with other countries. He said that they have a vision for a cleaner, greener and a prosperous future for the region. Regional cooperation can play a vital role in sustainability and ensuring energy security. SAFIR and SAREP can play a crucial role by coordinating, facilitating and extending cooperation in the energy sector in the SA region through promoting experience sharing.

Mr. I S Jha, Member, Central Electricity Regulatory Commission (CERC), India



Attempting energy transition on a scale for SA countries including India is quite challenging, he said. The peak demand in India in 2022 was 205 GW while in 2023, the peak demand increased by 17 percent to 240 GW. India's per capita electricity consumption was 33 percent of the world average of per capita electricity in 2022. To manage the electricity demand during covid times, RE was substituted for thermal in Europe and the US. In India during the last 2-3 years rapid RE capacity addition happened. The challenges associated with RE integration with the grid such as flexibility of operation, technical minimum, costs were successfully managed during the covid time.

Currently generation from thermal and RE sources are insufficient to cater to the increasing power demand. Some of the issues such as meeting additional demands through RE and storage at same cost require attention. India is currently the third largest consumer of power globally while the per capita consumption is almost 33 percent of the world average. With a huge potential of RE (~1700 GW) in India, the future demand can be met through RE by development of grid interconnection between the SA countries. On similar lines meeting the future power demands of the other SA countries like Nepal, Bhutan through the vast RE potential available in the country can be made possible by development of grid interconnection between the SA countries which would help to mitigate the challenge of utilizing the vast RE resource potential. A transparent regulatory standard would help to maintain consistency of power markets and promote sustainable financing for the project. Citing an example of Nepal, he said that the development of a large hydro power plant requires investment. With the rapid increase in the demand for clean energy in the SA region, a regional interconnected grid would help to facilitate hydropower generated in a country and traded with another country within the region with a demand for clean energy. The regulator plays a crucial role in maintaining a harmonized regulatory framework, technical standards, rules for interconnection of the grid and in the development of the power market. In the past years, numerous developments by SAFIR on harmonizing legal, policy and regulatory framework, development of common minimum grid code among others have been undertaken. The regulators play an important role in regulating the power market. Except Sri Lanka the rest of the SA countries share borders with India, so the investment requirement for transmission interconnection between the SA countries is feasible. All the SA countries have the same frequency, so technically the requirement of an HVDC line for interconnection is not a

necessity. But for interconnection with Sri Lanka, HVDC would be useful as for long transmission lines in DC connection the losses are minimized. HVAC synchronous connection forms a viable alternative for grid interconnection within the region. The regulatory framework requires grid discipline and grid reliability for a coordinated system of operation within the SA region.

Ms. Deki Choden, Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan



Speaking on the growth in power demand in Bhutan, Ms Choden said that till recently the country was self-sufficient in its own hydropower generation and net exporter of energy but due to growing demand within the country, since hydropower is seasonal, the country is faced with shortage of energy during the lean seasons. With access to the Indian market through IEX, it could meet the demand from the power exchange which they foresee would grow continuously. To meet the lean seasonal growth and contribute to the regional energy transition achieving the goals for the region, Bhutan has a huge potential to contribute. The hydropower generation potential is about 33 GW which is also a techno economically feasible potential. So as a country it is looking forward to developing that and contributing towards the clean energy transition for the region and moving forward would be exploring the solar potential (12 GW) in the country and would be also looking into utility scale solar projects also develop rooftop solar PV through the prosumer model or under the aggregated model. It requires some time for countries to come together and have a functional regional market in place but there is a need for a vibrant regional electricity market. In such a scenario the facilitation of the regional regulatory dialogue is quite timely. The work on the common minimum grid code with the aid of SAREP USAID is in the final stages of approval and needs to be expedited and released at the earliest. There are other steps to be taken in terms of pricing mechanism, such as the transmission pricing model which is yet to be adopted and would take some time to be developed with a way forward. A number of actions need to be facilitated for as we have seen in the case of ASEAN and the SAPP, and steps are being undertaken in south Asia to achieve it. As a member of the forum, she urged the participants to actively participate in such discussions and expedited recovery from the regional challenges. The firm capacity additions would have more energy security in terms of rapid energy supply. She said that the gestation timeline for hydropower plants is long and the investments for such projects take time which makes it a necessity to rely on the power market for some time. With the rapid capacity additions there will be excess power available to supply to the regional power market during the non-lean season. Bhutan is eyeing pumped hydro storage power plants as all of the hydro power projects are run on the river currently. There are also ongoing plans for a draft hydrogen policy which are in discussions. In the future there is a possibility to consider other storage options.

Mr. Dilli Bahadur Singh, Chairman, Electricity Regulatory Commission, Nepal



Mr. Singh said that Nepal is rich in hydro resources. A study done in 1966 showed that Nepal has a hydropower potential of 83000 MW. With the availability of trade through the SA power market the potential of hydropower has now increased to 200,000 MW. At higher altitudes of 3000-4000 mtr above sea level, solar radiation is available, so solar and wind power can be tapped at such an altitude. During one of the meetings held in 2023, India signed an agreement with Nepal in which India agreed to buy 10000 MW of power from Nepal in the next 10 years. Nepal has 100% clean energy generation with some multi fuel power plants on a standalone basis. Bhutan imports power from India during the lean season. Regional energy cooperation, power pools would enable us to utilize the vast clean energy potential within the region. During the lean season Nepal imports some amount of fossil fuel electricity as well. Nepal exports energy to India during the peak energy generation season and during the lean season imports energy from India. Within the next couple of years Nepal is expected to become a net exporter of clean energy. Nepal has announced that by 2045 the country would achieve net zero emissions. Nepal Electricity Grid Code 2023 was published last year for power trade among the SA countries. Nepal has provided suggestions to the common minimum grid code for SA to enable power trade within the SA region and Nepal Electricity Grid Code 2023 already factored in the provision of common minimum grid code. Bangladesh plans to import power from Nepal. Nepal plans to export power to Bangladesh through the Indian grid and has requested to utilize an underground route lying between the southeast part of Nepal and northwest part of Bangladesh. Nepal envisages that the transmission line should be of 765

kV AC. Bangladesh has intended that 9000 MW would be bought from Nepal and other neighbouring countries till 2040. Nepal envisages to have a transmission hub at the south of Siliguri as it is near Nepal and near the Teesta River and near to Fulchiling (Gateway to Bhutan) to export power to Bangladesh. Bhutan or Nepal can utilize the hub to avail energy.

Mr Arvind Kumar, Chairperson, Uttar Pradesh Electricity Regulatory Commission



Most of the states are gearing up for bringing in investments in the renewable energy sector. In the solar energy, bio-energy generation, and hydrogen conversion, like other Indian states UP is seeking investments into these sectors. At a recent global investors summit held in 2023, a total of Rs. 33.5 lakh crore investments were committed in UP over the next 5 years timeline, and about 150 proposals were received amounting to about Rs. 4.5 lakh crore worth of investments in the renewable energy sector. The solar power generation potential in UP is quite high. In Bundelkhand area the land is cheap, in Mirzapur – Sonbhadra area in eastern UP a lot of solar potential is available, and it is available all over UP as well which is beneficial for RE generation. There are investment interests in the pumped storage power plants with high potential in the Mirzapur-Sonbhadra area.

The key challenge for the regulators now rests on the manner to control such different types of renewable power available. The utilities are required to follow the RPO obligations and for 2024-25, about 15 percent of the renewable power is to be achieved which has already been accomplished by the utilities. The Government of UP has set some policies to increase the consumption of RE in the industrial sector as the sector is not so industrialized as it is in the other states. The capacity to draw such RE within the state of UP is limited. UP has drawn plans for a hydrogen policy so that some of the RE gets stored by hydrogen or by ammonia and hydrogen products. Innovative ways need to be planned to draw in RE keeping in view the consumer and utilities interests. A data centre initiative is coming up in the state with a Uttar Pradesh Data Centre policy in which the state government has notified that the data centres would be eligible for an independent licence to procure energy without relying solely on the utilities. An ambitious EV policy 2022 was released in the state recently. The state government signed an MoU with Ashok Leyland for setting up an EV manufacturing plant in UP for Rs 1500 crores.

The upcoming cross border trade mechanisms are being anticipated by the Government of UP and the regulatory body. One 400 kV transmission line is currently being planned between Gorakhpur (UP) and Bhutwal (Nepal) by NEA and PGCIL by 2025. Another 400 kV transmission line is being planned between Bareilly (UP) and Dodhara (Nepal) by 2028-2029. With the transmission lines, the available transmission capacity would be around 7000-8000 MW of power. Nepal would export firm power, which would help UP state in utilizing the renewable energy available to the state. The Guidelines for import/export (cross border) of electricity 2018, were released by Ministry of Power, India with objective to a) Facilitate import/ export of electricity between India and neighbouring countries; b) Evolve a dynamic and robust electricity infrastructure for import/ export of electricity; c) Promote transparency, consistency and predictability in regulatory mechanism pertaining to import/ export of electricity in the country; d) Reliable grid operation and transmission of electricity for import/ export. The CERC issued the Cross Border Electricity Trade Regulations in 2019, followed by the release of the CBET Rules in 2021.

The Indian Power Market has been evolving rapidly. Once the power markets develop, the upcoming renewable energy generators would be able to sell power in the grid through the power markets. The G20 declaration recognized the role of grid interconnections, resilient energy infrastructure and regional-cross-border power systems integration, to enhance energy security, fostering economic growth and facilitating energy access for all. The proposed India-Middle East-Europe Economic Corridor (IMEC) is expected to foster economic development through enhanced connectivity and economic integration between Asia, the Arabian Gulf, and Europe, he said.

SAFIR-SAREP Regional Regulatory Dialogue Proceedings - Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region



6. Annexure I: List of Speakers and Participants of Regional Regulatory Dialogue on Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region

SI No.	Name	Designation	Organization
1	Mr. Md Nurul Amin	Chairman	BERC
2	Ms. Deki Choden	CEO	Electricity Regulatory Authority
3	Mr. Ghanshyam Prasad	Chairperson	Central Electricity Authority
4	Mr. Harpreet Singh Pruthi	Secretary	SAFIR and CERC
5	Mr. S K Chatterjee	Chief (Regulatory Affairs)	Central Electricity Regulatory Commission
6	Mr. I S Jha	Member	Central Electricity Regulatory Commission
7	Mr. Arun Goyal	Member	Central Electricity Regulatory Commission
8	Mr. Pravas Kumar Singh	Member (Law)	Central Electricity Regulatory Commission
9	Mr. Proteek Chakraborty	Chief (Finance)	Central Electricity Regulatory Commission
10	Mr. Rajeev Pushkarna	Chief	Central Electricity Regulatory Commission
11	Ms. Rashmi S Nair	Deputy Chief (Regulatory Affairs)	Central Electricity Regulatory Commission
12	Mr. Sanjeev Tinjan	Assistant Chief (Regulatory Affairs)	Central Electricity Regulatory Commission
13	Mr. P M Antony	Asst Secy (FOR) and SAFIR	Central Electricity Regulatory Commission
14	Mr. John Smith Sreen	Director, IPO	USAID
15	Ms. Apurva Chaturvedi	Sr Clean Energy Specialist	USAID
16	Ms. Monali Zeya Hazra	Regional Energy & Clean Energy Specialist	USAID India
17	Mr. Bhaskar Rajah	Regional Energy Team Leader	USAID India
18	Mr. Saurabh		Central Electricity Regulatory Commission
19	Mr. Sushil Kumar Arora	Administrative officer	Central Electricity Regulatory Commission
20	Mr. Rajiv Kumar	Assistant Secretary	Central Electricity Regulatory Commission
21	Mr. Jishnu Barua	Chairperson	Central Electricity Regulatory Commission

22	Mr. Ravindra Kadam	Senior Advisor - Renewable Energy	Central Electricity Regulatory Commission
23	Mr. Hemant Verma	Chairperson	Chhattisgarh Electricity Regulatory Commission
24	Mr. Rakesh Kumar Goyal	Chief of Party	SAREP
25	Ms. Namrata Mukherjee	Deputy Chief of Party	SAREP
26	Mr. Rajiv Ratna Panda	Power Market Specialist	SAREP
27	Mr. Ajit Kumar	Regional Energy Market Lead	SAREP
28	Mr. Pramod Thakur	AVP	PTC
29	Ms. Arneet Kaur Gujral	Power Trade Analyst	SAREP
30	Dr. Navneet Sharma	Director General	CIRC
31	Mr. Dilli Bahadur Singh	Chairperson	Electricity Regulatory Commission
32	Mr. Pankaj Agarwal	Secretary	Ministry of Power
33	Mr. T Srirangarao	Chairman	Telangana State Electricity Regulatory Commission
34	Mr. D P Gairola	Member (Law)/Chairman (SCM)	Uttarakhand Electricity Regulatory Commission
35	Mr. Arvind Kumar	Chairperson	Uttar Pradesh Electricity Regulatory Commission
36	Mr. M D Ravi	Member	Karnataka Electricity Regulatory Commission - Regulations
37	Mr. Dorji	Chief	Electricity Regulatory Authority
38	Mr. S Phuntsho	Chief Policy, Research & Communication Division	Electricity Regulatory Authority
39	Mr. A S Pandey	General Manager	NTPC
40	Justice (Retd.) C V N Reddy	Chairman	Andhra Pradesh Electricity Regulatory Commission
41	Mr. Prihastya Wiratama	Project Manager	ASEAN
42	Mr. Amitav Gupta	Chairman	Jharkhand State Electricity Regulatory Commission
43	Ms. Bhumika Suri	Manager - Training & Events	SAREP
44	Ms. Nandita Deka	Content Editor	SAREP
45	Ms. Abira Sharma	Admin Assistant	SAREP
46	Ms. Aishwarya Gupta	Communication Assistant	SAREP
47	Ms. Drishti	Communication Specialist	ACEF - SAREP
48	Ms. Shivali	Energy Technology Specialist	SAREP
49	Mr. R K Pachnanda	Chairman	Haryana Electricity Regulatory Commission
50	Mr. D K Sharma	Chairman	Himachal Pradesh Electricity Regulatory Commission
51	Mr. Praveen Kumar	Director General	Indian Institute of Corporate Affairs

52	Mr. Alok Tandon	Chairperson	Joint Electricity Regulatory Commission
53	Mr. P Ravikumar	Chairperson/member	Karnataka Electricity Regulatory Commission
54	Mr. B Pradeep	Member	Kerala State Electricity Regulatory Commission
55	Mr. S P S Parihar	Chairperson	MP Electricity Regulatory Commission
56	Mr. Suresh Chandra Mahapatra	Chairperson	Odisha Electricity Regulatory Commission
57	Prof M A R M Fernando	Chairperson	Public Utilities Commission of Sri Lanka
58	Mr. Paramjeet Singh	Member	Punjab State Electricity Regulatory Commission
59	Mr. K B Kunwar	Chairperson (SCM)	Sikkim State Electricity Regulatory Commission
60	Mr. M Chandrasekhar	Chairperson	Tamil Nadu Electricity Regulatory Commission



7. Annexure 2: Concept Note of the SAFIR-SAREP Regional Regulatory Dialogue on 'Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region.'



**18th September 2023
Hotel Le Meridien, New Delhi, India**

**Jointly Organised
by
South Asia Forum for Infrastructure Regulation (SAFIR)
&
USAID's South Asia Regional Energy Partnership (SAREP)**

Background:

Power system and its regulation is undergoing rapid transformation across the globe due to various socio, economic, technological, and climate change factors, and South Asia (SA) region is also impacted by this change. From integrating new technologies and renewable energy sources to responding to consumers and climate change, electricity systems are constantly evolving to address environmental and social goals thereby bringing complexity.

South Asia region is highly vulnerable to the adverse impact of climate change and decarbonising energy sector is crucial in the fight against climate change. Increasing population, rising energy demand, growth in the manufacturing sector, extreme weather conditions such as heatwaves in India and Pakistan, climate change vulnerabilities, regional and global geopolitical events have intensified regional energy security concerns.

A regional approach to meet the energy challenges will be beneficial for the South Asia region. Cross border electricity trade possesses an immense opportunity and can trigger rapid decarbonising of the energy sector and will also foster energy and climate security in the region through development of large-scale sustainable energy infrastructure. Increased regional electricity cooperation on a sustained basis among SA countries can bring economies of scale, strengthen financing capability, enhance competition, support market development, improve sector efficiency and enhance greening of the SA power grid.

Development of an integrated regional power market will also help in mobilising investment in untapped energy resources. A vibrant regional power market will make the SA power sector competitive and streamline investments, making it lucrative for investors who seek fair, steady, and risk-mitigated short/long-term returns on their capital.

Recognizing energy security challenges and climate change vulnerabilities, SA country governments are ratcheting up their clean energy targets to minimize emissions and have come up with net zero goals. India, Maldives, Nepal, and Sri Lanka have announced net zero target year of 2070, 2030, 2045 and 2060, respectively. Bhutan has committed to remain carbon neutral. On regional front, South Asia has witnessed many-fold increase in Cross Border Electricity Trade, from 1,400 MW in 2012 to 4,500 MW in 2023. With an upsurge in cross-border transmission interconnection, power trade is expected to increase to about 43.8 GW by 2040. One Sun One World One Grid will further accentuate the regional grid integration in SA Region. Honourable Prime minister of India, Shri Narendra Modi during the G20 Energy Ministers' Meet in Chennai, India during July 2023 said *“Trans-national grid interconnections can enhance energy security. Realizing the vision of inter-connected green grids can be transforming.”*

Regulation is the management of complex systems according to a set of rules, standards, and trends. While electricity regulation depends on the political economy of the jurisdiction that creates it, for ensuring just clean energy transition and achieving net zero goals, regulators will have to play an important role in ensuring a smooth and balanced transition in a manner that is affordable and sustainable with minimal environmental and socioeconomic repercussions—and it requires regulatory leaders to navigate the difficult trade-offs. Regulators can provide a level playing field and provide businesses the certainty they need to invest in clean energy transition and net zero projects while protecting the interest of consumers. While SA countries are at different stage of regulatory evolution, a coordinated and harmonized regional regulatory framework and complementary mechanisms in SA shall help in deepening cross border electricity trade, enhancing regional energy and climate security, accentuating clean energy transition, and facilitating in achieving net zero goals.

Considering the long-term nature, scale of change and ramification of clean energy transition, there is a need to enhance the electricity regulatory ecosystem and develop coordinated and complementary regulatory framework among SA regulators for accelerating clean energy transition and in achieving net zero ambitions.

In the above context and to explore and discuss critical issues and long terms prospects for regulation of the dynamically evolving power system in the region, the First edition of the SAFIR-SAREP Regional Regulatory Dialogue on **“Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region ”** is being organised on September 18, 2023, from 10.00-13.00 Hrs at the Hotel Le Meridien, New Delhi, India.

Agenda

SAFIR-SAREP Regional Regulatory Dialogue

“Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region”

18th September 2023, 10.00-13.00 Hrs, Hotel Le Meridien, New Delhi, India

AGENDA	
09.30-10.00 Hrs.	Registration
10.00-11.00 Hrs.	Session-I: Inaugural Session
10.00-10.05 Hrs.	Lamp Lighting Ceremony
10.05-10.10 Hrs.	Welcome Address by Mr. John Smith-Sreen, Director, Indo Pacific Office, USAID/India
10.10-10.20 Hrs.	Special Address by Ms. Deki Choden, Chairperson of South Asia Forum for Infrastructure Regulations (SAFIR) & Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan
10.20-10.30 Hrs.	Special Address by Shri Jishnu Barua, Chairperson, Central Electricity Regulatory Commission (CERC), India.
10.30-10.45 Hrs.	Special Address by Shri Pankaj Agarwal, Secretary (Power), Government of India
10.45-10.50 Hrs.	Vote of thanks by Mr. Harpreet Singh Pruthi, Secretary, SAFIR and CERC
10.50-11.00 Hrs.	Group Photograph and Tea Break
11.00-13.00 Hrs.	Roundtable Dialogue : Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region

The roundtable will focus on:

- ❖ South Asia (SA) Regional Clean Energy Transition Scenarios and Future Outlook
- ❖ Emerging International Trends in Regulatory Approaches for accelerating Clean Energy Transition (CET) and in achieving Net Zero Goals (NZG).
- ❖ Role of Cross Border Electricity Trade (CBET) and Regional Power Market in accentuating clean energy transition and achieving net zero goals in an optimal and sustainable manner.
- ❖ Role of coordinated and harmonized regional regulatory framework and mechanisms for deepening CBET, enhancing regional energy and climate security, accentuating clean energy transition, and facilitating net zero goals.
- ❖ Role of Regional Institutions and Institutional Mechanism in developing regional regulatory frameworks and complementing regulations for facilitating Clean Energy Transition and Climate Ambitions in the Region.

11.00-11.15 Hrs	South Asian Regional Perspective	Presentation on “Regional Clean Energy Transition in South Asia: Current Scenario & Future Regional Outlook”	Mr. Rajiv Ratna Panda, Power Market Specialist, South Asia Regional Energy Partnership
11.15-11.30 Hrs	Southern	Presentation on “Regional energy	Mr. Alison Chikova,

	African Regional Perspective	Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in Southern Africa Region- SAPP Pool Plan for facilitating regional renewable energy deployment & clean energy transition in SAPP Region”	Chief Engineer (Planning and Operations), Southern African Power Pool, Harare, Zimbabwe
11.30-11.45 Hrs	ASEAN Regional Perspective	Presentation on “Regional energy Cooperation and regulatory approaches for achieving Just Clean Energy Transition and Net Zero goals in ASEAN Region- ASEAN Power Interconnection”.	Mr. Prihastya Wiratama, Project Manager of ASEAN Power Interconnection, ASEAN Energy Center, Jakarta, Indonesia
11.45-13.00 Hrs.	Round Table Dialogue		
11.55-13.00 Hrs.	<p>Moderator: Dr. S.K. Chatterjee, Chief (Regulatory Affairs), Central Electricity Regulatory Commission (CERC), India</p> <p>Key Questions:</p> <ul style="list-style-type: none"> ❖ What role Regulators and Regulatory Initiatives can undertake in South Asia to accelerate Clean Energy Transition and facilitate achieving Net Zero Goals? ❖ Taking in account Clean Energy Outlook of South Asia, what key experiences and lessons from international regional experience can be useful for the region? ❖ What are prospects of Cross Border Electricity Trade (CBET) for accelerating clean energy transition in an optimal and sustainable manner? ❖ What kind of cross border electricity trade model would be suitable for South Asia? ❖ Roadmap and Action Plan for South Asian Regulators for accelerating Clean Energy Transition and facilitate in achieving Net Zero Goals? <p>Discussants:</p> <ol style="list-style-type: none"> 1. Ms. Deki Choden, Chief Executive Officer, Electricity Regulatory Authority (ERA), Bhutan. 2. Mr. Md. Nurul Amin, Chairman, Bangladesh Electricity Regulatory Commission, Bangladesh. 3. Shri I S Jha, Member , Central Electricity Regulatory Commission (CERC), India. 4. Mr. Dilli Bahadur Singh, Chairman, Electricity Regulatory Commission, Nepal. 5. Prof. M A R M Fernando, Chairman, Public Utilities Commission of Sri Lanka (PUCSL), Sri Lanka. 6. Mr Arvind Kumar, Chairperson, Uttar Pradesh Electricity Regulatory Commission. 		
13.00-13.05 Hrs.	Summarization by Session Moderator		
13.05-13.10 Hrs.	Vote of Thanks by Ms. Monali Zeya Hazra, Regional Energy and Clean Energy Specialist, USAID		
13.10-14.15 Hrs.	Lunch		

Participants:

SAFIR-SAREP Regional Regulatory Dialogue participants will include SAFIR Steering Committee and Executive Committee members, and international speakers.

Expected Outcomes:

The event will lead to improved understanding and awareness on: i) how to enhance electricity regulatory ecosystem in South Asia for accelerating clean energy transition and achieving net zero ambitions, ii) regional regulatory roadmap and action plan for SA Regulators for accelerating clean energy transition and achieving net zero goals, iii) South Asia regional clean energy transition scenarios and future outlook, iv) emerging trends in regulatory approaches for clean energy transition and achieving net zero ambitions across the globe v) Role of Cross Border Electricity Trade and regional power market in accentuating clean energy transition and achieving net zero goals in an optimal and sustainable manner; and vi) Role of Regional Institutions/ Institutional Mechanism in developing regional regulatory frameworks and complementing regulations for facilitating Clean Energy Transition and Climate Ambitions in the Region.

Point of Contact:

1. Rashmi S Nair, Dy. Chief (Regulatory Affairs), CERC, Email rashmisnair102@gmail.com
2. Rajiv Ratna Panda, Power Market Specialist, SAREP, Email: rpanda@sarep-southasai.org

South Asia Forum for Infrastructure Regulation (SAFIR):

The South Asia Forum for Infrastructure Regulation (SAFIR) was established in May 1999. SAFIR aims at providing high quality capacity building and training on infrastructure regulation & related topics, in South Asia and to stimulate research on the subject by building a network of regional and international institutions & individuals that are active in the field. It also aims at facilitating effective and efficient regulation of Utility and infrastructure industries, initiate beneficial exchange of knowledge and expertise, and set the trend of rapid implementation of global best practices.

South Asia Forum For
Infrastructure Regulation

US Agency for International Development (USAID):

USAID is the world's premier international development agency and a catalytic actor driving development results. USAID leads international development and humanitarian efforts to save lives, reduce poverty, strengthen democratic governance, and help people progress beyond assistance. USAID works to foster sustainable development and advance human dignity globally.

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South Asia Regional Energy Partnership (SAREP):

The South Asia Regional Energy Partnership (SAREP) is a flagship energy program of USAID to advance objectives of the U.S. Government's Clean Asia Enhancing Development and Growth through Energy (EDGE) initiative. SAREP is working on developing regional power markets, improving coordination and planning, strengthening national and regional institutions, building consensus on power trade, and institutionalizing a supporting framework and mechanisms. SAREP activities are supporting expansion of cross-border power trade by supporting stakeholders to participate in trilateral, multilateral, and exchange-based markets.

8. Annexure 3: Presentation on “Regional Clean Energy Transition in South Asia: Current Scenario & Future Regional Outlook”

South Asia Regional Energy Partnership (SAREP)

Presentation

on

“Regional Clean Energy Transition in South Asia: Current Scenario & Future Regional Outlook”



Roundtable Dialogue: Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region”

11.00-13.00 Hrs., 18th September 2023

SAFIR-SAREP Regional Regulatory Dialogue (SRRD)

“Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in the South Asia Region” 18th September 2023, 10.00-13.00 Hrs, Desire Hall, Hotel Le Meridien, New Delhi, India

Presented by

Rajiv Ratna Panda, Power Market Specialist, SAREP

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02.2 Regional Fossil Co2 Emission & SA Regional Power Sector Contribution

02.3 Renewable Energy Deployment & Fuel mix of SA Regional Power Sector

02.4 Cross Border Electricity Trade, Relying on Market Based Instruments (MBIs)

03 Clean Energy Transition in South Asia- Future Regional Outlook

03.1 Climate, Clean Energy & Net Zero Goals of SA Countries

03.2 Transformational Action Across Energy Value Chain

03.3 Projected Peak Demand, Cross Border Electricity Trade Future Outlook

03.4 Long-Term Implication of Net Zero Goals- Understanding the Scale, OSOWOG

03.5 Benefit of Integrated, Complementary Regional Energy Integration & Challenges

04 G20 Consensus-G20 New Delhi Leaders' Declaration-Extraordinary Consensus

05 Suggestion and Way forward



01

Macro-Economic Situation, Integration



Decade of High Growth

Resilient economy

High growth prospects despite economic headwinds

Fastest growing region

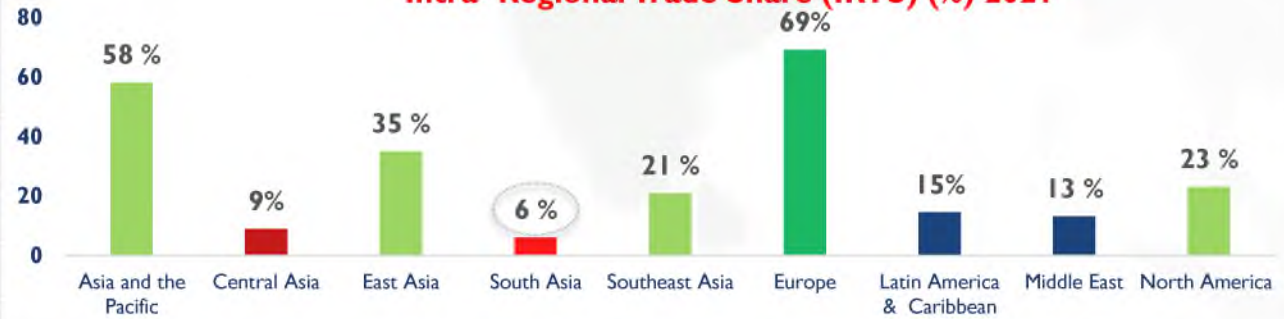
Intra-Regional Trade

Continue to be the Least Integrated Region

Only 6% IRTS



Intra-Regional Trade Share (IRTS) (%) 2021





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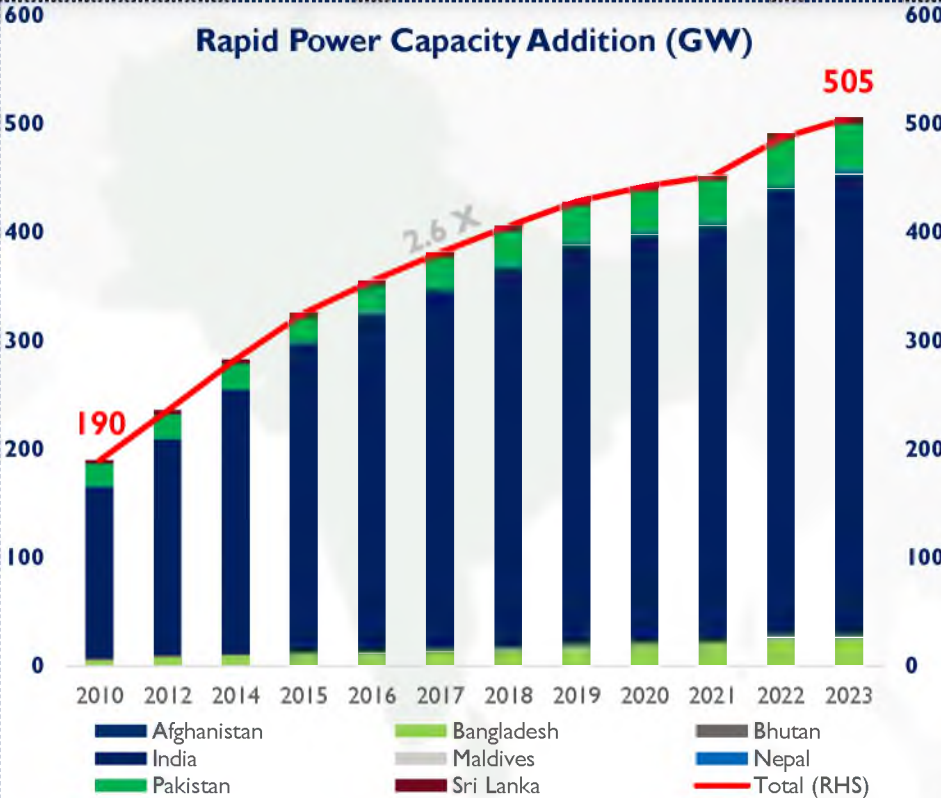
02

Regional Clean Energy Transition in South Asia: **Current Scenario**



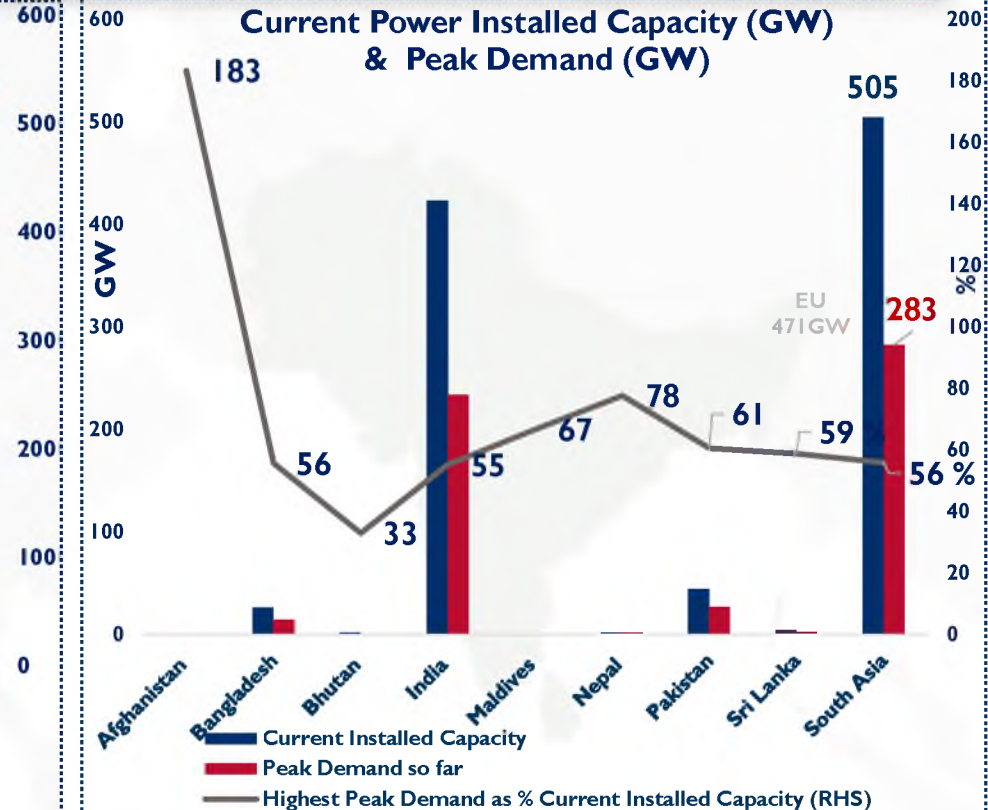
SA Regional Power Capacity Addition Trend & Peak Demand

Rapid Power Capacity Addition (GW)



Source: Compiled by Author from Various Sources- BPDB, NEPA, CEA, PUCSL, CEB, MOEA, BEA, SAED

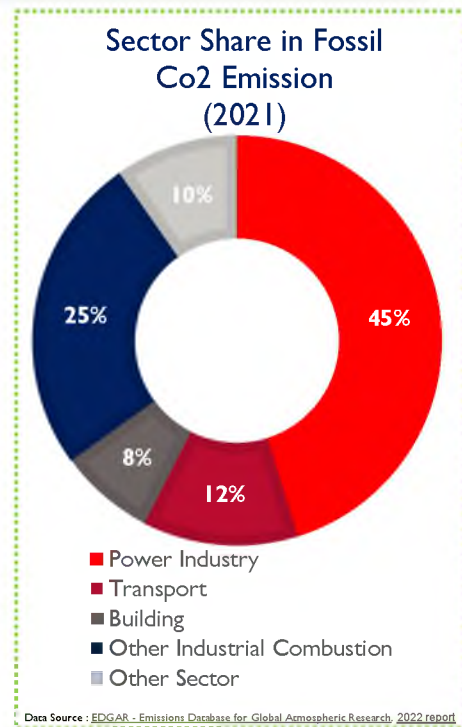
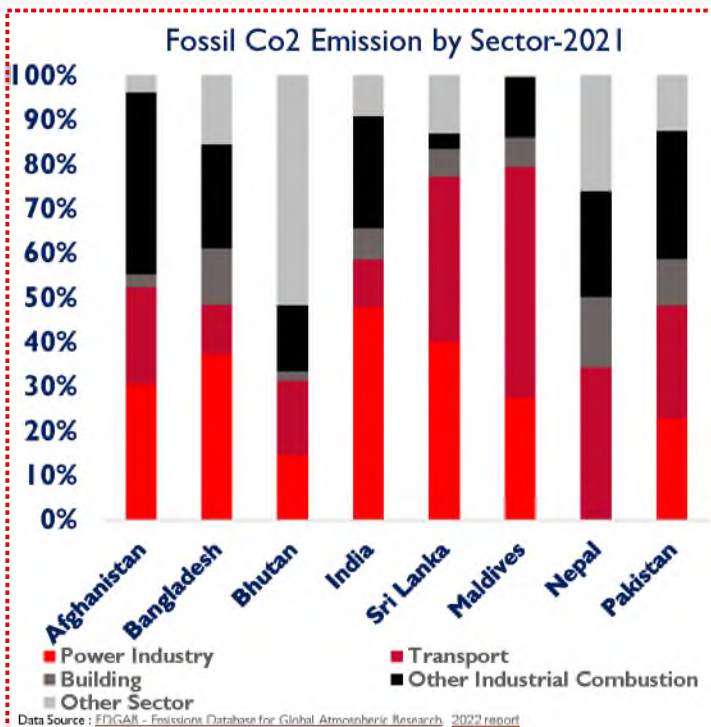
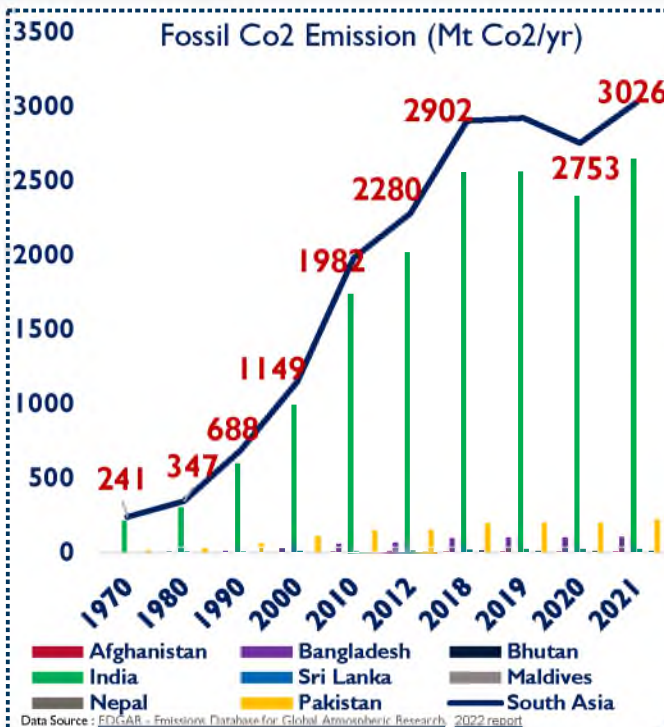
Current Power Installed Capacity (GW) & Peak Demand (GW)



Source: CEM Presentation Power Cell, BPSHP, APSP, EPS, WEGCS, NEPA, CEB, NEPA, Daily Report (PSP) on June 9, 2023, Author's Estimation, EU/ENTSOE for the year 2021-471 GW

Significant Capacity Addition | 84% India | 283 GW of Peak Demand | Still Low Electricity Consumption (~1105 KWh/Capita) | World ~3105 KWh

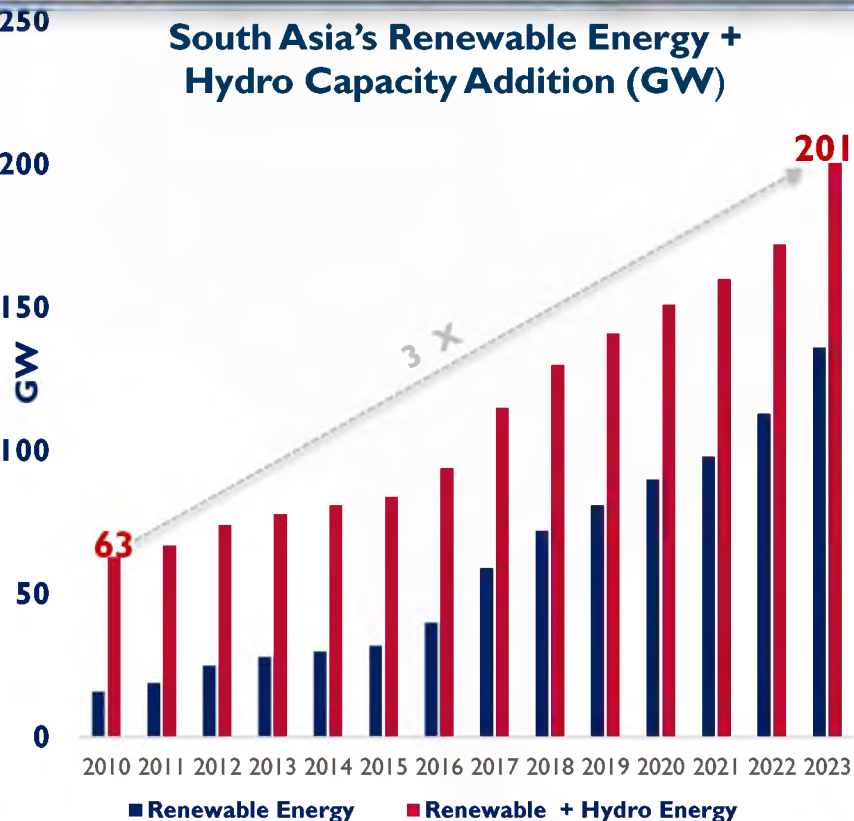
02.2 Regional Fossil Co2 Emission & SA Regional Power Sector Contribution



Transformational Action in Power followed by Transport Sector will be Crucial in South Asia
Greening Power Sector and Electrifying Transport

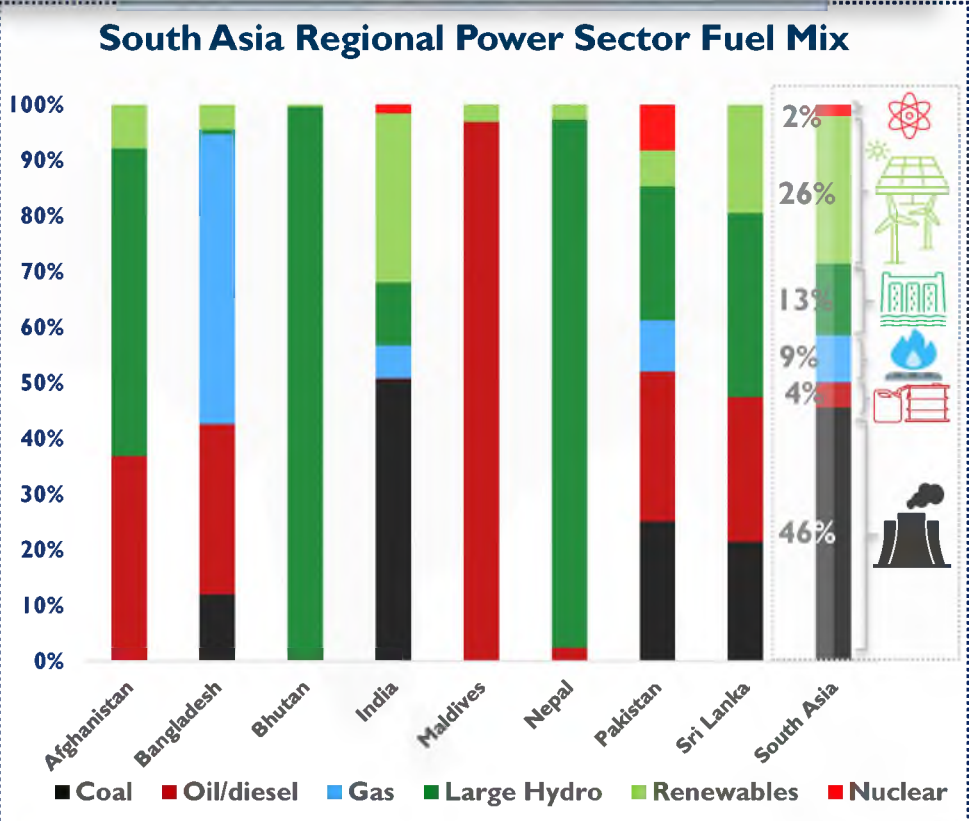
Rapid Clean Energy Deployment, Continued Fossil Dominance

South Asia's Renewable Energy + Hydro Capacity Addition (GW)



Source: Compiled by Author from Various Sources: BPD, NEPA, CEA, PLCSL, CEB, MOEA, BEA, SAED

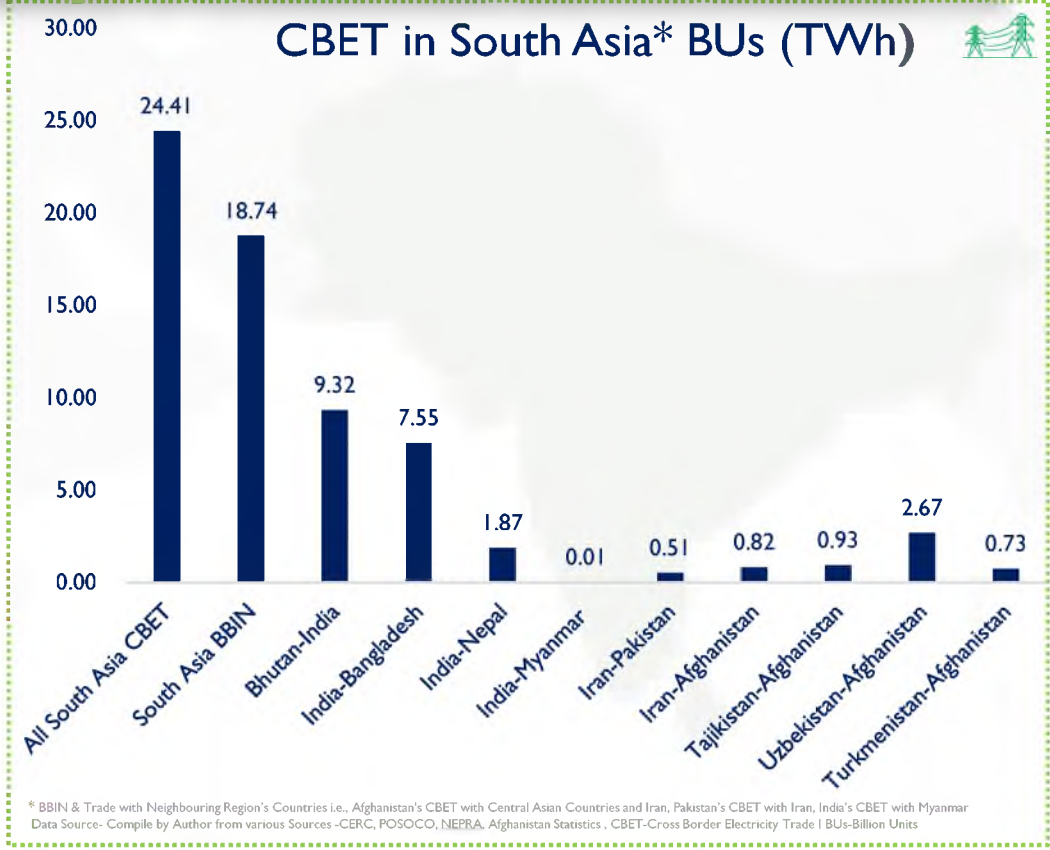
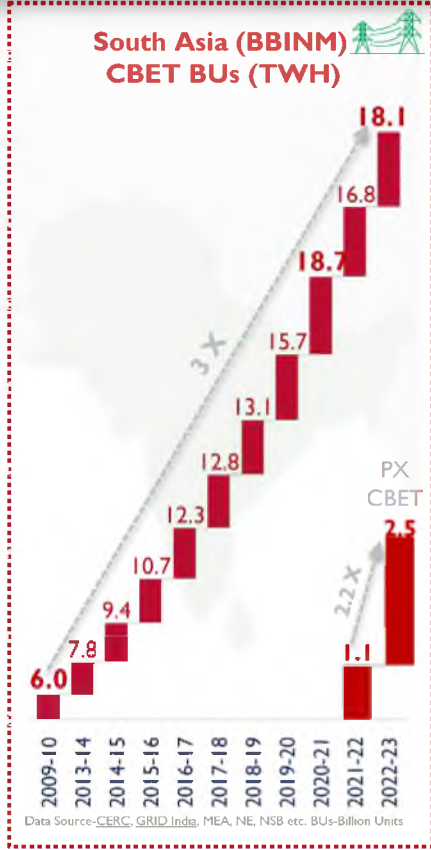
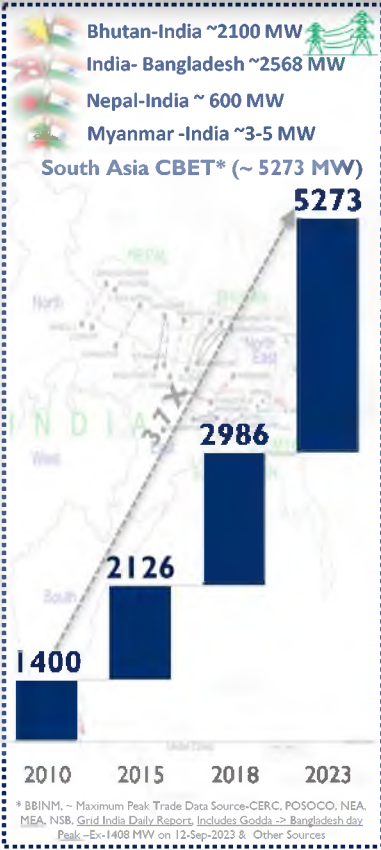
South Asia Regional Power Sector Fuel Mix



Source: Compiled by Author from Various Sources: BPD, NEPA, CEA, PLCSL, CEB, MOEA, BEA, SAED

Tripled Renewable Energy (RE) Electricity Capacity Addition | ~201 GW RE | 59 % Fossil Capacity | 39 % RE Capacity | Fossil Domination

02.4 Cross Border Electricity Trade (CBET) in South Asia : Current Scenario




CBET Tripled | Potential Remains Large | EU (ENTSOe)-427 TWh | Prospects for Inter-Regional Integration | CBET through PX- 4.3 BUs*

02.4 Relying on Market Based Instruments (MBIs), Regional Energy Market Development

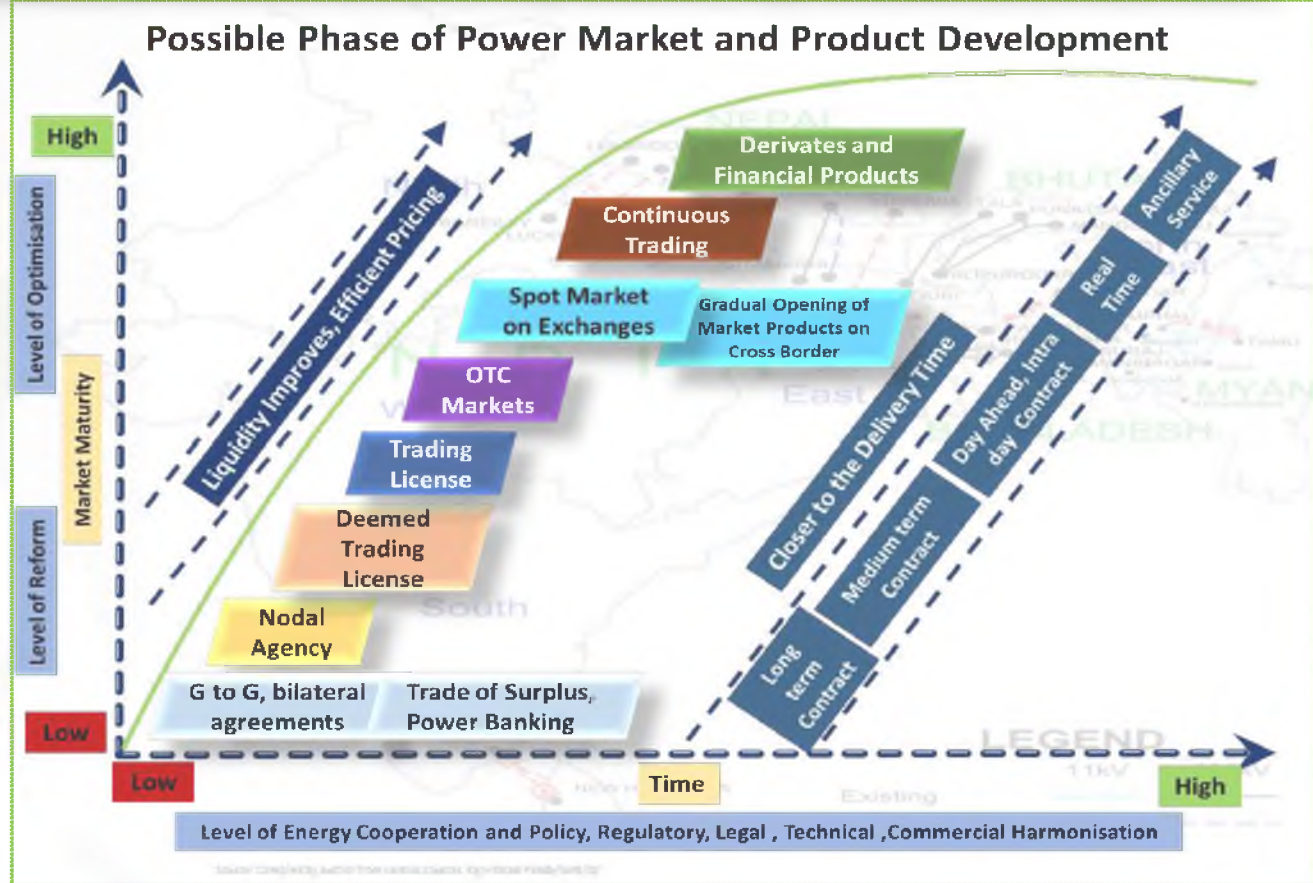
 Trend is to Rely on Competition & Market Instruments under Policy & Regulatory Oversight

 Tapping Demand Diversity-Daily, Weekly, Monthly, Seasonal

 Power Exchange-Competitive price discovery, Auction Platforms

 Portfolio of Product, Electricity (DAM, RT), Green (G-DAM, G-TAM), REC, ESCRTs

 Emergence of Carbon Market, Resurgence of Carbon Credits



Increase in Commercial/Market CBET since 2010 | Integrated Regional Power Market will facilitate optimal allocation of cost & and benefit of clean energy transition.

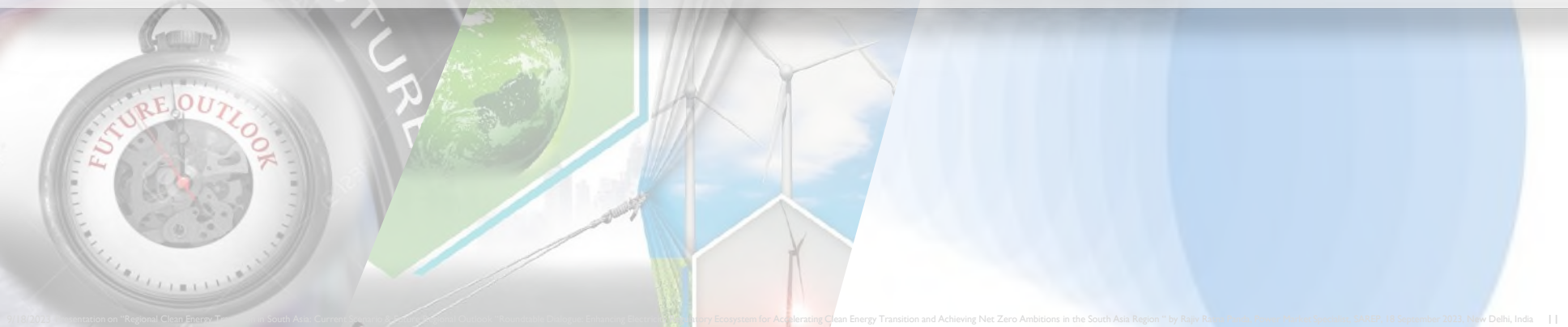


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03

Clean Energy Transition in South Asia : *Future Regional Outlook*



03.2 Transformational Action Across Energy Value Chain in South Asia : Future Outlook



Rapid De-carbonising Power Sector



Cleaner and Efficient Public Transport



Renewable Energy



Electric Vehicle & Charging Infrastructure



Modernising power grid , smart grid, smart utility



Green Hydrogen Economy and Energy Storage



Cross Border Hydro Power Projects & Cross Border Power Transmission

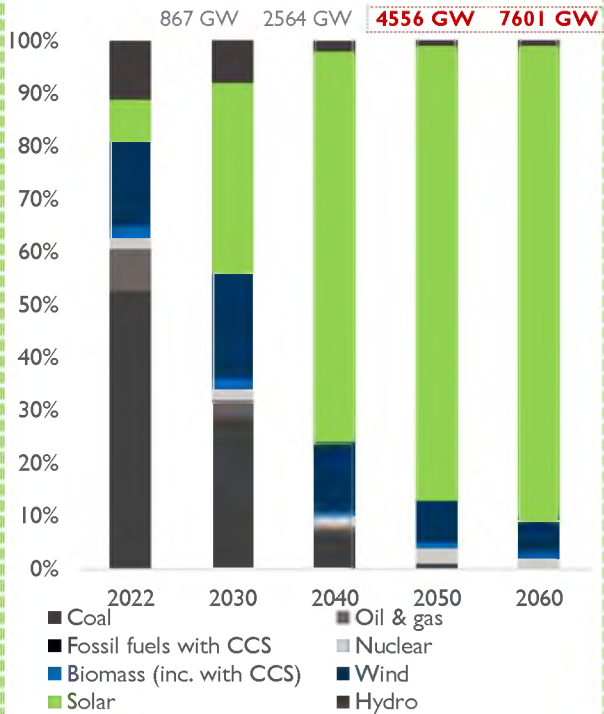


Natural Gas, LNG and Region Gas Grid

South Asia Power & Energy System is Undergoing Transformation : Electrifying and Greening the Way of Life

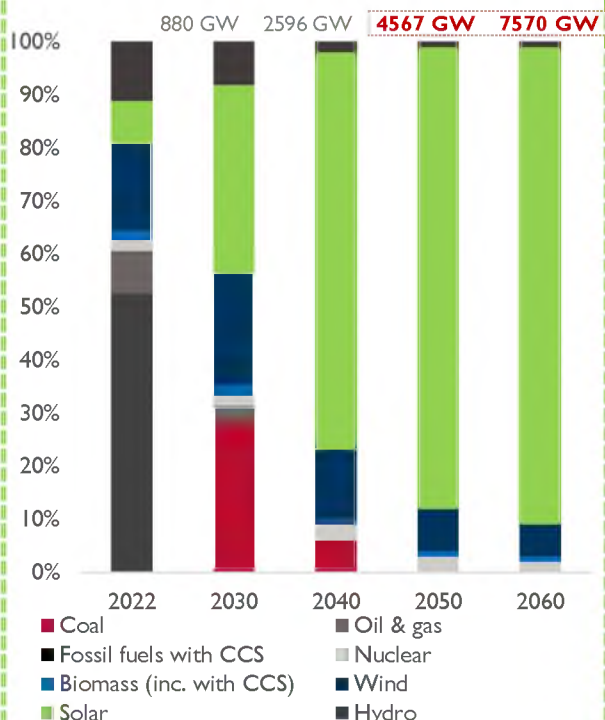
03.4 Long Term Implication of Net Zero Goals- Understanding the Scale

India-Projected Power Capacity (GW) mix in 2070 Net Zero (balanced policy mix) scenario



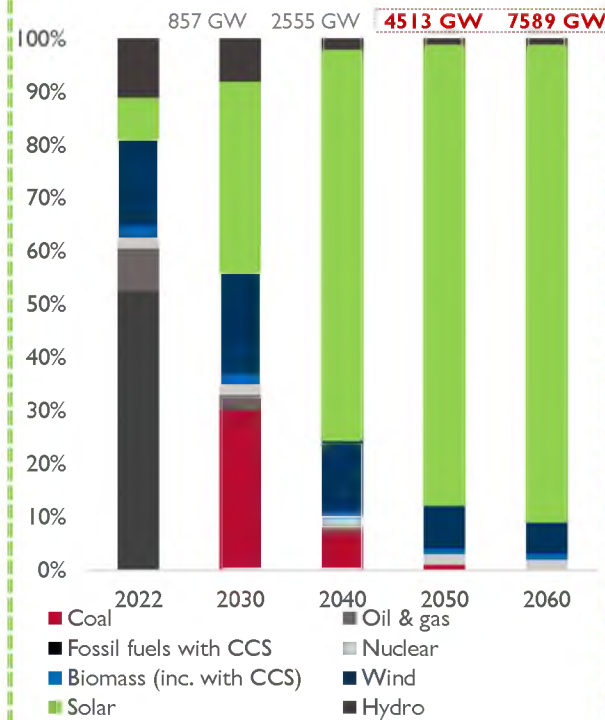
Source: Getting India to Net Zero - A Report Of The High-level Policy Commission On Getting Asia To Net Zero, ASPI

India-Projected Power Capacity (GW) mix in 2070 Net Zero (with regulation focus) scenario



Source: Getting India to Net Zero - A Report Of The High-level Policy Commission On Getting Asia To Net Zero, ASPI

India-Projected Power Capacity (GW) mix in 2070 Net Zero (with Market-Based Focus) scenario



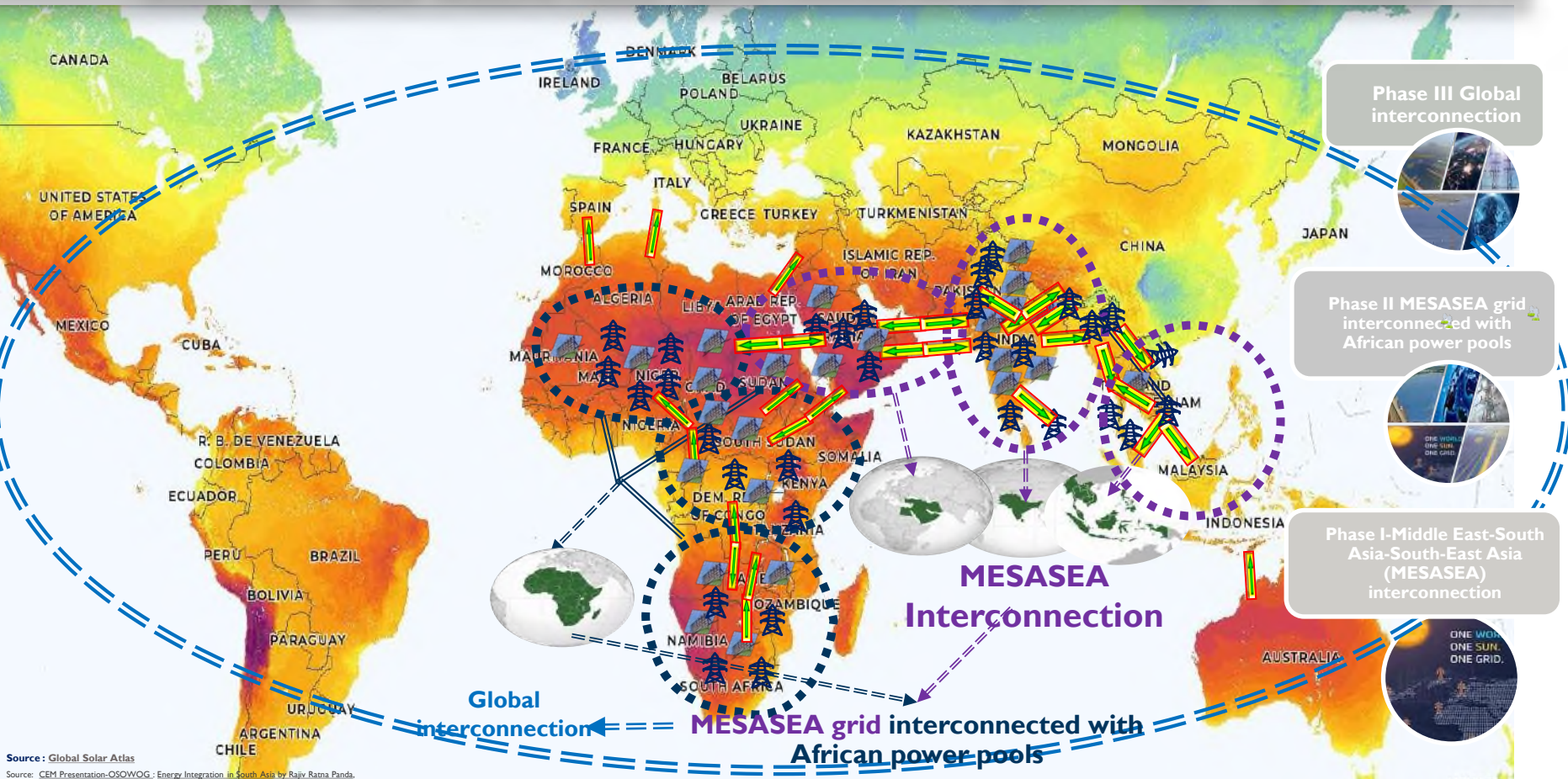
Source: Getting India to Net Zero - A Report Of The High-level Policy Commission On Getting Asia To Net Zero, ASPI



India will need around \$10.1 Trillion in Cumulative Economy-wide Investment from now to meet its 2070 target | 7601 GW by 2060

One Sun One World One Grid (OSOWOG)-3 Phase Approach

*Artistic representation only. Map not to scale, do not represent any identified location/point of interconnection or direction of power flows, purpose is simply to illustrate graphically for easier understanding of OSOWOG & its 3 phase approach in graphical manner



OSOWOG will provide further impetus to South Asia Grid Interconnection | Building Regional, Sub-Regional Consensus will be the key



Economic & Financial

- ❖ Optimal System/Resource Development
- ❖ Export Revenues
- ❖ Economic Extension of grid
- ❖ Economic growth



Technical & Operational

- ❖ Larger grid, better grid
- ❖ Seasonal/Peak /Time zone differences
- ❖ Better Hydro-Thermal Mix
- ❖ Regional Balancing
- ❖ Trilateral Trade



Climate and Net Zero

- ❖ Achieving Climate/ Net Zero Goals
- ❖ Clean Energy Development
- ❖ RE based CBET
- ❖ Improved Energy & Climate Security



Regional Energy Market

- ❖ Competitive Energy Market
- ❖ Transparent Price Discovery
- ❖ Choice of Products
- ❖ Consumer Benefits & Social Welfare



Mobilizing of Investment

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

Challenges : Navigating Debates Around Energy Security-Interdependence | Resource Nationalism | Prioritisation of Regional-National Objectives | Competitive-Cooperative Spirit | Market access | Geopolitical Realities in a quantifiable manner to feed into planning processes



G20 New Delhi Leaders' Declaration: **Extraordinary Consensus**



वसुधैव कुटुम्बकम्

ONE EARTH • ONE FAMILY • ONE FUTURE

G20 New Delhi Leaders' Declaration

New Delhi, India, 9-10 September 2023



C. Green Development Pact for a Sustainable Future

implementation and support. We reiterate our commitment to achieve global net zero GHG emissions/carbon neutrality by or around mid-century, while taking into account the latest scientific developments and in line with different national circumstances, taking into account different approaches including the Circular Carbon Economy, socio-economic, technological, and market development, and promoting the most efficient solutions.

Source: [G20 New Delhi Leaders' Declaration](#)

Implementing Clean, Sustainable, Just, Affordable & Inclusive Energy Transitions

- xi. Recognize the role of grid interconnections, resilient energy infrastructure and regional/cross-border power systems integration, where applicable in enhancing energy security, fostering economic growth and facilitating universal energy access for all.

Source: [G20 New Delhi Leaders' Declaration](#)



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05

Suggestions and Way Forward



Five Point Suggestion and Way Forward

1. **Coordinated and Complementary Regional Regulatory Frameworks:** Transition needs Transformational Action. Net Zero & Clean Energy Transition investments are long-term and irreversible in nature. Regulators can play a facilitating role by providing a level playing field for ensuring a smooth and balanced transition in a manner that is

- ❖ Resilient
- ❖ Economical
- ❖ Sustainable &
- ❖ Inclusive (**RESI**)

2. **Getting South Asia (BBIN) to Net Zero :** Conduct a comprehensive South Asia Regional Economy Wide Assessment (**SAREA**) on scope for optimization through Deepening Regional Energy Cooperation and Cross Border Electricity Trade for meeting Net Zero and climate Goals and it's quantitative and qualitative impact.

3. Create a “**High-Level Regulatory Working Group on Energy and Climate Prosperity (RWG-ECP)**“ to evolve RESI-compatible **Long-Term Energy Regulatory Pathways & Roadmaps-2070** for clean energy transition, achieving Net Zero in South Asia (BBIN). (To be updated & and reviewed at regular intervals to remain consistent with technology progress/development)

4. Spur the development of **Innovative Regulatory & Market Instruments (IRMI)** for Regional Energy Market, Commission Biennial Knowledge Report on “**South Asia Clean Energy Transition & Net Zero Outlook (SACETO)**”

5. Commission and Institutionalise a South Asia Annual Regional Training Program on “ **Regulatory Innovation for Accelerating Clean Energy Transition and Achieving Net Zero Goals** “

Thank You



Contact: rpanda@sarep-southasia.org
rajivratnapanda@gmail.com
+91-9650598697

Disclaimer

The data, information and assumptions (hereinafter ‘data-set’) used in this document are in good faith and from the source to the best of SAREP (the program) knowledge. The program does not represent or warrant that any data-set used will be error-free or provide specific results. The results and the findings are delivered on “as-is” and “as-available” data-set. All data-set provided are subject to change without notice and vary the outcomes, recommendations, and results. The program disclaims any responsibility for the accuracy or correctness of the data-set. The burden of fitness of the data-set lies completely with the user. In using the data-set data source, timelines, the users and the readers of the report further agree to indemnify, defend, and hold harmless the program and the entities involved for all liability of any nature.

Getting India to Net Zero

POWER CAPACITY AND GENERATION MIX IN THE 2070 NET ZERO (BALANCED POLICY MIX) SCENARIO

		2022	2030	2040	2050	2060
Power capacity	GW	402	867	2,564	4,556	7,601
Coal	% of total	52	29	7	1	0
Oil & gas	% of total	8	3	1	0	0
Fossil fuels with CCS	% of total	0	0	0	0	0
Nuclear	% of total	2	2	2	3	2
Biomass (inc. with CCS)	% of total	2	2	1	1	1
Wind	% of total	16	20	13	8	6
Solar	% of total	8	36	74	87	90
Hydro	% of total	11	8	2	1	1
Power generation	TWh	1,850	2,811	5,901	9,967	15,886
Coal	% of total	76	50	11	1	0
Oil & gas	% of total	1	1	0	0	0
Fossil fuels with CCS	% of total	0	0	0	0	1
Nuclear	% of total	3	4	8	9	7
Biomass (inc. with CCS)	% of total	2	3	2	2	2
Wind	% of total	6	10	8	5	4
Solar	% of total	4	24	67	81	86
Hydro	% of total	6	9	3	2	1

Getting India to Net Zero

POWER CAPACITY AND GENERATION MIX IN THE 2070 NET ZERO (WITH REGULATION FOCUS) SCENARIO

		2022	2030	2040	2050	2060
Power capacity	GW	402	880	2,596	4,567	7,570
Coal	% of total	52	28	6	0	0
Oil & gas	% of total	8	3	0	0	0
Fossil fuels with CCS	% of total	0	0	0	0	0
Nuclear	% of total	2	2	3	3	2
Biomass (inc. with CCS)	% of total	2	2	1	1	1
Wind	% of total	16	21	13	8	6
Solar	% of total	8	35	75	87	90
Hydro	% of total	11	8	2	1	1
Power generation	TWh	1,850	2,814	5,946	9,992	15,860
Coal	% of total	76	49	9	0	0
Oil & gas	% of total	1	1	0	0	0
Fossil fuels with CCS	% of total	0	0	0	1	1
Nuclear	% of total	3	4	8	9	7
Biomass (inc. with CCS)	% of total	2	3	2	2	2
Wind	% of total	6	10	8	5	4
Solar	% of total	4	24	69	82	86
Hydro	% of total	6	9	3	2	1

Getting India to Net Zero

POWER CAPACITY AND GENERATION MIX IN THE 2070 NET ZERO (WITH MARKET-BASED FOCUS) SCENARIO

		2022	2030	2040	2050	2060
Power capacity	GW	402	857	2,555	4,513	7,589
Coal	% of total	52	30	7	1	0
Oil & gas	% of total	8	3	1	0	0
Fossil fuels with CCS	% of total	0	0	0	0	0
Nuclear	% of total	2	2	2	2	2
Biomass (inc. with CCS)	% of total	2	2	1	1	1
Wind	% of total	16	19	13	8	6
Solar	% of total	8	36	73	86	90
Hydro	% of total	11	8	2	1	1
Power generation	TWh	1,850	2,809	5,888	9,908	15,864
Coal	% of total	76	51	12	2	0
Oil & gas	% of total	1	1	0	0	0
Fossil fuels with CCS	% of total	0	0	0	0	1
Nuclear	% of total	3	3	7	8	7
Biomass (inc. with CCS)	% of total	2	3	2	2	2
Wind	% of total	6	9	8	5	4
Solar	% of total	4	23	67	81	86
Hydro	% of total	6	9	3	2	1

9. Annexure 4: Presentation on “Regional Energy Cooperation and Regulatory Approaches for Achieving Just Clean Energy Transition and Net Zero Goals in Southern Africa Region- SAPP Pool Plan for Facilitating Regional Renewable Energy Deployment & Clean Energy Transition in SAPP Region”.

Enhancing Electricity Regulatory Ecosystems

Southern African Power Pool Presentation

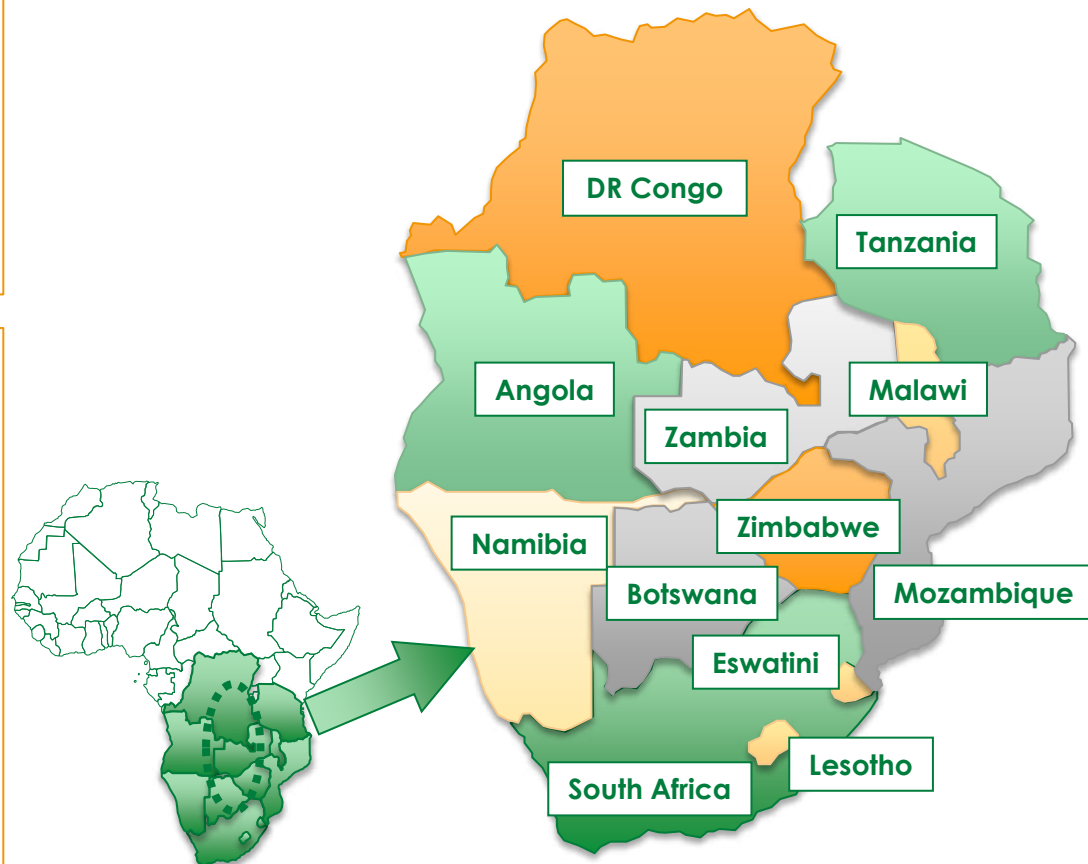


18 September 2023

Introduction to SAPP

- 12 Countries
- 400 Million people
- Installed Capacity: 80 GW

Created 1995 under Southern Africa Development Community (SADC) through an Inter-Governmental Memorandum of Understanding (IGMOU)

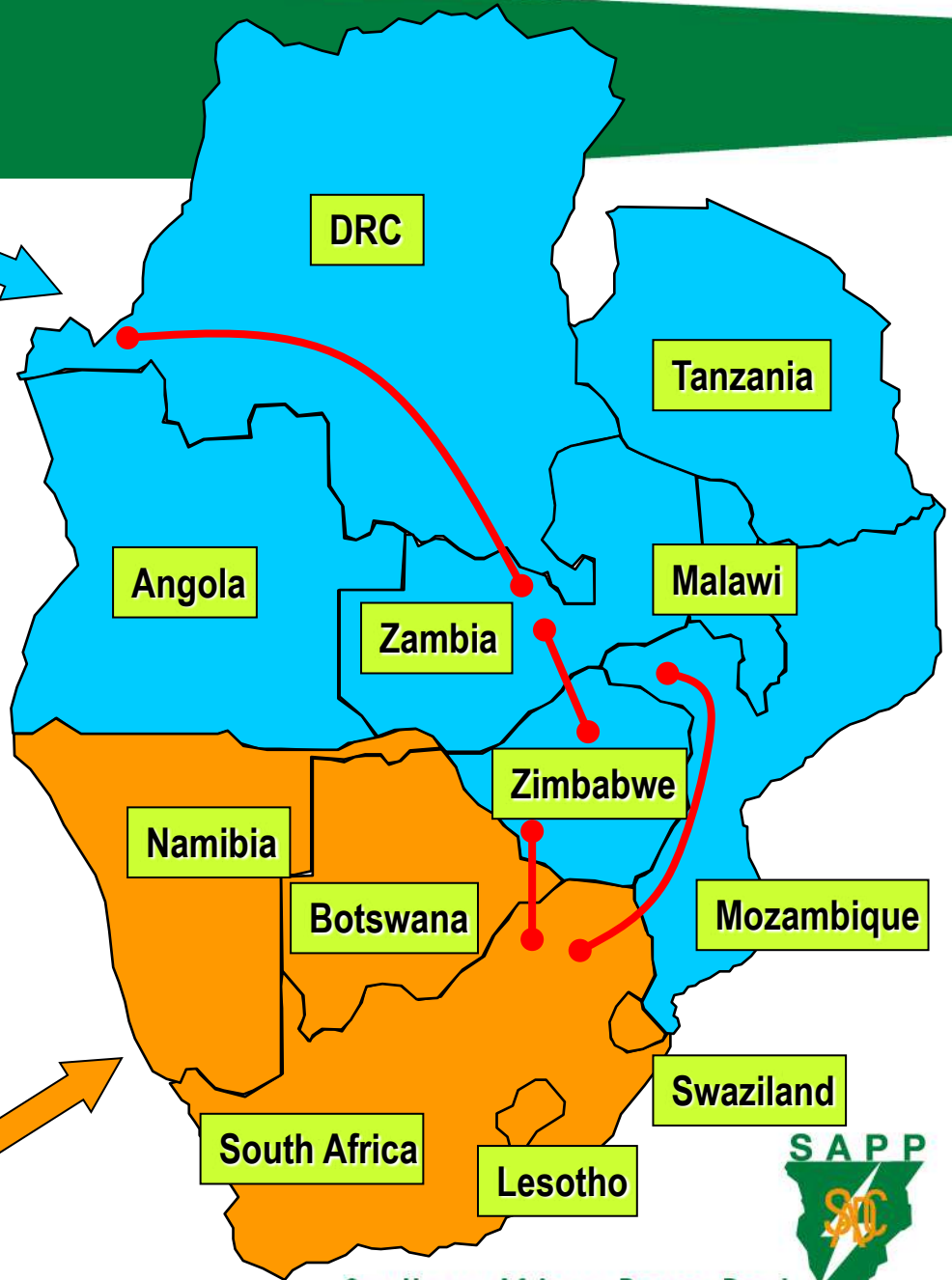


SAPP is financed by member utility contributions, electricity trading fees, other sources and Development partners



Historic

Hydro Northern Network



Thermal Southern Network



Southern African Power Pool

SAPP Vision and Mission Statement

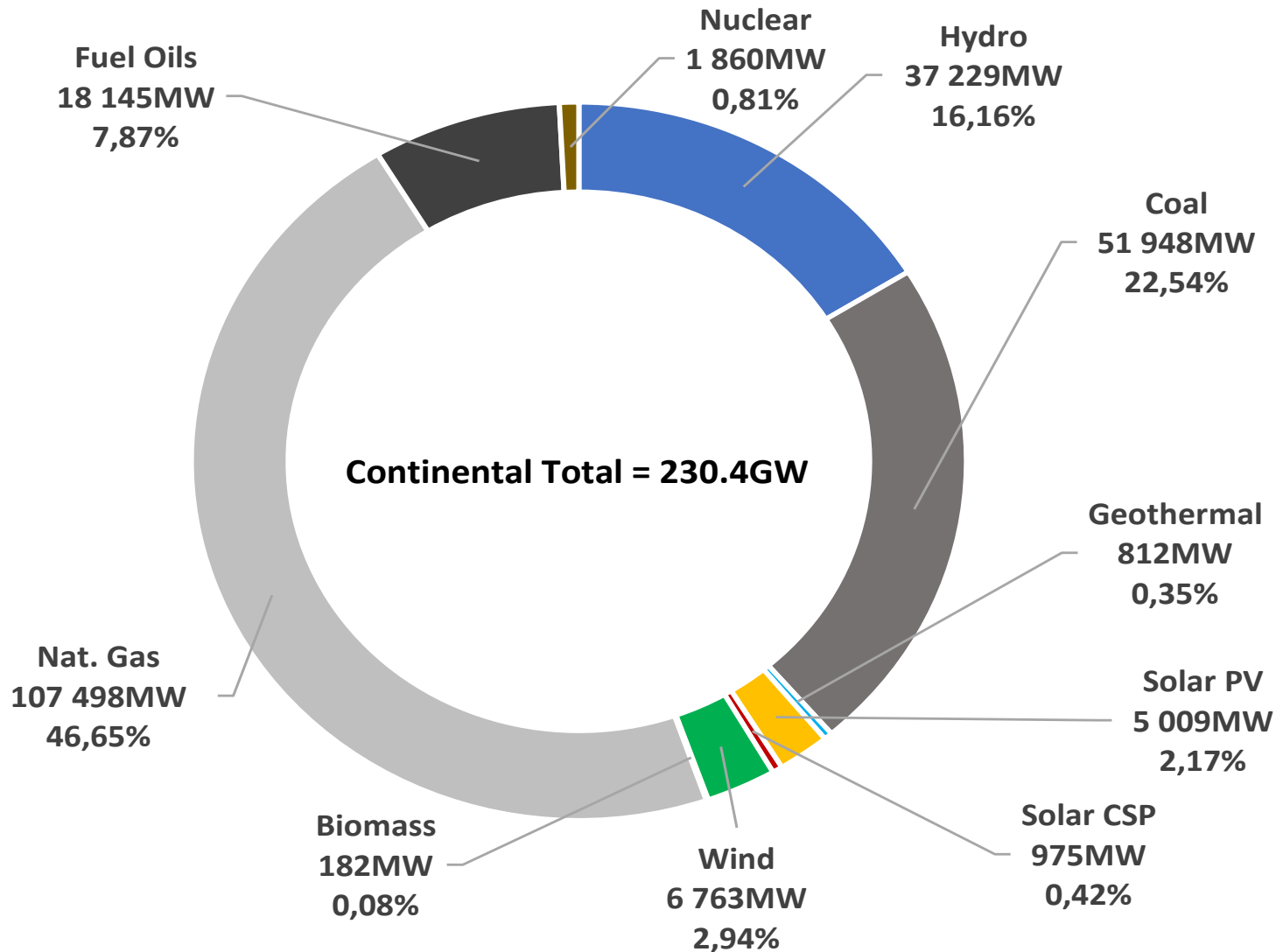
The Vision Statement of SAPP is:

To be a fully integrated, competitive energy market and a provider of sustainable energy solutions for the SADC region and beyond.

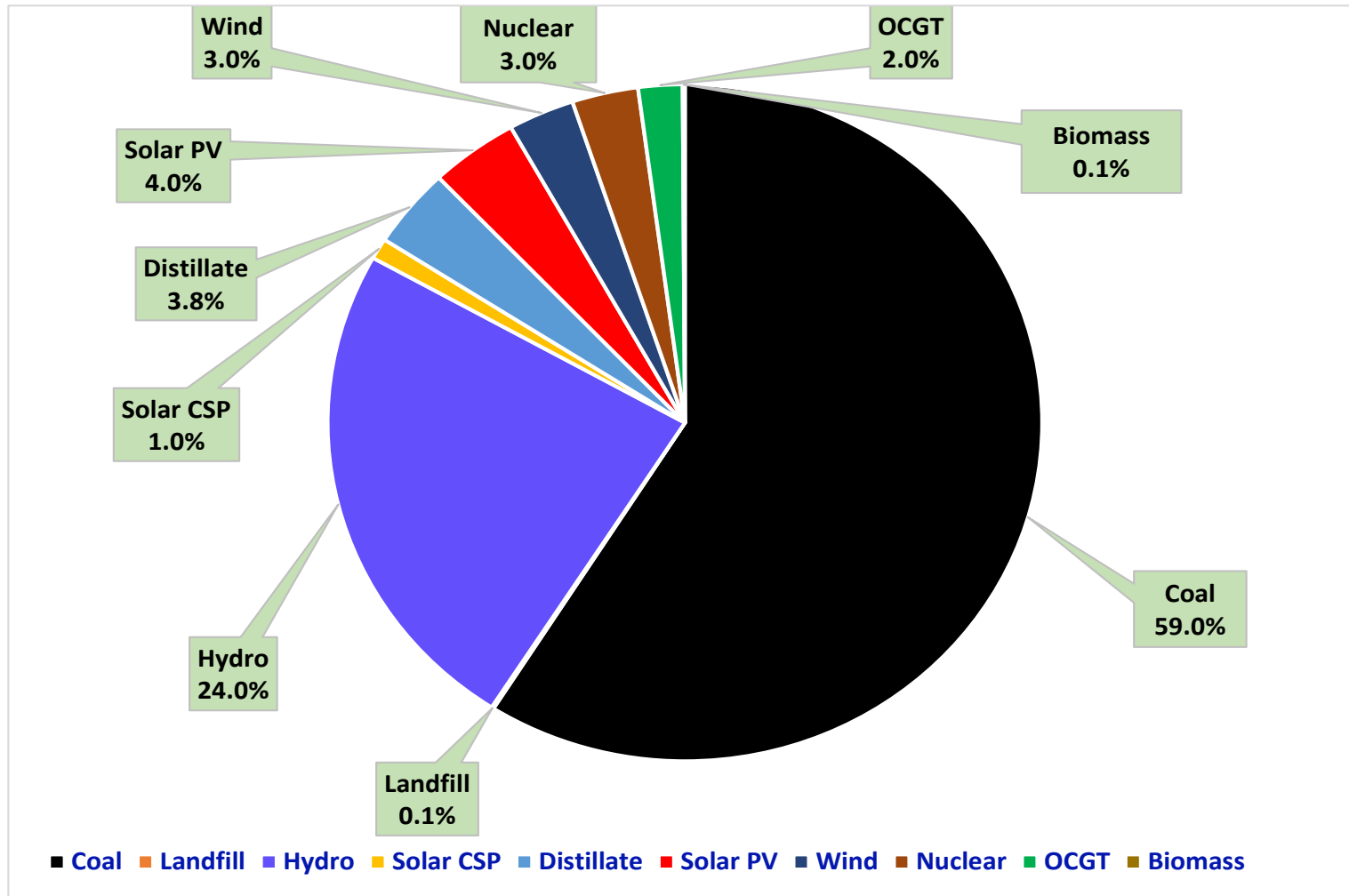
The Mission Statement for SAPP is:

To provide energy associated services in the region and beyond.

Continental Installed Generation Capacity Mix

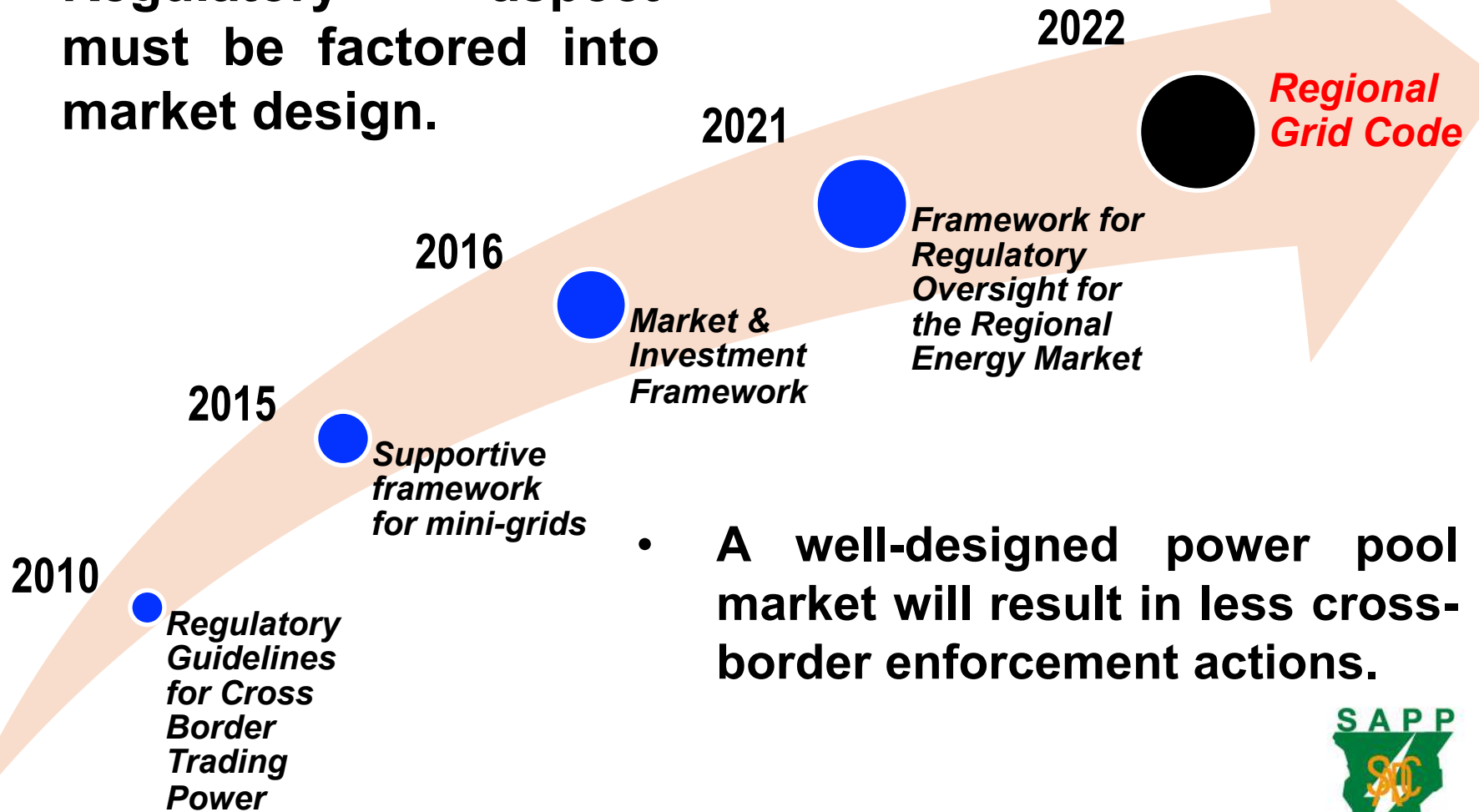


SAPP Generation Mix



Regulatory Initiatives and Harmonisation

- Regulatory aspect must be factored into market design.



- A well-designed power pool market will result in less cross-border enforcement actions.

Cross Border Electricity Trade in SAPP

- Bilateral contracts
- Short-Term Energy Market (STEM) – 2001 to 2009
- Post STEM – 2002 to 2009
- Day-Ahead Market (DAM) – 2009
- Post Day Ahead Market – 2013 to 2016
- Forward Physical Markets (Month Ahead & Week Ahead) – 2016
- Intra Day Market (Hour Ahead)– 2016
- Balancing Market- April 2022



POTENTIAL FUTURE ADDITIONS

- Ancillary Services Market
- Financial Markets
- Renewable Energy Market

The SAPP Market is changing

- New solar and wind technologies being commissioned in most countries
- Intermittent and fluctuating nature of renewables will need to be addressed
- New Large scale renewable energy projects will require transmission investments
- Solar on roof tops of building is resulting in net metering where customers are selling to the power company

SAPP Pool Plan Results

Installed Generation Capacity	130 GW
New Generation Capacity	75 GW
Item	Cost, USD billion
Generation Investments	117.7
Transmission Investments	3.3
Total Investments	121

It is **USD 37 billion cheaper** over a 40-year period to go for the regional integrated approach than pursuing national plans. More transmission corridors are developed.

Over-arching benefits of regional integration in the power sector

- **Within the electricity sector**

- **Technical benefits – frequency stability, security of supply through shared reserves**
- **Planning benefits – greater flexibility in developing generation projects**
- **Financial benefits**
 - **Reduced investment and operational costs of meeting demand**
 - **Improved utility viability**
 - **Accelerated attainment of electrification targets**

- **Within the wider economy**

- **Resources freed up for investment in the productive sectors**
- **More competitive industries due to lower electricity tariffs**
- **Electrification (esp. on-grid) gives multi-fold benefits at the household level, which also feed into the macro-economy**
- **Enhanced employment and national income**



Renewable Energy Targets

Renewable Energy Targets in SADC by 2030

39% for On Grid share of electricity consumption

7.5% for Off Grid

Key Observations

- The impact of VRE on the SAPP system on an hourly scheduling and dispatch basis can be managed. It is more the impact of the SAPP system on the VRE that presents the challenges.
- Ensure that regional transmission infrastructure that will enhance the sharing of resources in the SAPP region to be built
- Increase the ability for 3rd party access to the SAPP Physical Markets

Regulatory Initiatives

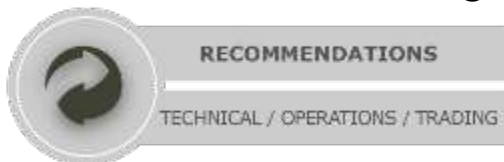
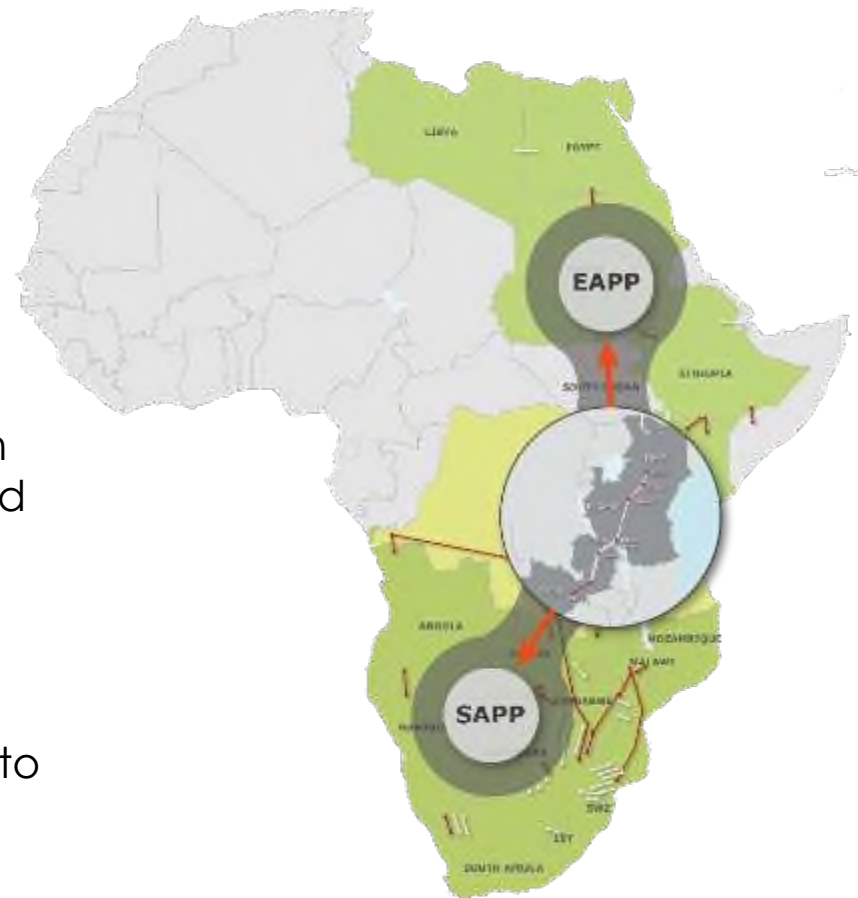
Completed the development of the [SADC Regional Grid Code](#) with the following objectives:

- 1 Implementing common standards for satisfactory operational security, reliability and quality of supply in the SAPP Electricity Market;
- 2 Ensuring non-discriminatory access and application to the cross-border trade of electricity in the region;
- 3 Defining the responsibilities of operational participants in the SAPP Electricity Markets and adding additional requirements to the SAPP Coordination Centre to increase the transparency and efficiency in the operation of the SAPP Electricity Markets;
- 4 Defining minimum technical requirements for all users of the SAPP Interconnected Transmission System and other Synchronous Areas in the SADC region; and
- 5 Setting out information exchange obligations for all parties to the Regional Grid Code.

Regional Transmission Integration

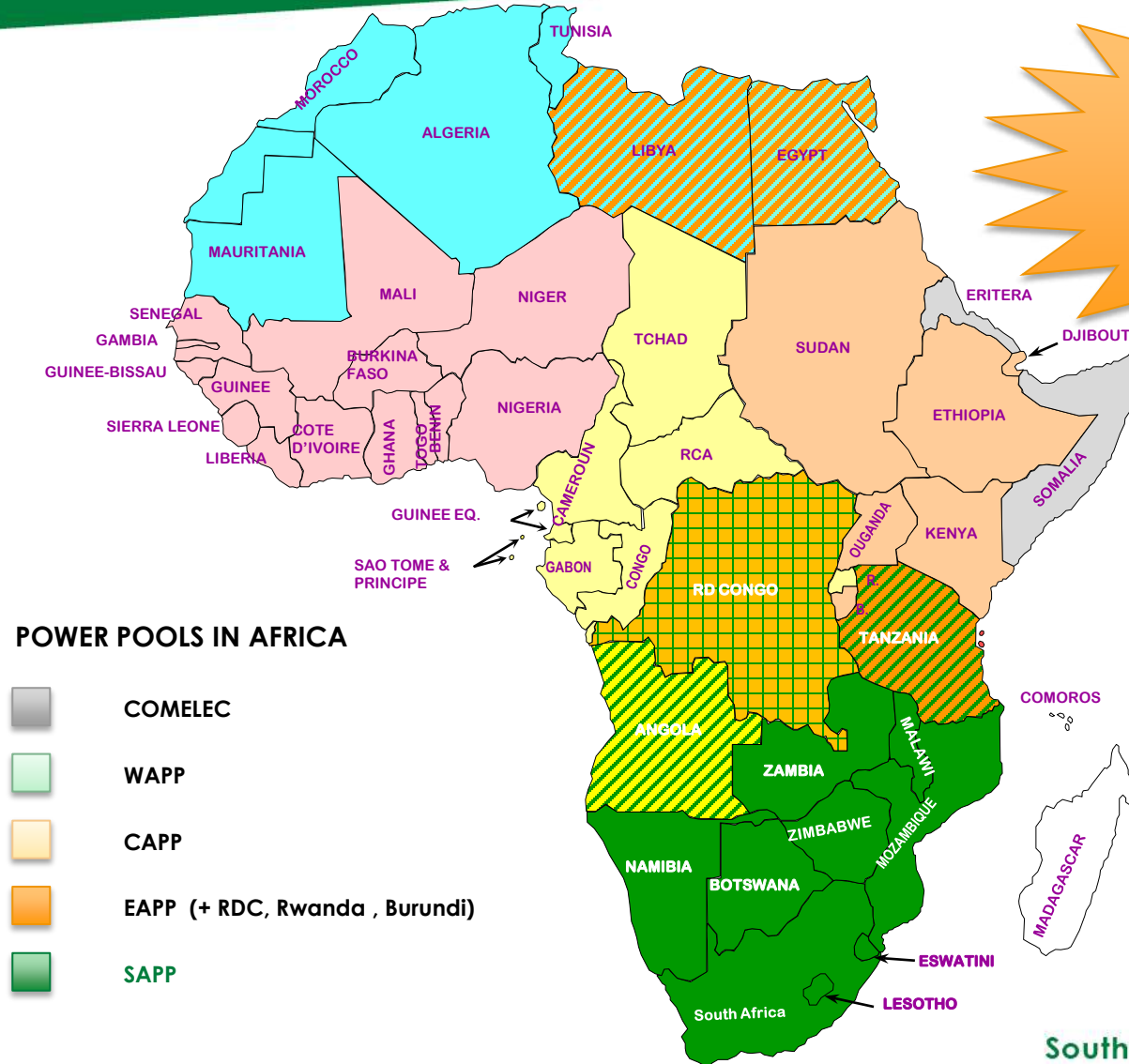
Specific recommendations regarding:

- The **Technical Performance** of the transmission interconnector when commissioned as well as under potential future scenarios (2030),
- The **Operations and Planning** requirements to ensure the safe and effective operation of the transmission interconnector under steady-state and selected contingency conditions, as well as the harmonised planning principles between the two Power Pools,
- Broad recommendations with regard to **Power Pool Trading** governance structures, agreements and memorandums of understanding, market and trading rules and platforms.



Towards an African Single Electricity Market (AfSEM)

Continental
Master Plan in
progress under
AUDA-NEPAD



Please note that RNT (Angola) is also a member of CAPP, SNEL (DRC) is also a member of CAPP and EAPP and TANESCO (Tanzania) is also a member of EAPP



Southern African Power Pool

10. Annexure 5: Presentation on “Regional Energy Cooperation and Regulatory Approaches for Achieving just Clean Energy Transition and Net Zero Goals in ASEAN Region- ASEAN Power Interconnection”.



One Community
for Sustainable
Energy

Regional Energy Cooperation and Regulatory Approaches for Achieving Clean Energy Transition and Net Zero Goals in the ASEAN Region – ASEAN Power Interconnection

Prihastya Wiratama

Project Manager of ASEAN Power Interconnection,

Power Fossil Fuel, Alternative Energy, and Storage (PFS) Department, ASEAN Centre for Energy

“Enhancing Electricity Regulatory Ecosystem for Accelerating Clean Energy Transition and Achieving Net Zero Ambitions in The South Asia Region”

18 September 2023

Introduction to the ASEAN Centre for Energy (ACE)

Established in January 1999, ASEAN Centre for Energy (ACE) is an **intergovernmental organization within ASEAN** structure that represents the 10 ASEAN Member States' interests in the energy sector.

What We Do



Catalyst

Unify and strengthen ASEAN energy cooperation by providing a platform for sharing, policy advisory, best practices, and capacity building.



Knowledge Hub

Provide a knowledge repository for ASEAN Member States (AMS) and services through data management, publication, and dissemination.

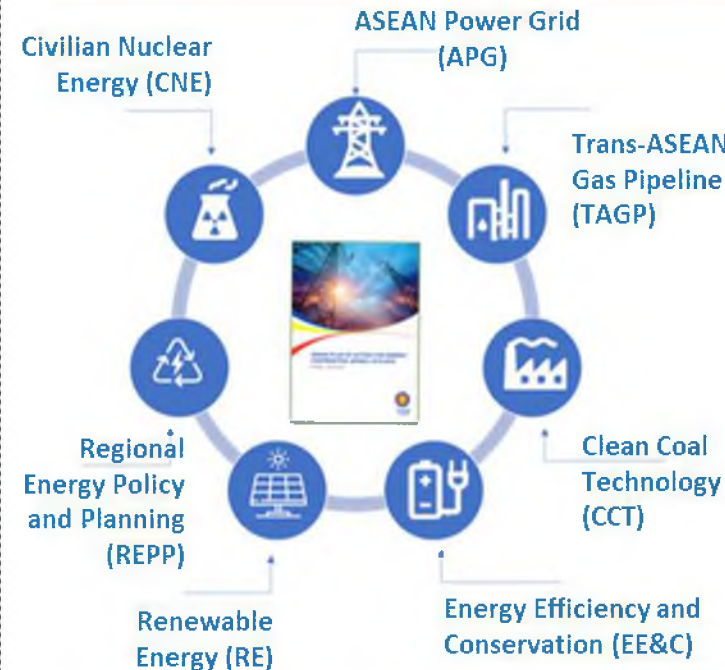


Think Tank

Assist AMS on research and identifying practical and specific solution on policies, legal, and regulatory frameworks, technologies, and innovative solutions.

ASEAN Plan of Action for Energy Cooperation (APAEC)

Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve Energy Security, Accessibility, Affordability and Sustainability for All



What is APAEC?

A series of guiding policy documents serving as the platform for deeper cooperation both within ASEAN as well as with DPs and IOs.

What does APAEC do?

Promoting **multilateral cooperation and integration** in the energy sector.

What is APAEC trying to achieve?

To attain the goals of **ASEAN Economic Community (AEC)** by enhancing security, accessibility, affordability, and sustainability in the energy sector.

Commitment of ASEAN in carbon neutrality

ASEAN Country	Emission Reduction Target		Carbon Neutrality / Net Zero Target
	Unconditional	Conditional	
Brunei Darussalam	<ul style="list-style-type: none"> 20% GHG emissions reduction by 2030 compared to Business as Usual (BAU) At least 10% GHG emissions reduction by 2035 through better supply and demand management of electricity consumption 	N/A	Net zero emission by 2050
Cambodia	N/A	42% GHG emissions reduction or 64.5 MtCO ₂ eq by 2030 compared to BAU	Carbon neutrality by 2050
Indonesia	31.89% GHG emissions reduction by 2030 compared to BAU	43.2% GHG emissions reduction by 2030 compared to BAU	Net zero emission by 2060 or sooner
Lao PDR	60% GHG emissions reduction compared to Baseline scenario, or around 62 MtCO ₂ eq in absolute terms	N/A	Net zero emission by 2050 conditionally
Malaysia	Economy-wide carbon intensity (against GDP) reduction of 45% in 2030 compared to the 2005 level	N/A	Carbon neutrality by 2050
Myanmar	244.52 MtCO ₂ eq emissions reduction by 2030	414.75 MtCO ₂ eq emission reduction by 2030	Carbon neutrality by 2050
Philippines	2.71% GHG emissions reduction by 2030 compared to BAU	72.29% GHG emissions reduction by 2030 compared to BAU	N/A
Singapore	Achieve peak emissions at 60 MTCO ₂ eq around 2030	N/A	Net zero emission by 2050
Thailand	30% GHG emissions reduction by 2030 compared to BAU	40% GHG emissions reduction by 2030 compared to BAU	Carbon neutrality by 2050 and Net zero emission by 2065
Vietnam	15.8% GHG emissions reduction by 2030 compared to BAU	43.5% GHG emissions reduction by 2030 compared to BAU	Net zero emission by 2050

Source: ACE (2023) based on several national documents submitted to UNFCCC

The APAEC Phase II: 2021 – 2025

A regional blueprint for energy cooperation in the ASEAN that builds on the success of APAEC Phase I: 2016-2020, sets out ambitious targets and initiatives to enhance energy security and sustainability and supports the UN SDG 7.

ASEAN Plan of Action for Energy Cooperation (APAEC) 2016-2025 Phase 2: 2021-2025

- **Theme:** “Enhancing Energy Connectivity and Market Integration in ASEAN to Achieve **Energy Security, Accessibility, Affordability and Sustainability** for All”.
- **Sub-theme:** “Accelerating Energy Transition and Strengthening Energy Resilience through Greater Innovation and Cooperation.”

APAEC Program Area No.1: ASEAN Power Grid



Key Strategies:

To expand regional multilateral electricity trading, strengthen grid resilience and modernisation, and promote clean and renewable energy integration.



Outcome Based Strategies:



OBS 1

Accelerate the completion of APG Project and initiate the expansion of multilateral electricity trading



OBS 2

Work on Institutional framework and regulatory capacity as minimum requirement to advance multilateral electricity trading



OBS3

Work on harmonizing the minimum technical requirements to advance multilateral electricity trading



OBS 4

Explore integrating renewable energy and other digital developments into APG Grid

Why Southeast Region Need APG?

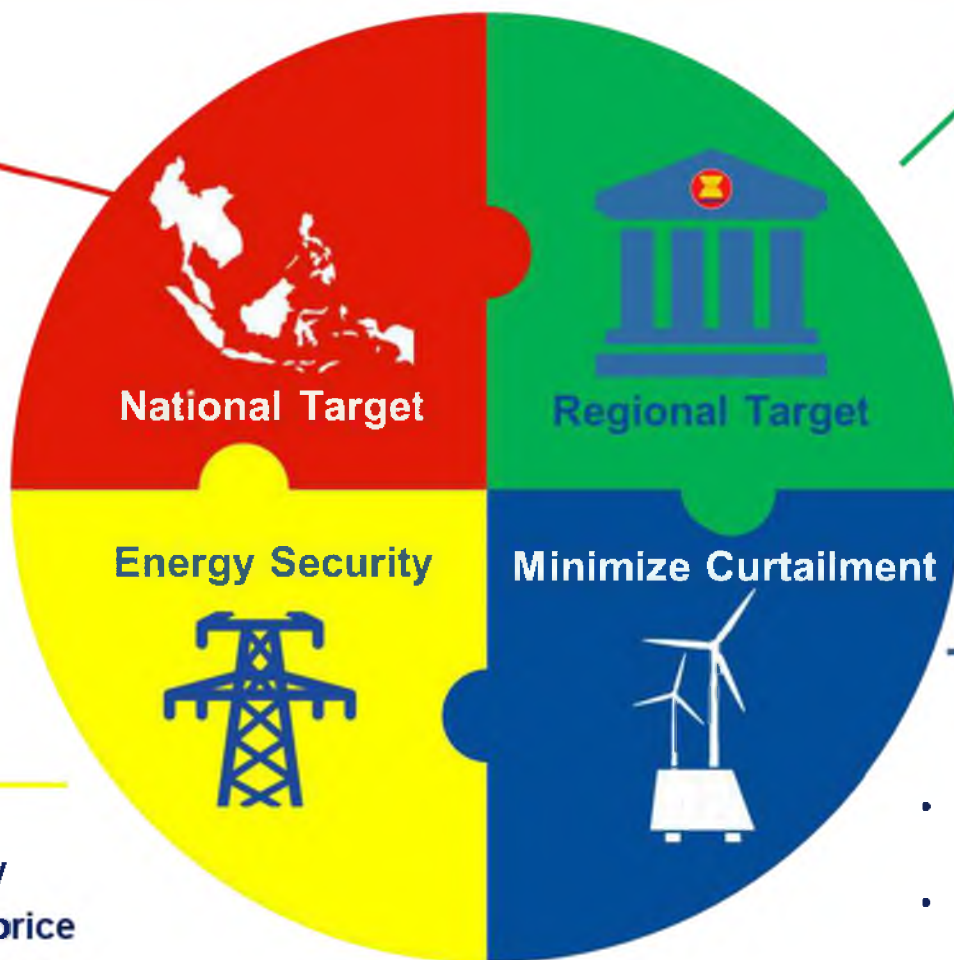
Realize National Target

Addressing different condition of AMS, pursuing higher interconnection can unlock higher share of RE utilization

- To Achieve Regional Target, needs 44% share of RE installed capacity. Updated national PDP, predicted 39% of RE share in 2025
- Interconnection can help country like Singapore achieve its national target despite land and resource scarcity

Energy Security

- Enhance regional energy security
- Minimize damage due to price volatility in global market



Pursuit of Regional Target

ASEAN need to Achieve 23% share of RE in energy mix and 35% share of RE in installed Capacity by 2025

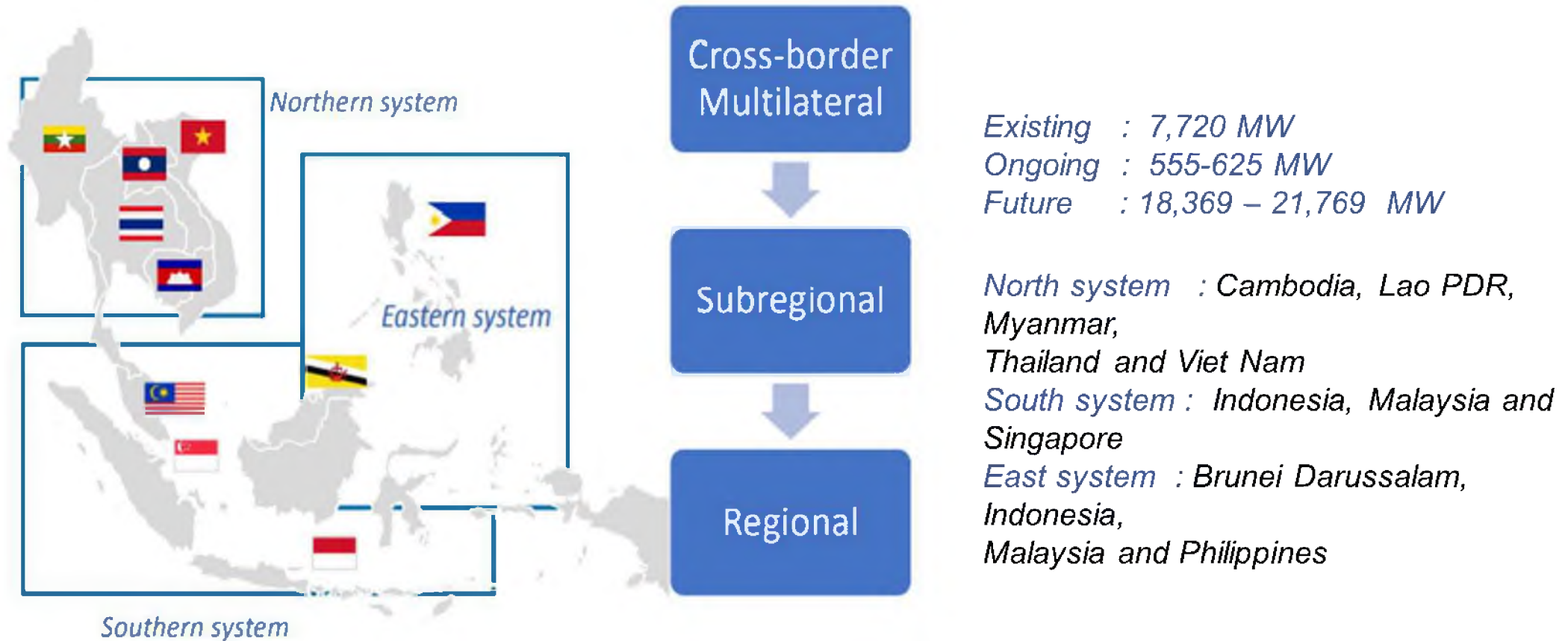
- Based on ASEAN Energy Outlook VII, it is predicted 60% of new installed capacity (2021-2025) will be RE
- Need 155 GW RE Capacity installed by 2025

Minimize Curtailment

- Connect high-cater demand area with big potential RE Sites
- Minimize Curtailment Issue
 - Solar Power in Vietnam faces high curtailment due to high supply yet small domestic demand

APG Concept: Pathway to establishing regional (multilateral) power trading

- The pathway to regional (multilateral) power trading in ASEAN has three different steps, where most progress has been made in bilateral cross-border trading.



ASEAN Interconnection Master Plan Study (AIMS) in a nutshell



AIMS I (2003)

- Proposed regional electrical power transmission network: ASEAN Power Grid (APG).
- Identified potential saving in new investment and operating costs on interconnection.



AIMS II (2010)

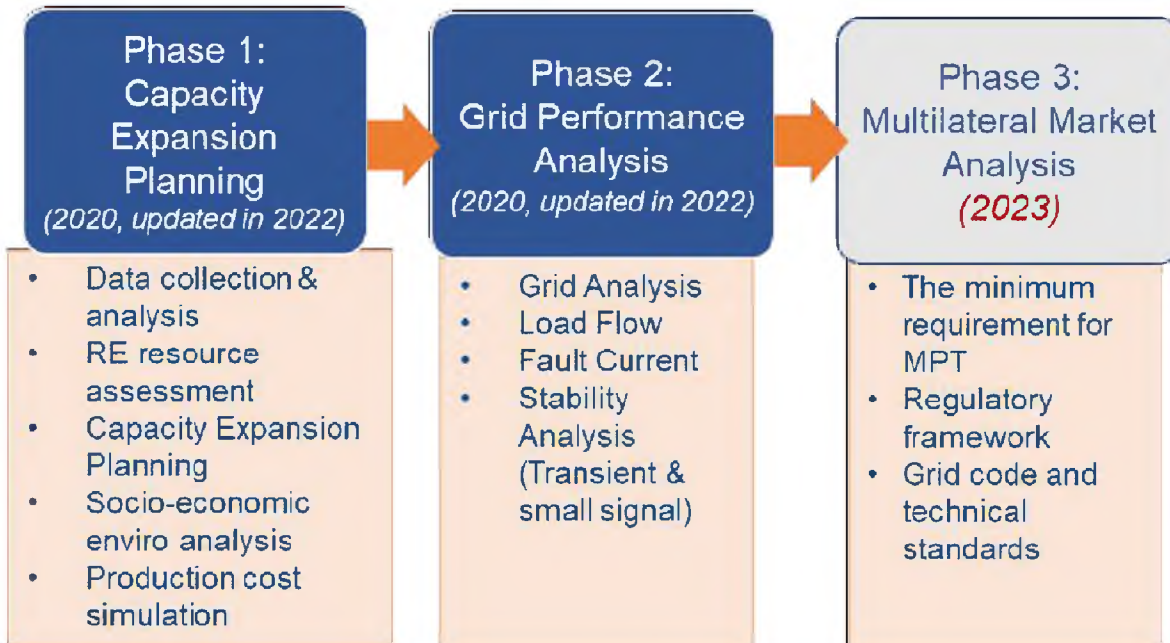
- Updated APG: changes in economic situation, electricity demand, energy requirement.
- Primarily made to plan APG through interconnection and to promote efficient, economical, and secure power system.



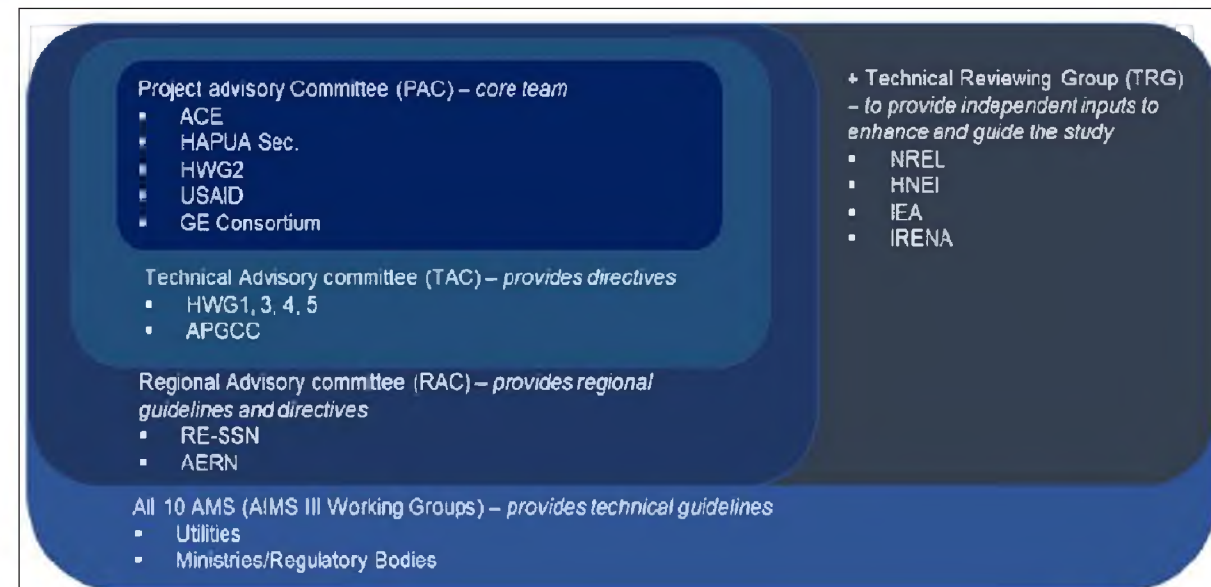
AIMS III (2020) & Update (2022)

- Update APG plan under AIMS II
- Focus on increasing RE integration (as part of the ASEAN's target for having 23% share of RE in ASEAN's energy mix by 2025) through greater interconnections
- Time horizon up to 2040.

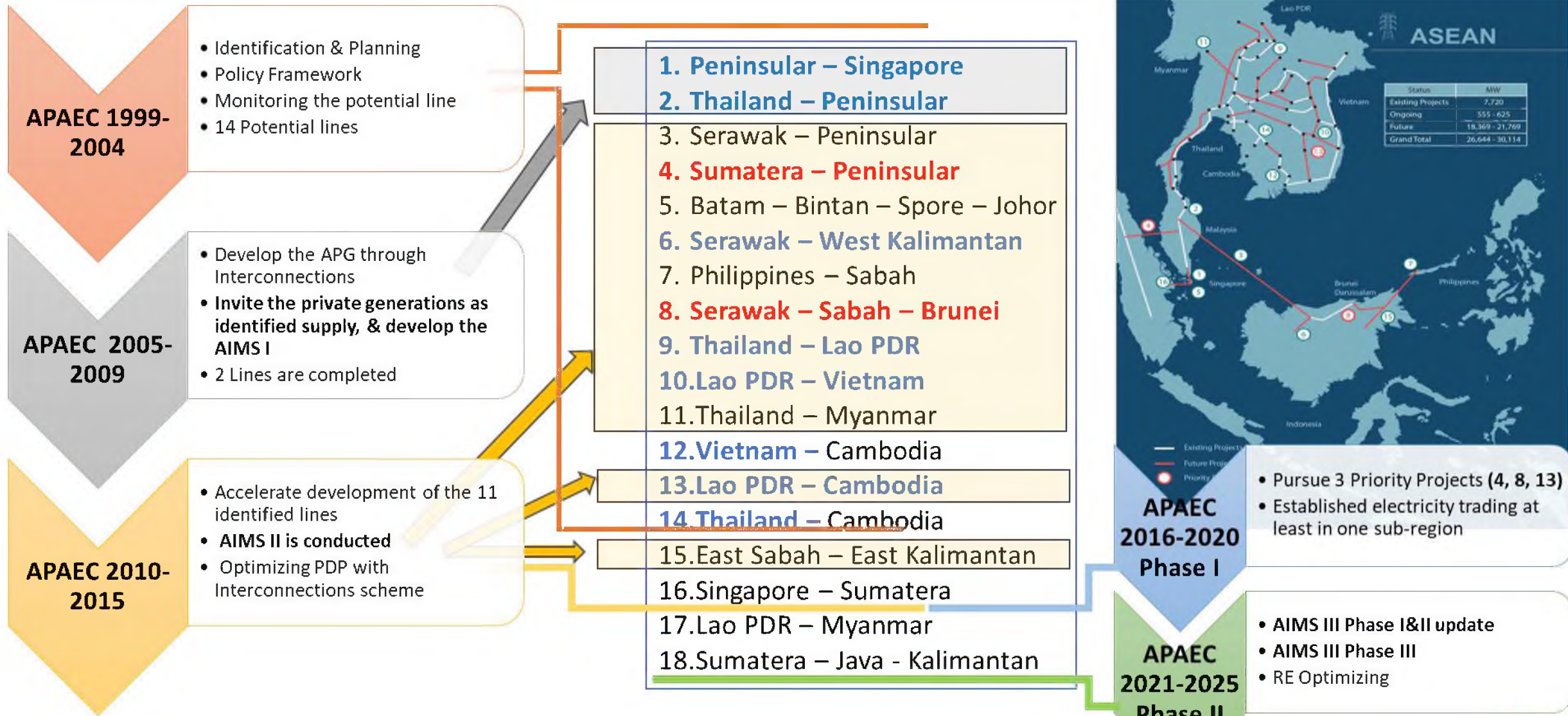
What are the scope of AIMS III?



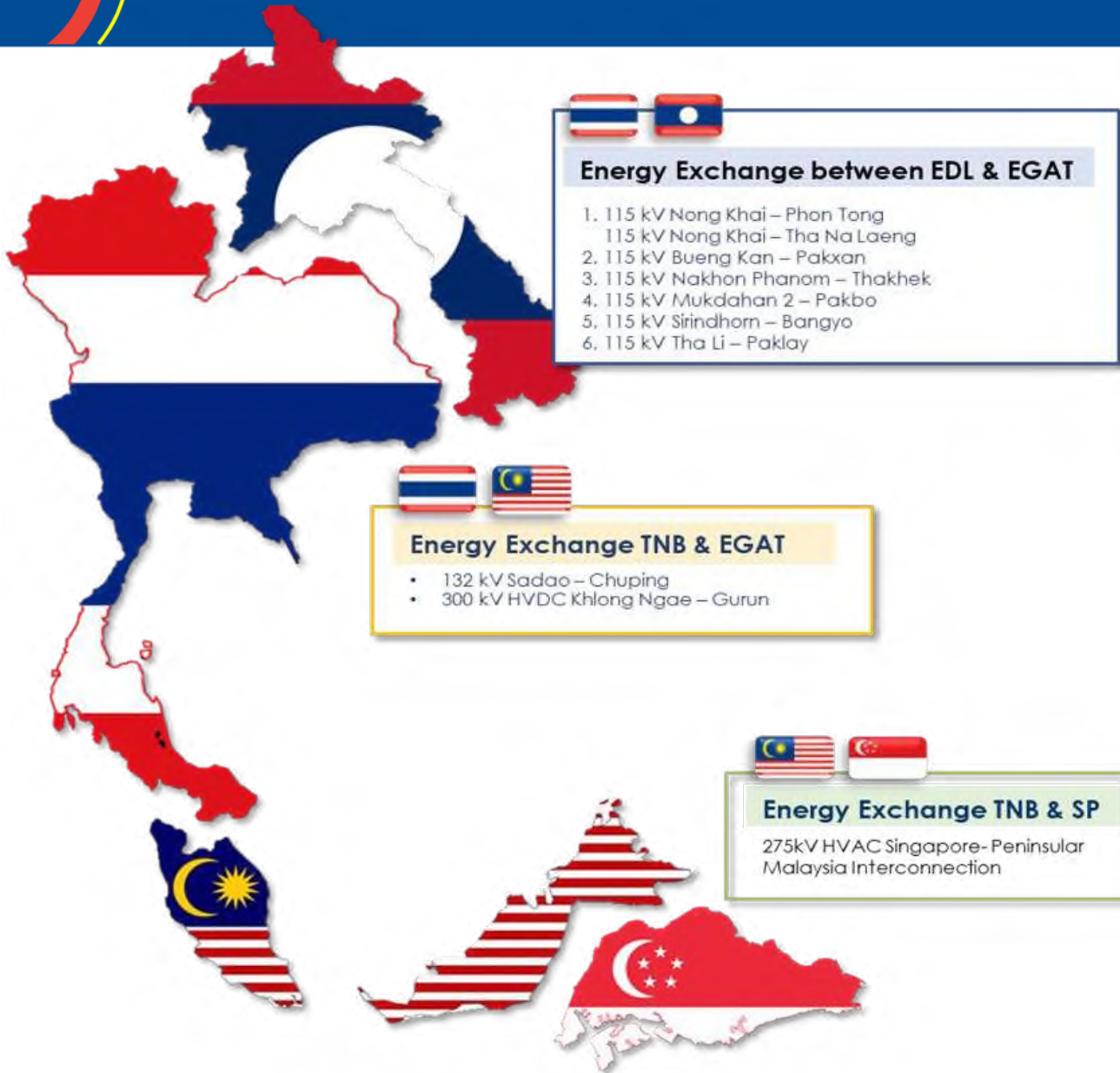
Who are involved?



Historical Brief of ASEAN Power Grid Based on AIMS




Pathfinder for MPT: LTMS Power Interconnection Project



LTM- PIP: Phase 1  **COMPLETED**

- Power purchase amount was up to 100 MW,
- Total electricity delivered of 30.2 GWh**

LTM- PIP: Phase 2  **COMPLETED**

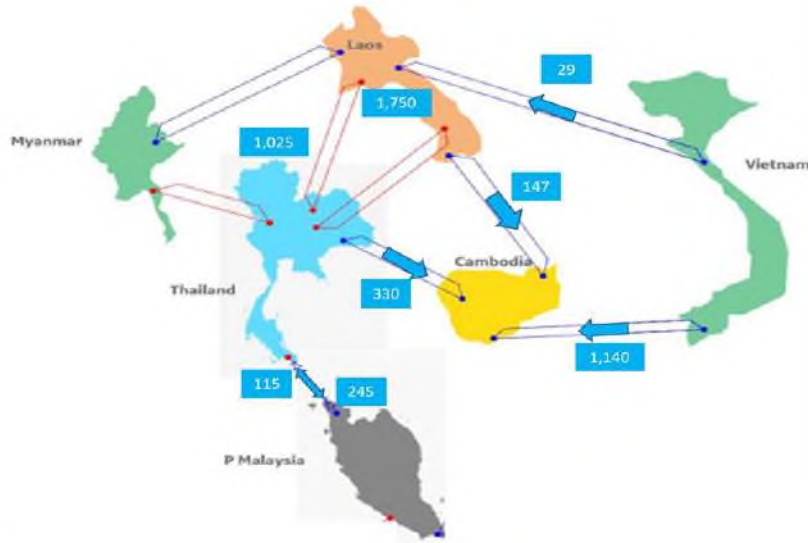
- Power purchase amount has been **expanded up to 300 MW**
- LTM PIP Phase 2 into operation on December 27, 2019
- Operational period is from January 2020 – December 2021
- A total of 2.6 GWh**, of electricity has been traded as of Dec 2021

LTMS- PIP  **IN PROGRESS**

- Power purchase amount is up to 100 MW,
- Contract Period: 2 years (2022- 2024)
- Effective Date: 22nd June 2022
- 1st Power Flow date : 23rd June 2022
- Total of 265.73 GWh** of electricity has been traded (as of 30 April 2023)
- Proposed for the next phase power purchase capacity up to 300 MW with a 5-year contract

Building Block of Harmonized Regulatory Framework for MPT

Illustration of Grid-to-Grid Imports and Exports (Power Trade) in the ASEAN Region



Data & Information Sharing
Interconnector Capacity calculations

Harmonized
Grid Codes
& Standards

Harmonized Grid Codes
Harmonized Wheeling Charge Methodology
Third-party access

Harmonizing
the
Transparency

Oversight &
Governance

Intergovernmental Agreements
Institutional arrangements
Settlement and payment mechanism
Dispute resolution mechanism

ASEAN Region Interconnection (ASEAN Power Grid)



The Region is requiring a balance in energy trilemma:

- security,
- affordability,
- and environmental sustainability.

APG initiative to fuelling the increasing regional energy demand and Energy Trilemma.

Today's Quote "There will be no energy transition without transmission"

ASEAN Centre for Energy

Soemantri Brodjonegoro II Building
Jl. H.R. Rasuna Said Block X-02, Kav. 07-08,
RT.10/RW.4, Kuningan Timur, Kecamatan Setiabudi,
Daerah Khusus Ibukota Jakarta 12950
T: (+62 21) 527 9332



<https://www.aseanenergy.org>







**For more information,
please visit the SAREP program website:
<https://sarepenergy.net/>**