Fourth Meeting of SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge Sharing, Addressing Cross Cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia"

Minutes of the Meeting

14th and 15th February 2023, Karnali Hall, Kathmandu Marriott Hotel, Kathmandu, Nepal

The Fourth Meeting of SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge Sharing, Addressing Cross Cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia" was held on 14th and 15th February 2023 at the Karnali Hall, Kathmandu Marriott Hotel, Kathmandu, Nepal. The list of participants is attached as **Annexure-I**.

14th February 2023, DAY-1

A. Inaugural Session -1

Introduction by the Participants: Each SAFIR Working Group member and meeting participants gave a brief introduction about themselves and their organisation.

Mr. Dilli Bahadur Singh, Chairman, Electricity Regulatory Commission (ERC), Nepal and special invitee, SAFIR Working Group, delivered the keynote address in the meeting. In his keynote address, he highlighted Nepal's power sector scenario and the importance of energy and regulatory cooperation among South Asian countries. Nepal's energy sector is driven by clean energy resources - hydropower. The country has potential of around 84 GW, of which less than 3% has been tapped so far. Nepal is aiming to achieve a total combined installed capacity of 15,000 MW by 2028, out of which 5,000 MW hydropower projects are planned to be export oriented. Nepal is aiming to tap power markets in neighbouring countries such as India and Bangladesh for its hydropower. He said cross-border cooperation and interconnected power grids can lower energy costs, improve reliability, and reduce carbon emissions at lower cost while increasing the share of clean energy in the mix in the region.

Touching on the importance of regulatory cooperation, he highlighted that South Asian Countries are at different stage of power sector reforms and have different electricity regulatory environment. To enhance cross border electricity trade (CBET) between two or more countries in South Asia, it is desirable to have common/coordinated set of regulations which facilitates/addresses the mechanism of cross border interconnection. He pointed out that, without consistent and coherent regional regulatory framework in place, investment opportunities and consequently large-scale cross border electricity trade between nations that could benefit both importing and exporting nations may find it difficult to materialize at a regional level. In the South Asian regional context, the risks associated with forging an intraregional, cross border electricity trade project would be greatly minimized if each participating country adopts complementary regulatory frameworks to facilitate cross border interconnection and electricity trade. Countries should also work towards gradually developing key regulatory ingredients for facilitating cross border electricity trade and cross border electricity trade regulatory frameworks/ rules/ procedures as applicable.

He expressed his happiness that the work done by the SAFIR working group till date has been commendable. He pointed out that, while it is important to learn from each other in the South Asia region, it also important learn from other regions around the globe on matters related to regional regulation, regional market integration and promoting cross border electricity trade through conducive regulatory frameworks. He hoped that the SAFIR working group will explore to learn from other regions of the globe through certain activities in the area of regional energy market, regional energy cooperation etc.

He said SAFIR has a potential in terms of serving as a platform for sharing experience amongst the regulators of the region and build regulatory decision-making and response capacity in South Asia. Nepal can visibly benefit from SAFIR's initiations and programs and believes that other countries in the region can do the same. SAFIR should continue to push through to empower the regulators of the region and gain consensus on matters pertaining to development of infrastructure sector.

He updated that ERC, Nepal is drafting various regulatory instruments including open access guidelines, directives on generation, transmission, and distribution tariff. Nepal for example is in the verge of electricity sector reform. In the near future, Nepal is expected to operationalize a multi-buyer system in electricity and make electricity sector more competitive. This shall necessitate Nepal to operationalize open access, determine wheeling charges and trading margin, prescribe code of conduct for power traders, restructure, and build capacity of the system operator, etc. To accomplish reforms in the sector, Nepal will look out for best regulatory practices worldwideand also learn from the trials and successes of regulatory bodies of the countries in South Asia such as India.

In conclusion he stated that regional energy cooperation will play a key role in pivoting the region towards clean energy transition. He thanked colleagues from regulatory bodies from the neighbour countries, SAFIR Secretariat and USAID/SAREP for organizing this event and inviting him to this event. He thanked USAID for supporting the work of the SWG.

Ms. Monali Zeya Hazra, Regional Energy and Clean Energy Specialist, Indo Pacific Office, USAID/India delivered her remarks. She highlighted on the continued cooperation, support and partnership with SAFIR and explained the transition of these activities from SARI/EI to SAREP and that the activities related to SAFIR Working Group is now being supported through USAID's SAREP program. She highlighted that the USAID has been working to enhance regional energy cooperation in South Asia since 2000 through its South Asia Regional Initiative for Energy (SARI/E) program and its successor programs. The first three phases of USAID's regional energy work focused on building trust, raising awareness, and assessing potential transmission interconnections. The fourth phase of the program, called the South Asia Regional Initiative for Energy Integration (SARI/EI), launched in 2012 and successfully concluded in September 2022, focused on advancing regional energy integration through cross-border power trade. The current regional energy program, SAREP builds on the USAID contributions over more than two decades to sustainable, secure energy in the region.

She mentioned that this meeting will help take forward the activities under the SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge sharing, addressing Cross Cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia". She added- Regulators in South Asia are in a powerful position to create an enabling environment to accelerate the clean energy transition and climate actions essential to combating the climate crisis. The regulations, guidelines, and standards that regulators develop, can impact millions of lives in the region. Regulators, working together, can strengthen regional energy cooperation, facilitate cross-border energy trade and energy project partnerships, and help ensure energy access and electrification throughout South Asia.

She mentioned that a significant learning is that regional energy cooperation and expansion of trade and infrastructure, has policy & regulatory challenges that require strong institutional support. SAFIR is an example of such an institutional support mechanism that acts as a platform for deliberations on issues of interest or concern among regulators in the region.

Mr. Shanker Khagi, Energy and Environment Specialist, USAID/Nepal delivered his remarks and thanked SAFIR Secretariat and SAREP for hosting the meeting in Kathmandu, Nepal. He briefly explained overall power sector scenario of Nepal and Nepal's desire to enhance cross border electricity trade in the region. He hoped that more frequent meetings will happen which will enhance exchange of knowledge and information on a more regular and sustained basis considering the continuously evolving power sector of the region. He also thanked and expressed his special appreciation for SAFIR Secretariat and SAREP for inviting Nepal to participate as a special invite in the fourth SAFIR working group meeting despite the fact

ERC, Nepal is yet to become a member of SAFIR. He hoped that Nepal will learn from the fourth meeting of SAFIR working group in terms of regulatory evolution, regulatory exchange which will help in developing effective, harmonised, coordinated regulations for advancing cross border electricity trade.

B. Session- 2: (i) Country Updates on Regulatory frameworks to support Cross Border Electricity Trade

(i) Context Setting & Presentation on Cross Border Electricity Trade, Regional Energy Cooperation and Future Outlook for South Asia

(ii) Updates in SAFIR member countries on the Existing Energy /electricity Regulatory framework and Perspective on regulatory cooperation to facilitate knowledge sharing, addressing cross cutting energy/electricity regulatory issues

, Mr. Rajiv Ratna Panda, Power Market, Specialist, SAREP, in first half of his presentation presented on the cross-border electricity trade, regional energy cooperation and future outlook for South Asia. In his presentation he covered cross border electricity trade, regional energy cooperation, emerging outlook for South Asia. He explained the macro-economic growth & level of economic integration in South Asia, country wise overview of South Asia power sector, evolution of energy integration & cross border electricity trade, current and future scenario of cross border electricity trade. He said that there have been significant developments in energy cooperation, cross-border electricity trade with several key policy & regulatory instruments that have been promogulated and agreed upon in the last decade by the south Asian countries both at the bilateral and multilateral level. The last decade has been a decade of policy and regulatory action and implementation. Speaking on the emerging outlook in South Asia from the perspective of opportunity for deepening cross border electricity trade, regional energy cooperation, he explained four key areas: a) climate change induced renewable based cross border electricity trade, b) impacting clean energy transformation vision through cross border electricity trade, c) proliferation of market instruments, regional energy market development and gradually transitioning to trilateral and multilateral power trade, and d) One Sun One World one grid (OSOWOG) and its implications. The presentation was well received by the members, an interactive discussion took place on various aspects and members thanked for the presentation. The copy of the presentation is attached as **Annexure-2** .

Some of the key observation/remarks made by the members are summarized below:

1. Observed peak demand is suppressed. In reality, actual peak demand could be larger.
2. Regional cooperation and cross border electricity trade can help in management of peak load of South Asian countries, optimisation of the peaking capacity requirements and overall optimisation of generation capacity addition needs to meet peak load.
3. Load profile of South Asian countries varies from country to country and this diversity could be utilised through cross border electricity trade for optimal management of power system.
4. For making clean energy transition goals a reality in the region, Regulators can play a facilitating role in regional context within the overall prevailing environment of Government policy.
5. While there are regional prospects for clean energy transition, further long-term policy level clarity at a regional level is needed for complementing each other in achieving clean energy transition goals.
6. Regional electricity market development is a gradual and step by step process as it hinges on the overall policy environment in the region. CBET through Power exchange is a positive development which will lead to further deepening of market integration.

7. Trilateral cross border electricity trade will materialise gradually and in case of tripartite agreements, the cross-border trade of electricity across India is allowed under the overall framework of bilateral agreements signed between Government of India and the Government of respective neighbouring country (ies) of the participating Entity (ies) as per India's Guidelines for Import/Export (Cross Border) of Electricity- 2018.
8. One Sun One World One Grid (OSOWOG) initiative will further help in deepening power grid integration in South Asia.
9. Bangladesh has the potential to optimise power generation in an economical manner through import of electricity from neighbouring countries as cross border electricity is the second economical option for power generation after natural gas.
10. While cross border electricity can lead to regional optimisation, Energy security concerns due to import dependency continues to be a consideration among policy makers.

In the second half of his presentation, country wise regulatory updates (final regulations published since the year 2020) were presented and SAFIR working group members from each country explained the key regulations that have been promulgated.

The presentation was well received by the members and an interactive discussion took place. The copy of the presentation is attached as **Annexure-2**.

Some of the key observation/remarks made by the members are summarized below:

1. Bangladesh Energy Regulatory Commission (BERC), Bangladesh will be regulating the tariff of petroleum products in the coming future as per the BERC Act. Updated BERC grid code regulation and energy audit regulation has been sent for gazette notification.
2. Bhutan is working on developing updated Grid Code and Regulations related to deviation settlement mechanism.
3. Policy related to hydro as renewable energy has been changed and currently all Hydro (irrespective of size of Hydro power) is counted as renewable energy in India.
4. While renewable purchase obligation exists in India, recently India has come up with hydro power purchase obligation and also energy storage obligations. In future, combined renewable purchase obligation would likely to prevail subjected to the consensus among stakeholders.
5. In addition to the regulation issued by Central Electricity Regulatory Commission (CERC), India, the States in India through State Electricity Regulatory Commissions also come up with State specific regulations.
6. Electricity Regulatory Commission (ERC), Nepal revising the NEA grid code and revised grid code will be mandatory for grid users. Cross border aspects are being integrated as a part of the updated grid code of Nepal. ERC, Nepal is also drafting several regulations/directives/bylaws such as regulations/directives/bylaws related to open access etc.
7. Pakistan is transitioning from Single Buyer to Competitive Market (Competitive Trading Bilateral Contract Market). Therefore, a lot of policy and regulatory instruments have been put in place.
8. In the context of Competitive Trading Bilateral Contract Market development in Pakistan, almost 15 regulations have been promulgated and around 10 regulations are in the pipeline.
9. Trial run of Competitive Trading Bilateral Contract Market has already completed in Pakistan, and report/result from trial run is awaited. Competitive Trading Bilateral Contract Market is expected to start in April 2023.
10. Public Utilities Commission of Sri Lanka (PUCSL) have come up with various regulations and Regulatory Manual 2022 was also developed that provides a guide to the work of the PUCSL.

C. Session - 3: Updates on the current activities of the SAFIR working group

C.1. As per the agenda, the Draft key findings of the Study on "Research on South Asia electricity/energy regulations to develop regulatory pathway/road map for electricity/energy exchange and energy cooperation in South Asia" was presented (virtually) by Deloitte Touche Tohmatsu India LLP (Consultant) represented by Mr. Rajneesh Sharma, Director and Mr. Arun Kumar, Associate Director. The presentation was well received by the members for providing an outlook and an interactive discussion took place and members thanked for the presentation. The copy of the presentation is attached as **Annexure-3**.

Some of the key suggestions/observation made by the members are summarized below:

1. Ms. Rashmi Nair, Deputy Chief, Regulatory Affairs, Central Electricity Regulatory Commission, India

1.1. Model Regulation template (Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation) mentions the word 'Regulatory Authority'. To have clarity, it may be mentioned like "---- Name of the Regulatory Authority ".

1.2. Clause 1.3 of Model Regulations (Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation), relating to conflict with existing laws are confusing and has potential to be misunderstood and therefore needs to be further made clear as appropriate in the report.

1.3. In Clause 9.2, 12.4 and 23.1 there are ambiguous provisions/language like "may, can" on powers of Regulatory Authority. These may be firmed up for better clarity.

1.4. Note relating to Common minimum Grid Code may be removed from the main body.

1.5. Further review of the report and model regulation could take place as CERC staff takes up further review of the model regulation template.

2. Mr. Nima Tshering C, Director, Electricity Regulatory Authority (ERA), Bhutan

2.1. Queried on the nature of the template.

2.2. Suggested that it may be clarified that this is not binding on the regulators.

2.3. Queried on how the Model Regulation template (Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation) to be implemented.

{It was clarified by SAREP and Consultant that: -

a) Template is designed in the manner/form of regulatory document i.e., Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation for ease of reference and appropriate use by the member countries for ease of adoption as deemed fit and as consider appropriate)

b) It is only a model regulation template (Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation) and not binding by any means and

c) The detailed road map to provide further guidance to the respective member countries, detailed country wise roadmap and action plan are provided in the document.}

3. Mr. Chamath Goonewardena, Director, Regulatory Affairs, Public Utilities Commission of Sri Lanka enquired about overall the concept of the harmonized and standardized template and how the document is intended to be utilized/implemented.

{The consultants and SAREP clarified

a) *On the nature of Model Regulation template (Common minimum harmonized and standardized template of energy/electricity regulations for energy cooperation)-It merely seeks to provide a voluntary model template for harmonization of provisions as starting reference point and as a guidance document, which each member country is free to adopt and follow/refer after undertaking country specific customizations as required and as deemed appropriate, therefore by no means model regulations template is a binding in nature.*

b) *From a utilisation point of view, based on the Model regulation template each member countries may prepare country specific regulation with the attributes/features of the model regulation template as deemed fit and appropriate in a particular country context which will facilitate in development of harmonised/coordinated/consistent regulatory frameworks in the region.}*

4. Mr. Muhammad Ramzan, NEPRA, Pakistan

4.1. In the previously shared version, there were references to a few regulations such as "Wheeling of Electric Power" Regulations, which were recently repealed by NEPRA.

{It was clarified by consultants and SAREP that these updates have been taken care in a new version, which will be shared with SAFIR members.}

4.2. Based model regulations template, tailored country specific regulation to be prepared as per the country needs/priorities.

Way forward and Action Plan:

1) SAREP with the support of consultant to incorporate the comments made by SAFIR WG members.
2) Report and the Model regulations (after incorporating comments provided by SAFIR WG members) to be shared with SAFIR Secretariat.
3) SAFIR Secretariat may share the report and the Model Regulations with SAFIR WG members for their final comments including the comments /suggestions to be received by the relevant department/staff of regulatory commissions being represented by each SAFIR working group member.
4) Each SAFIR working group member will facilitate providing the consolidated comments at the earliest possible with the SAFIR Secretariat, preferably within 15-20 days from the date of issuance of the draft report by SAFIR Secretariat.
5) Upon receipt of the comments by SAFIR Secretariat, SAREP with the support of consultant will incorporate the comments made by SAFIR WG members and prepare the revised draft report.
6) Upon finalisation of the revised draft report, the revised draft report to be placed before SAFIR ECM and SAFIR SCM for approval.

C.2. The agenda "Draft key findings of the study assessing the Potential Benefits of Cross Border Electricity Trade for affordable supply of electricity, facilitating grid balancing of renewable energy integration, and suggesting a framework for Ancillary Service Market in the South Asia Region" was presented (virtually) by the KPMG team (Consultant) represented by Ms. Suruchi Uppal and Mr. Puneet Chitkara. The presentation was well received by the members, an interactive discussion took place and members thanked for the presentation. The copy of the presentation is attached as **Annexure-4**.

Some of key observation made by the members and SAREP Team are: -

1. SAREP team clarified that presentation being made in the 4th SAFIR WG meeting is based on the updated report and is different from the version circulated in the agenda note. Therefore, the revised report will be shared with SAFIR WG members for review, suggestions, and comments.
2. SAREP team clarified that as per the agenda, Draft Report on the Ancillary Services Cooperation in the cross-border context: A Case of Bangladesh, Bhutan, India, Nepal, and Sri Lanka (BBINS) was also supposed to be presented in this 4th SAFIR WG meeting. However due to extraneous reasons, the Consultant was unable the present the same. The findings of the said Report will be presented in the next Meeting of SAFIR Working Group.
3. Mr. Nima Tshering, Director, Electricity Regulatory Authority, Bhutan
   3.1. Sought clarification on the assumption related to reserve requirement vis-à-vis reserve violation considered in the model

   {It was clarified by the Consultant that, reserve requirement vis-à-vis reserve violation considered in the model is 2% of power demand in each time block and 3% of the combined solar and wind generation capacity in each time block. This assumption is in line with international experience in developed countries. It was also highlighted that, during the study it has been observed that, when the power systems or when the countries do not coordinate or collaborate in terms of sharing of reserves, then it is observed that there is a shortage of reserves which leads to the cost of reserves of Nations going up.}

Way forward and Action Plan:

1) It was discussed that the study is exhaustive in nature and a thorough review of the report needs to be undertaken by the SAFIR WG members.
2) SAREP to share the updated report reflecting findings presented in the 4th SAFIR WG meeting with SAFIR Secretariat.
3) SAFIR Secretariat to share the report with SAFIR WG members for their critical review, including the comments /suggestions to be received by the relevant department/staff of regulatory commissions being represented by each SAFIR working group member.
4) Each SAFIR working group member to facilitate providing the consolidated comments at the earliest possible to SAFIR Secretariat, preferably within 15-20 days of the date of issuance of the draft report by SAFIR Secretariat.
5) Upon receipt of the comments by SAFIR Secretariat, SAREP with the support of consultant to incorporate the comments made by SAFIR WG members and prepare the revised draft report.
6) The findings of the Draft will be presented in the next Meeting of SAFIR Working Group.
7) SAREP to share (upon finalisation of the revised draft report, the revised draft report to be placed before SAFIR Executive Committee Meeting (ECM) and SAFIR Steering Committee Meeting (SCM) for approval.

C.3.The "SAFIR Regulatory Newsletter (SRN), Web portal "South Asia Energy/Electricity Database (SAED) and plan and South Asia Energy/Electricity Regulatory Compendium (SAERC) and scope for improvement" was presented by Mr. Rajiv Ratna Panda, Power Market, Specialist, SAREP. The presentation was well received by the members, an interactive discussion took place and members thanked for the presentation. The copy of the presentation is attached as **Annexure-5**.

SRN Way forward and Action Plan:

1) Addition of data on cross-border electricity trade through Power Exchange in BBIN Transaction.
2) Need to maintain continuity through timely release of the newsletter for each quarter.
3) Coordination through SAFIR Secretariat to seek updates and finalise the Newsletter.
4) SAREP is in the process of engaging a firm for developing the combined edition and regularly publishing the SAFIR newsletter and is planned to be released in the SAFIR Conference.

C.3.2. Web portal "South Asia Energy Database (SAED)" and plan:

1) South Asia Energy Database (SAED) has been developed to create a single point, user-friendly data source; promote data transparency and help high quality data research and analysis; disseminate data/information on the key indicators of power/energy sector for all the South Asian countries; and to act as information repository for the power/energy sector of South Asian countries.
2) It is a first of its kind database in South Asia. It has web portal along with mobile application (both on android and apple platform) for providing easy data access and portability. It also has features of analytics, automatic report generation, country comparative, projections , indicative graphs, pie charts and figures, info graphics, annual data book etc.
3) SAED was launched at Delhi (India) on 22nd June 22. The launch and high-Level demonstration and training held in Nepal on 18th July 2022, Bangladesh on 31st July 2022 and Bhutan on 12th August 2022
4) Annual Data Book 2021 of Bhutan, Bangladesh, India, Nepal, and South Asia Country Comparative-Annual Data Book 2021 has also been published.

SAED Way forward and Action Plan:

1) SAED Data Acquisition Technology Modernisation: SAREP is working to move to Application Program Interface (API)system for better security and accuracy, gradually doing away with web scrapping and web crawling technologies in all SAED countries.
2) Technical assistance by SAREP to SAED countries (as per the need) to come up daily, monthly & annual reports.
3) Technical assistance by SAREP to SAED countries for Regional (BBINS) Daily Power Supply Position Report by SAREP.
4) Technical assistance by SAREP on strengthening of load dispatch centre/system operator's Real Time Data Acquisition System (RTDAS),Management Information System (MIS),data dissemination system and facilitating integration with SAED in BBNS countries as per the need of the country.
5) SAED linkages with national databases/portals (if any) to avoid any data discrepancy and improving further the data analytics by SAREP
6) Making SAED link/tab available in the websites of leading power sectors institutions in each SA country and Regional Institutions.
7) SAED Research Fellowship program by SAREP to improve the culture and ecosystem of data science and data analytics through SAED scholarship/fellowship program-in partnership with a leading academic/research /management institution in SAED countries and
8) Annual regional SAED conference to be organised by SAREP.

C.3.3. South Asia Electricity Regulatory Compendium (SAERC) :-

1) South Asia Electricity Regulatory Compendium (a first of its kind in SA) has been prepared.

2) Compendium comprehensively captures all aspects (three volumes), primary legislation, key policies , guidelines, regulations , technical standards, grid code, transmission pricing, open access, power trade & markets, cross border electricity trade, licensing, generation, and transmission tariffs.
3) SAREP is in the process of engaging a firm for developing the editions and for regularly publishing the SAERC.

SAERC Way forward and Action Plan:

1. SAREP will update the South Asia Electricity Regulatory Compendium in every six month & yearly editions will be published by SAREP.
4) SAREP to look at enhancing the current design of the South Asia Regulatory Compendium to make it more reader and user-friendly by using with latest technologies feature for better accessibility, readability in online format.
5) Limited hard copy of the annual edition will be published (soft copy six monthly and annal updating will also be published) by SAREP.

D. Session 4: Work Plan for FY 2023-24-Ideas/New activities

The "Work Plan for FY 2023-24-Ideas/New activities" was presented by Mr. Rajiv Ratna Panda, Power Market, Specialist, SAREP. The copy of the presentation is attached as **Annexure-5** .The key details of the presentation along with the Way forward and Action Plan as agreed by the WG members is as below: -

1. The Terms of Reference (TOR) of the SAFIR working group were deliberated and discussed and familiarisation with each aspect of TOR with SAFIR WG members were undertaken.
2. Ideas/new activities under SWG in the context changing/evolving scenario and emerging outlook in south Asia and updating & expansion of the SWG activities were as follows :
    2.1. Support regulators in developing model regulation related to CBET (In countries that currently does not have CBET regulations). Nature of support to be provided by SAREP could be
        2.1.1. Technical resource/expert support in drafting/developing model regulation related to cross border electricity trade.
        2.1.2. Technical activities/support for implementing the recommendations of the SAFIR Working Group Studies such as study on South Asia electricity/electricity regulations to develop regulatory pathway/road map for electricity/energy exchange and energy cooperation in South Asia.
        2.1.3. Knowledge and experience sharing of best practices in the above context of developing cross border electricity trade regulations both from inside the region and outside of the region.
    2.2. Preparation of Biennial flagship knowledge report on "South Asia Clean Energy transition & cross border energy trade Outlook-2040".
        2.2.1. .
        2.2.2. Preparation of Biennial flagship knowledge report on "South Asia Clean Energy transition & cross border energy trade Outlook-2040.
        2.2.3. The knowledge report aims to be a credible and flagship source of knowledge information on outlook on Clean Energy transition & cross border energy trade and is

expected to inform South Asia and other regional and global stakeholders on South Asia's Clean Energy and cross border energy trade ambitions and showcasing the increasingly leadership role of South Asia in Clean Energy, cross border energy trade, grid interconnection (OSOWOG) in the comity of nations/regions.

2.3. Regulatory Exchange visit/International Study Tour to Western Energy Imbalance Market (WEIM).

2.3.1. A Regulatory Exchange visit/International study tour to a regional power market is planned for SAFIR working group members/SAFIR regulators.

2.3.2. Western Energy Imbalance Market (WEIM), A real Time Market, an initiative led by California Independent System Operator (CAISO) since 2014. CAISO operates the WEIM, a voluntary market.

2.3.3. The uniqueness of WEIM is that CAISO has made its markets available to entities outside of its ISO territory, which currently includes CAISO and other balancing authority areas in the western United States and parts of Canada.

2.3.4. Regulatory Exchange visit/International study tour to Western Energy Imbalance Market (WEIM) is planned by SAREP to expose to the regulators on various aspects of regional energy market design and to understand various aspects such as:

2.3.4.1. How CAISO allowed other parties to participate outside its territories?

2.3.4.2. What was the motivation behind WEIM and what is the process followed for joining the WEIM?

2.3.4.3. What kind of legal, policy, regulatory, technical, commercial, institutional agreement and governance structure were needed for WEIM? How were the political, regulatory, and territorial issues managed?

2.3.4.4. How Powerex of Canada joined WEIM? What is the overall regulatory framework for governing WEIM?

2.3.4.5. What is the dispute settlement method? How were the regional Consensus built for WEIM? How was the WEIM Charter drafted and adopted?

2.3.5. Technical Assistance and support to Regulators on enhancing institutional regulatory capacity.

2.3.5.1. Various capacity buildings areas identified by various SAFIR studies such as Regulatory Interventions for Grid Discipline and Grid Reliability (GDR) in the South Asian Region and study recommendations should be followed upon for implementation.

2.3.5.2. Member from Bhutan, Sri Lanka, and Bangladesh in particular, highlighted country specific institutional regulatory capacity building program with implementation feature by SAREP will be very helpful for advancing the cause of regional energy cooperation and cross border energy trade considering the different level of regulatory evolution at the level of regulatory institution in the South Asia Region.

3. Annual 3 week residential "South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and exchange of electricity in SA"

3.1. Annual 3-week residential Certificate Master Class on "Electricity Market" for Electricity Regulators by SAREP will help in building a specialised pool of expert

regulators on power market and enhancing the regulators capacity for developing, regulating, and monitoring the power market.

3.2. Certificate Master Class on "Electricity Market" will have three module (one week for one module) i.e., Module -1:-Power Market Basic , Module-2:- Power Market Model, Design and Other Considerations, Module-3:- Power Market Economics, Regulation and Operation.

3.3. Organise the South Asia Three-week Residential Certificate Master Class on "Electricity Market" for Electricity Regulators of South Asian Countries in partnership with reputed training/research organisations such as Florence School of Regulation, European University Institute, Indian Institute of Management (IIM-Ahmedabad), Administrative Staff College of India, IISC Bangalore, IIT-Kanpur etc.

3.4. Details of Module -1: -Power Market Basic, Module-2: - Power Market Model, Design and Other Considerations, Module-3: - Power Market Economics, Regulation and Operation and format of the training program will be developed in consultation with training/research organisations from the certification point of view.

Way forward and Action Plan:

1. Members appreciated the new ideas/activities suggested above by SAREP and agreed with the activities proposed and provided their concurrence.
2. It was decided that new ideas/activities suggested above are under the ambit of the TOR of SAFIR working and therefore no change to the TOR of SAFIR working group is needed.
3. As next step, the new ideas/activities suggested above to be presented in the SAFIR ECM for their concurrence.
4. Upon the concurrence of SAFIR ECM, SAREP to implement the activities.

15th February 2023, DAY-2

SAFIR working group members along with USAID and SAREP officials undertook a Technical Visit to the Kulekhani Hydro Power Project. Some pictures of the Technical Visit to the Kulekhani Hydro Power Project are attached as **Annexure-6**.

Annexure-I: The list of Participants at the Fourth Meeting of SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge Sharing, addressing Cross Cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia", 14th February 2023, Karnali Hall, Kathmandu Marriott Hotel, Kathmandu, Nepal

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5	Mr. Muhammad Ramzan	Dy. Director – Technical, National Electric Power Regulatory Authority	Pakistan	m.ramzan@nepra.org.pk
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8	Ms. Monali Zeya Hazra	Regional Energy Manager and Clean Energy Specialist, USAID/India	India	mhazra@usaid.gov
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SAREP Official (Physical)				
10	Mr. Rajiv Ratna Panda	Power Market Specialist, SAREP	India	rpanda@sarep-southasia.org
11	Mr. Ajit Kumar	Regional Energy trade Lead , SAREP	India	ajitkumar@sarep-southasia.org
12	Mr. Hari Subedi	Country Manager, SAREP	India	hsubedi@sarep-southasia.org
SAREP Official (Virtual)				
13	Ms. Namrata Mukherjee	Deputy Chief of Party (Trade & Investments), SAREP	India	nmukherjee@sarep-southasia.org
Consultant (Virtual) for Study on "Research on South Asia electricity/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in SA"				
14	Mr. Rajneesh Sharma	Director, Deloitte Touche Tohmatsu India LLP	India	rajneeshs@DELOITTE.com
15	Mr. Arun Kumar	Associate Director, Deloitte Touche Tohmatsu India LLP	India	arunka@DELOITTE.com
Consultant (Virtual) for Study on "study assessing the Potential Benefits of Cross Border Electricity Trade for affordable supply of electricity, facilitating grid balancing of renewable energy integration, and suggesting a framework for Ancillary Service Market in the South Asia Region"				
16	Mr. Puneet Chitkara	KPMG Advisory Services Private Ltd.	India	puneetchitkaramajhu@gmail.com puneetchitkara@kpmg.com
17	Ms. Suruchi Uppal	KPMG Advisory Services Private Ltd.	India	suruchiuppal@kpmg.com
18	Mr. S. K. Soonee	Senior Advisor, SAREP	India	sksoonee@gmail.com
19	Mr. Pankaj Batra	Former PD, SARI/EI/IRADe & Senior Advisor, IRADe	India	pbatra@irade.org

Annexure-2: Presentation on a) Cross Border Electricity Trade, Regional Energy Cooperation, and Emerging Outlook for South Asia & b) Updates in SAFIR member countries on the Existing Energy/Electricity Regulatory Framework and Perspective on Regulatory Cooperation to facilitate knowledge sharing, addressing cross-cutting Energy/Electricity Regulatory Issues

Annexure-3: Draft key findings of the Study on "Research on South Asia electricity/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in SA"

Annexure-4: "Draft key findings of the study assessing the Potential Benefits of Cross Border Electricity Trade for an affordable supply of electricity, facilitating grid balancing of renewable energy integration, and suggesting a framework for Ancillary Service Market in the South Asia Region"

Annexure-5: Presentation on Updates on the Current Activities of the SAFIR Working Group (SWG) & Work Plan activities for FY 2023-24- Ideas/New activities

Annexure-6: Some pictures of the Technical Visit to the Kulekhani Hydro Power Project.


नेपाल विद्युत प्राधिकरण
कुलेखानी प्रथम जलविद्युत केन्द्र


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Annexure-2

South Asia Regional Energy Partnership (SAREP)

Presentation

on

a) Cross Border Electricity Trade, Regional Energy Cooperation and Emerging Outlook for South Asia

&

b) Updates in SAFIR member countries on the Existing Energy/Electricity Regulatory Framework and Perspective on Regulatory Cooperation to facilitate knowledge sharing, addressing cross cutting Energy/Electricity Regulatory Issues

Session 2

Fourth Meeting of SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge sharing, addressing Cross cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia"

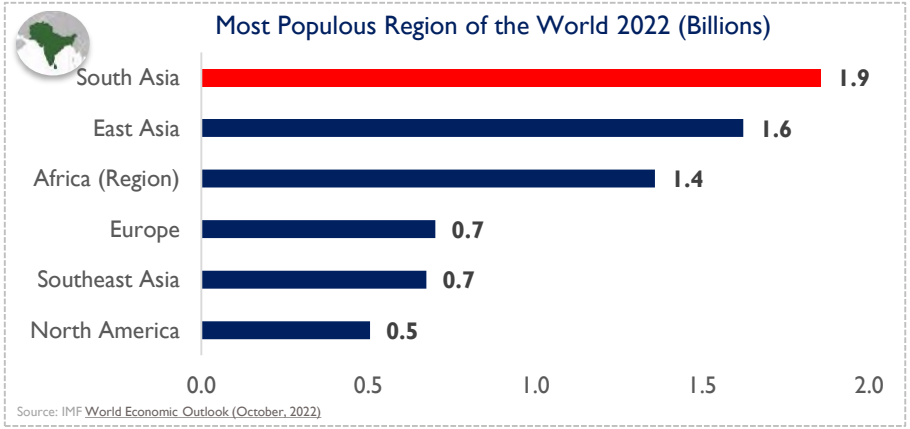
11.00-13.00 Hrs. 14th and 15th February 2023, Trisuli Hall Conference Hall, Kathmandu Marriott Hotel, Kathmandu, Nepal

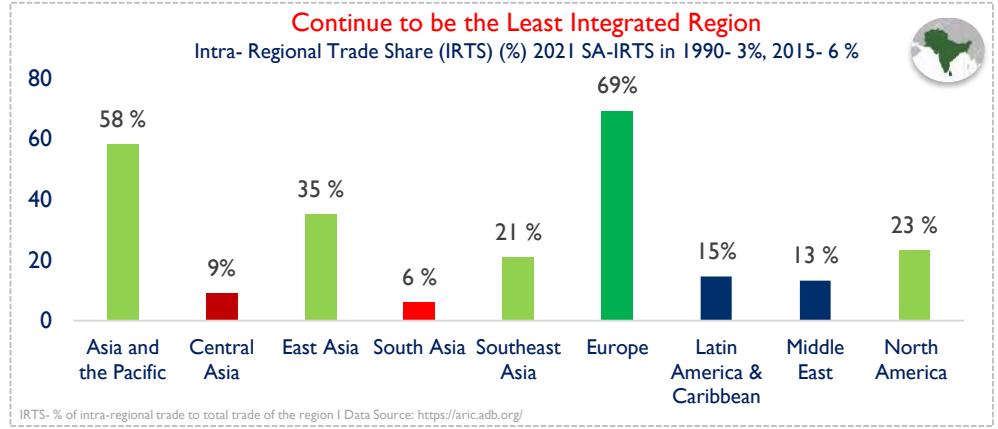
Presented by
Rajiv Ratna Panda

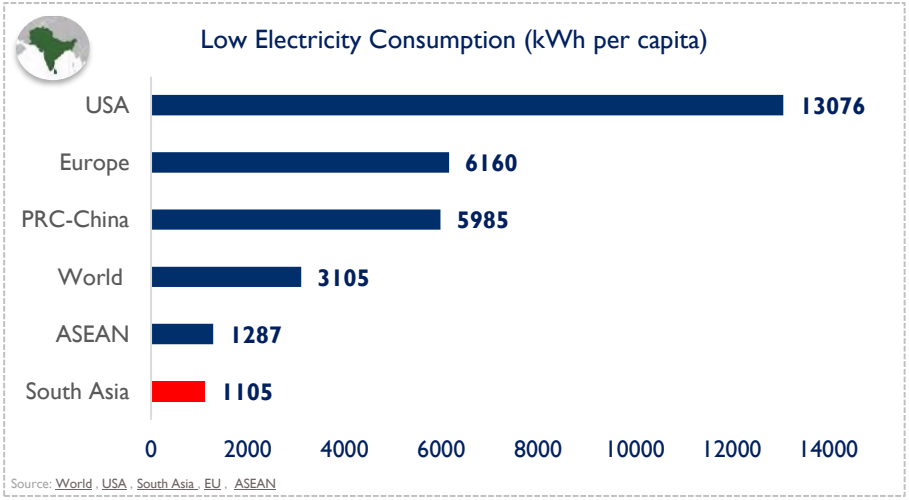
Content

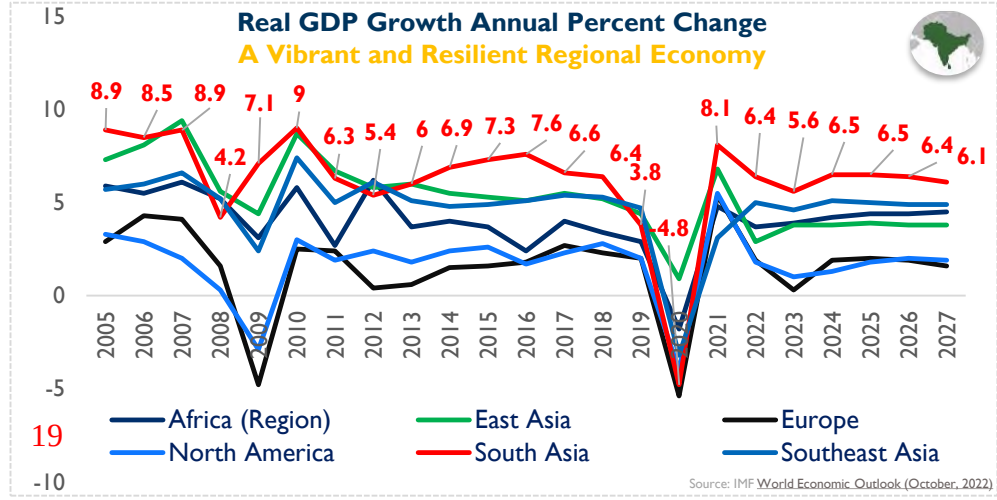
Marco-Economic , integration and energy situation in South Asia

01.1 Overview of South Asia (SA): A Unique & Dynamic Region of the World









Overview of South Asia Power Sector-A Snapshot

01.2 Overview of South Asia Power Sector-A Snapshot

Afghanistan
- #Very small power system (~.6 GW)
- #High Electricity Imports
- #Hydro and Oil Dominated

Bangladesh
- #Mid size power system (~26 GW)
- #High gas dependence
- #Resource Crunch

Bhutan
- #Small power system (~2.3 GW)
- #Large Exporter of hydro power
- #Champion of Hydro CBET in SA

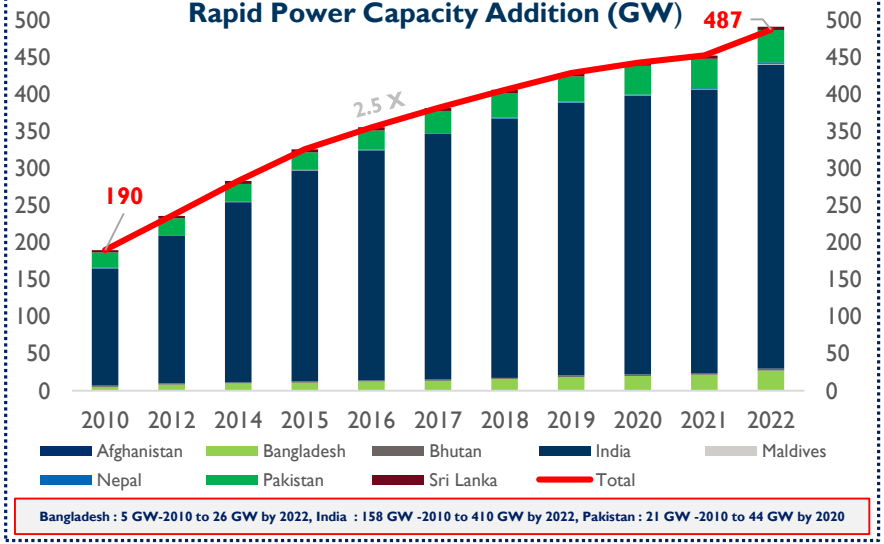
India
- #Very Large System (~410 GW)
- #Coal Dominated-210, RE-167 GW
- # Central to CBET in SA
- # Competitive Power Market

Maldives
- #Fragmented & very small power systems (~.5 GW)
- #Oil, Diesel dependent, Island's limited possibility of interconnection

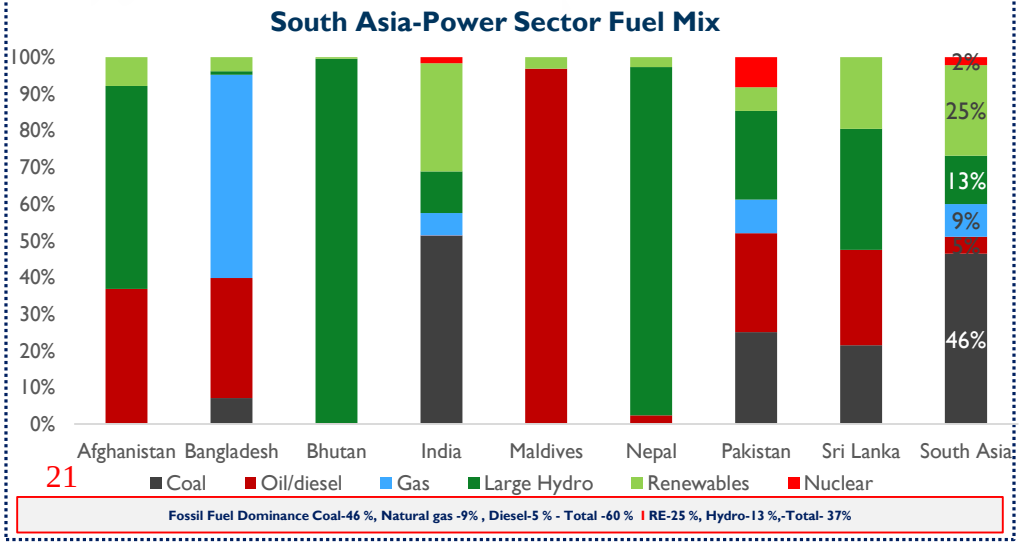
Nepal
- #Very Small power system (2.1 GW)
- #Under utilized hydro (82 GW)
- #Potential-large exporter in future

Pakistan
- #Mid sized (44 GW) power system
- #Gas and Oil dependent.

Sri Lanka
- #Small power system (~4 GW)
- # Hydro and Oil dominated
- # High Peak –Off peak differential

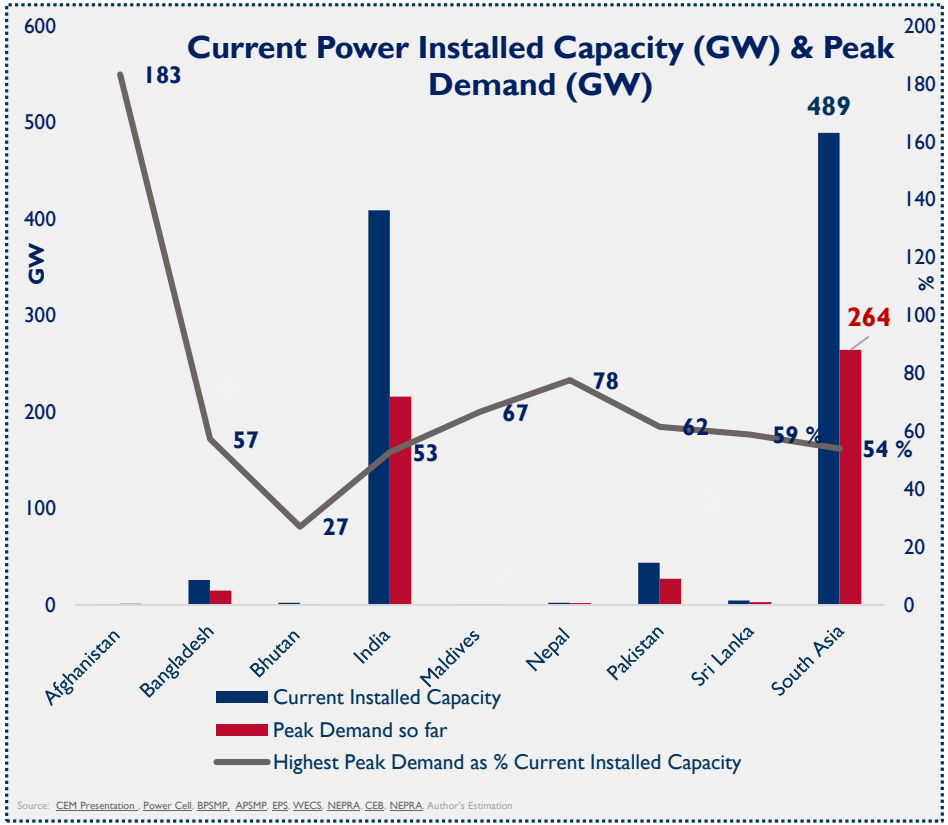


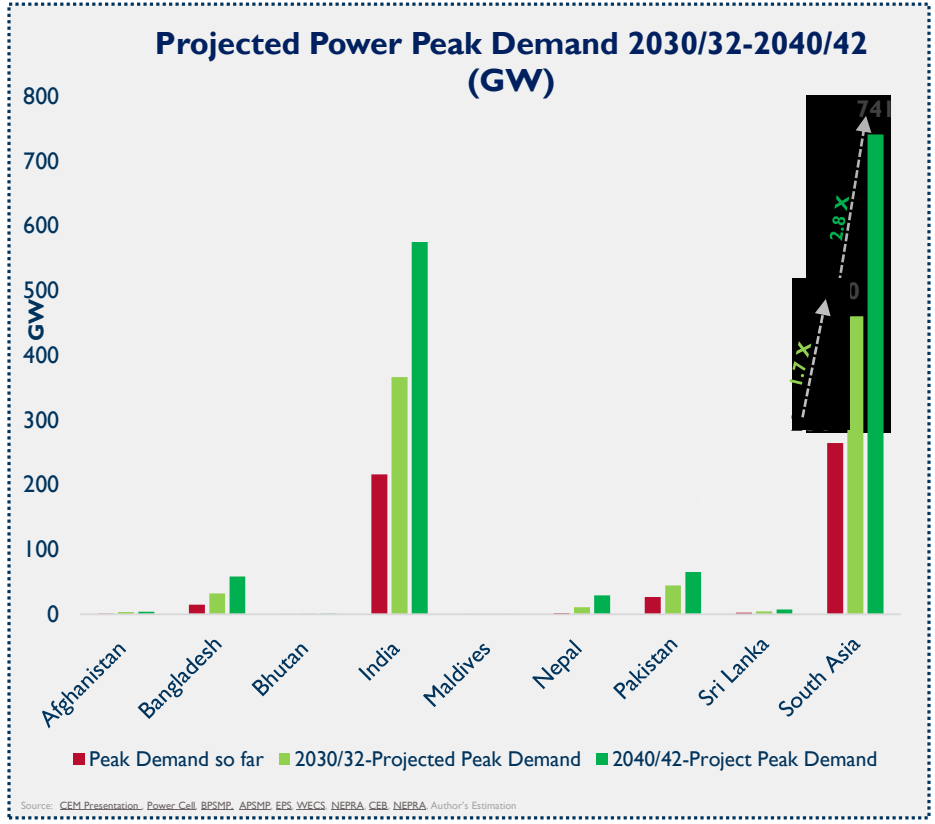
Bangladesh : 5 GW-2010 to 26 GW by 2022, India : 158 GW -2010 to 410 GW by 2022, Pakistan : 21 GW -2010 to 44 GW by 2020



Fossil Fuel Dominance Coal-46 %, Natural gas -9% , Diesel-5 % - Total -60 % I RE-25 %, Hydro-13 %,-Total- 37%

01.2 Overview of South Asia Power Sector-A Snapshot

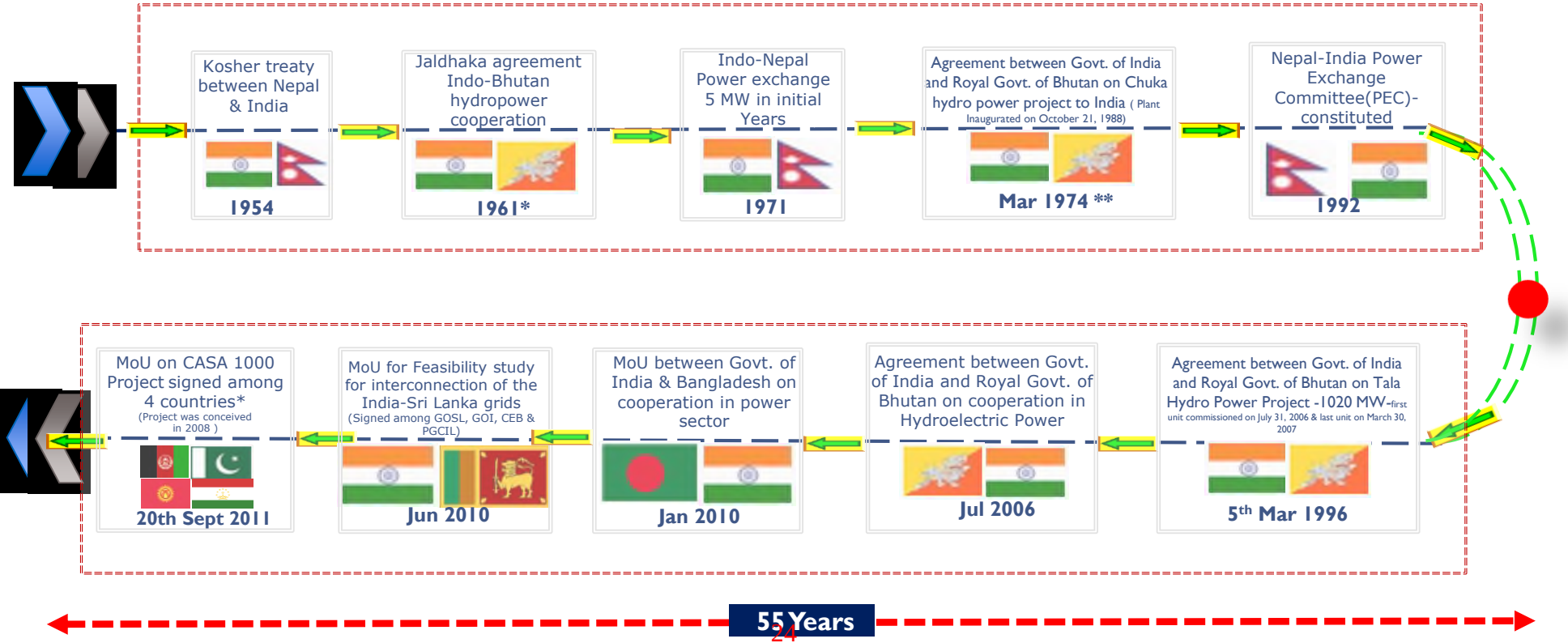




Opportunity for Generation Capacity Optimization | Massive demand growth in future | Significant Capacity addition will be needed

Evolution of Regional Energy Cooperation & Cross Border Electricity Trade (CBET)

01.3 Evolution of Regional Energy Cooperation and Cross Border Electricity Trade (CBET) : Half a Century Journey



* http://www.mfa.gov.bt/rbedelhi/?page_id=28 Source: CEM Presentation-OSOWOG ; Energy Integration in South Asia by Rajiv Ratna Panda. ** http://www.mea.gov.in/bilateral-documents.htm?dtl/6349/agreement

01.3

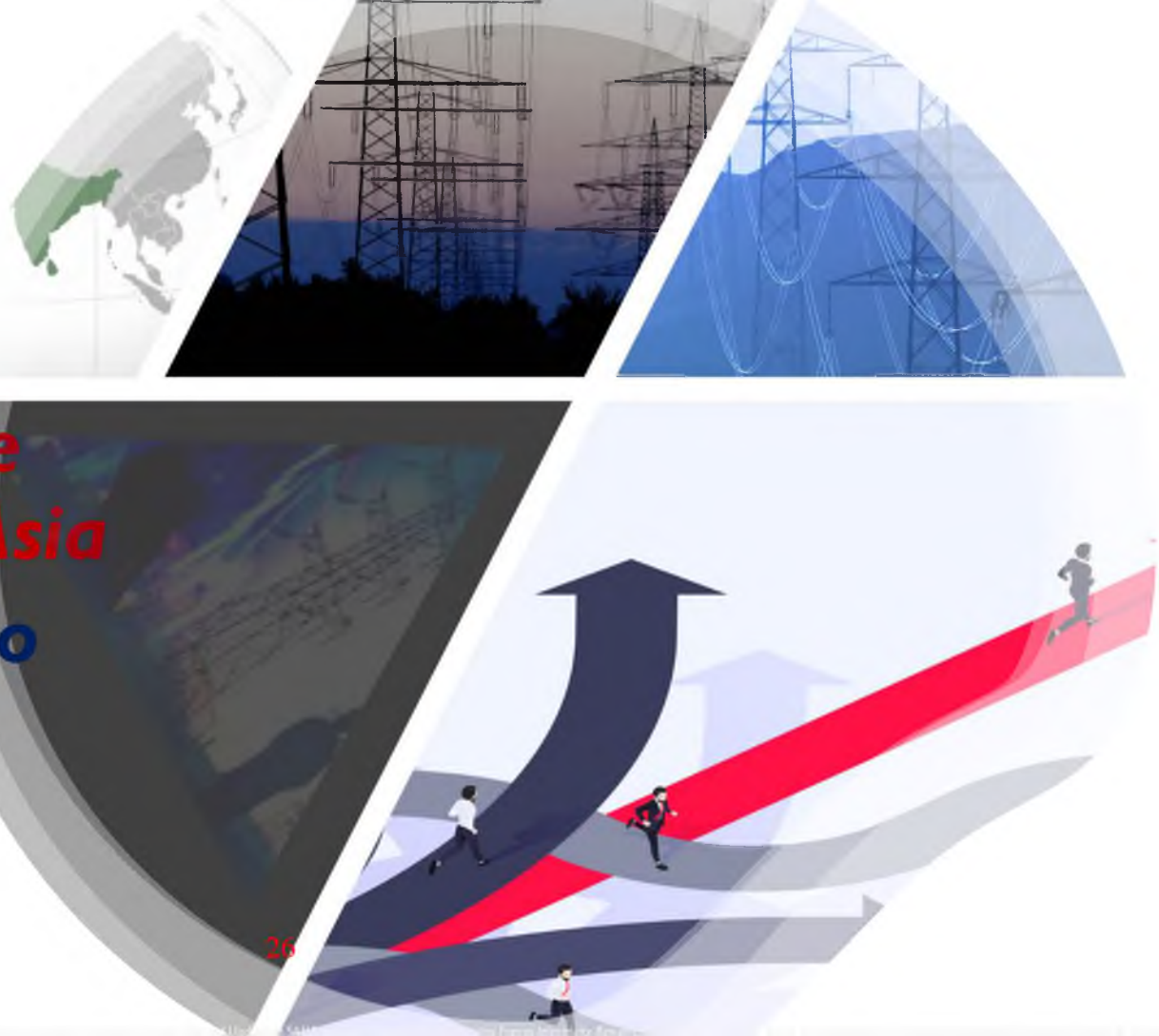
Significant Developments in Energy Cooperation, CBET- Key Policy & Regulatory

A Decade of Policy and Regulatory Action and Implementation

Source: CEM Presentation-OSOWOG ; Energy Integration in South Asia by Rajiv Ratna Panda

Cross Border Electricity Trade (CBET) in South Asia

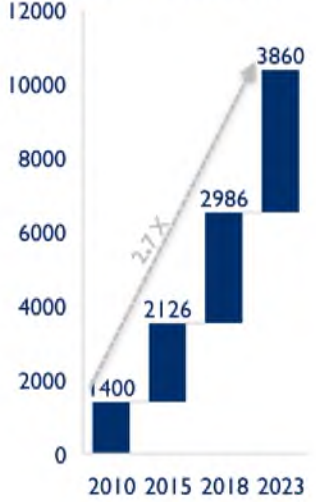
Current Scenario



01 4 Cross Border Electricity Trade (CBET) in South Asia : Current Scenario

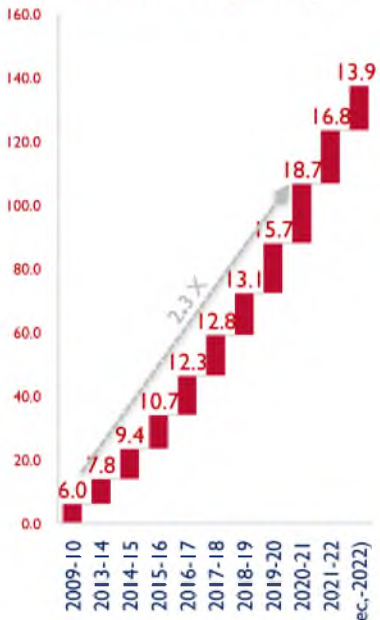
Bhutan-India ~2100 MW
India- Bangladesh ~1160 MW
Nepal-India ~ 600 MW

South Asia
CBET* (~ 3860 MW)



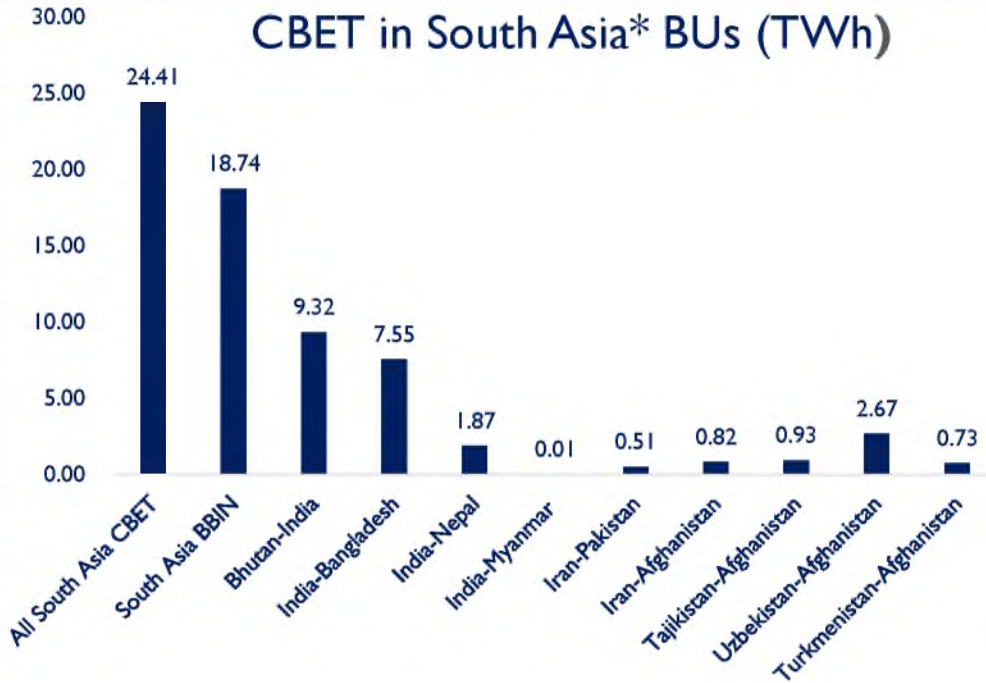
* ~ Maximum Peak Trade Data Source-CERC, POSOCO, NEA, MEA, NSB and Other Sources

South Asia (BBIN)
CBET BUs (TWH)



Data Source-CERC, POSOCO, MEA, NE, NSB etc. BUs-Billion Units

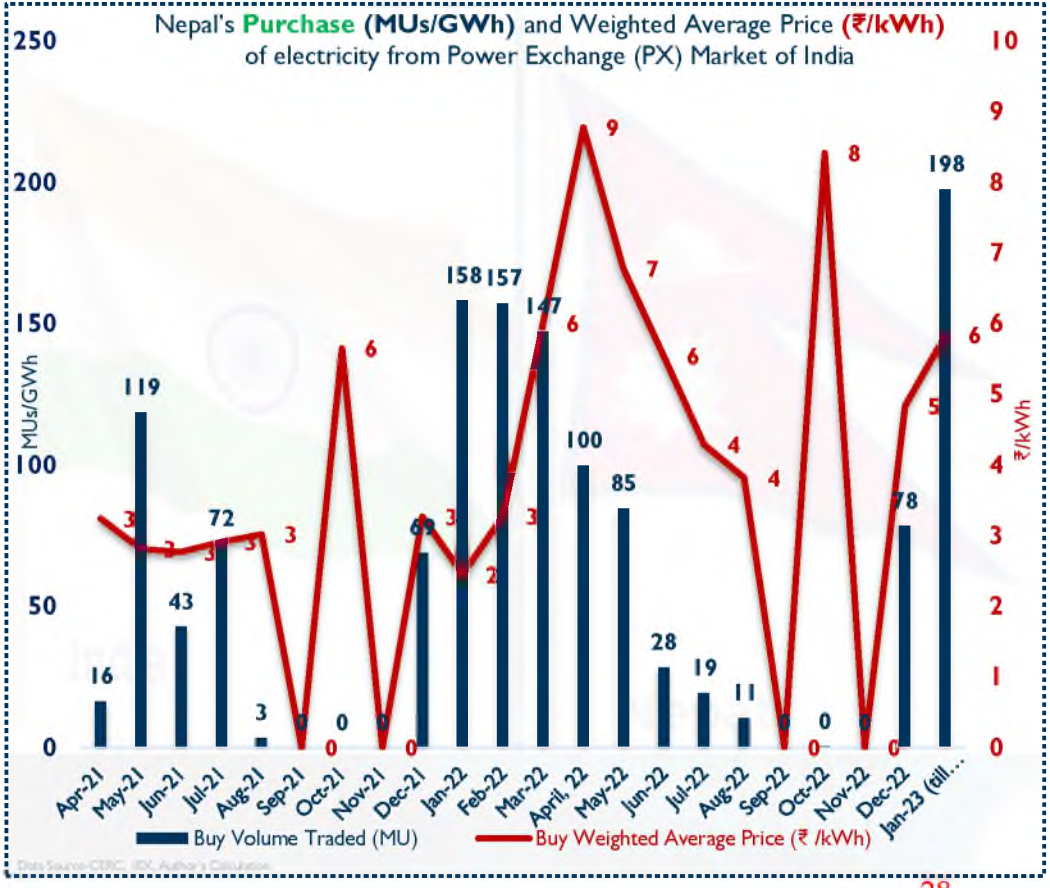
CBET in South Asia* BUs (TWh)

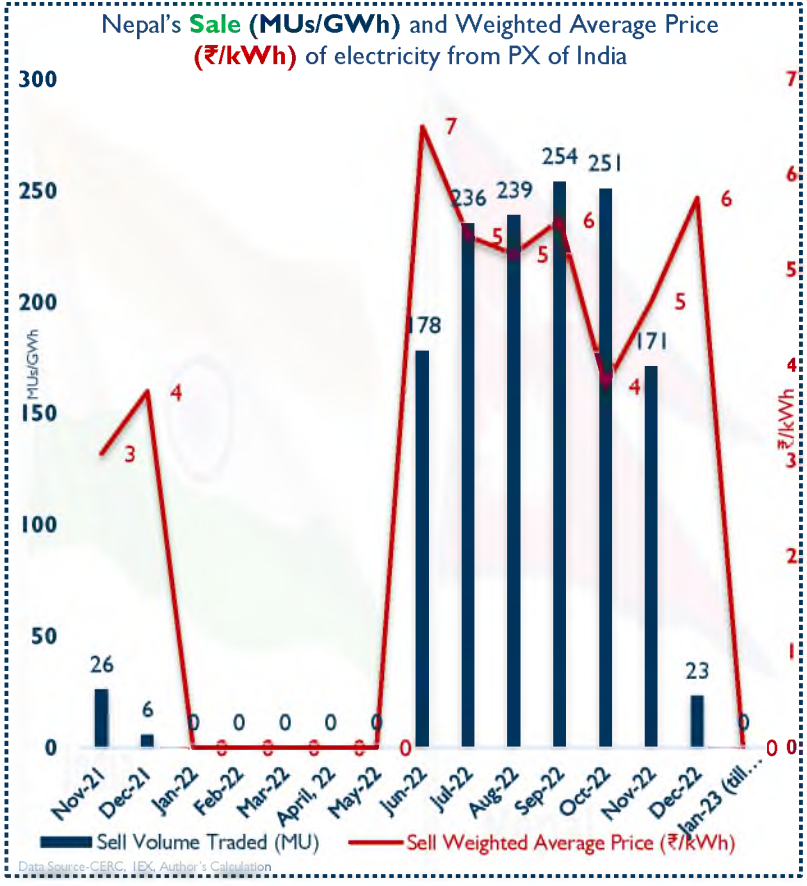


* BBIN & Trade with Neighbouring Region's Countries i.e. Afghanistan's CBET with Central Asian Countries and Iran, Pakistan's CBET with Iran, India's CBET with Myanmar
Data Source- Compile by Author from various Sources -CERC, POSOCO, NEPRA, Afghanistan Statistics , CBET-Cross Border Electricity Trade I BUs-Billion Units

CBET Doubled | Potential Remains Large | Prospects for Inter–Regional Integration

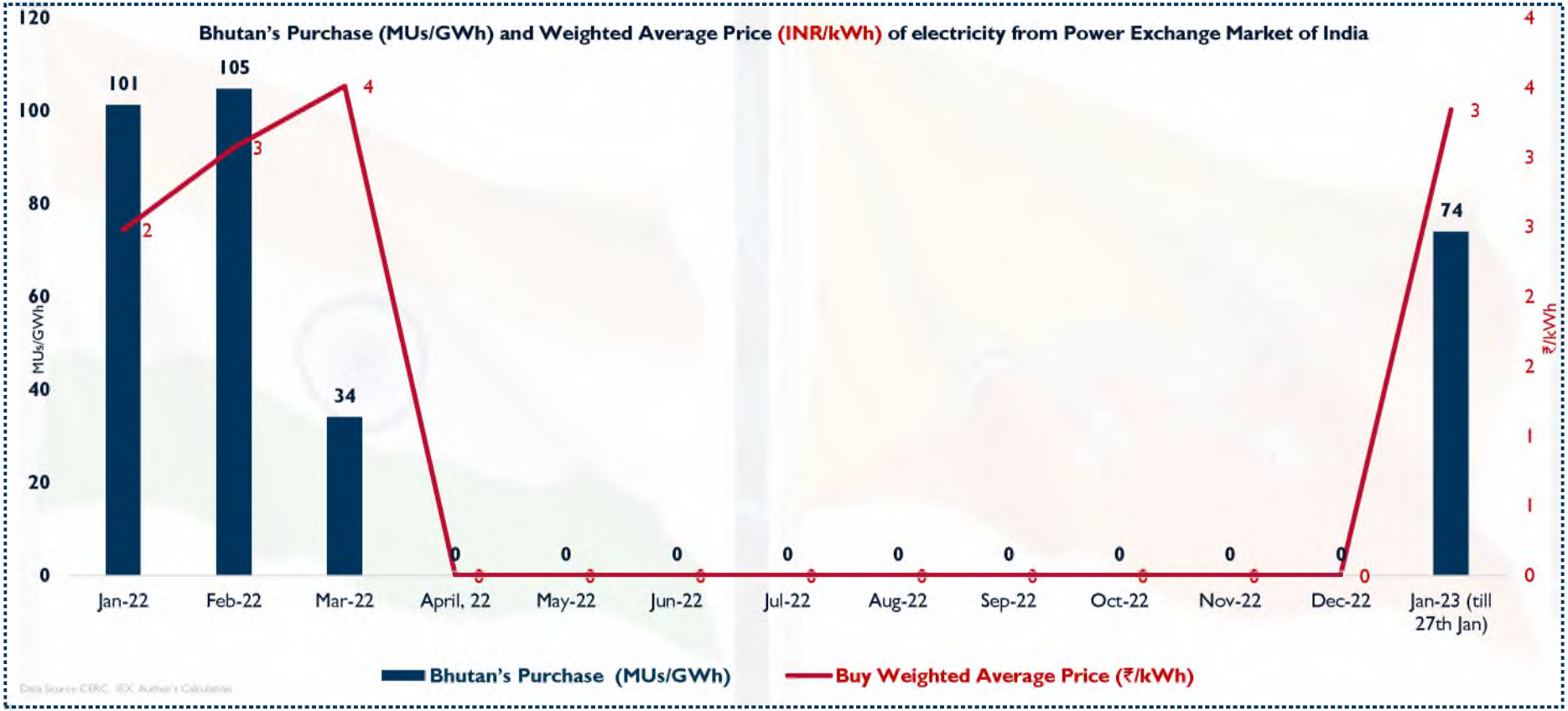
01.4 Market form of Cross Border Electricity Trade: A Beginning of a new Renaissance



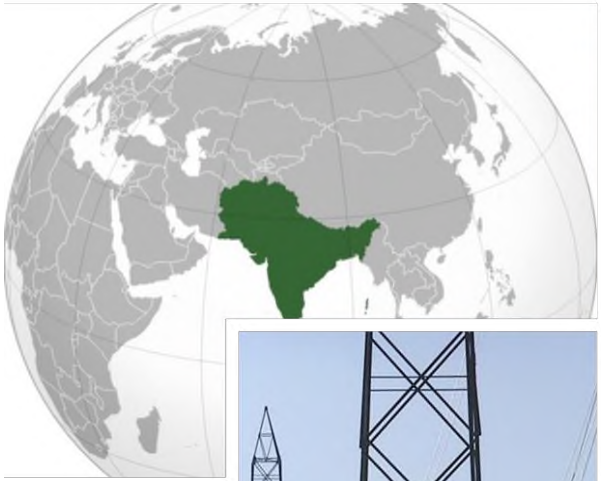


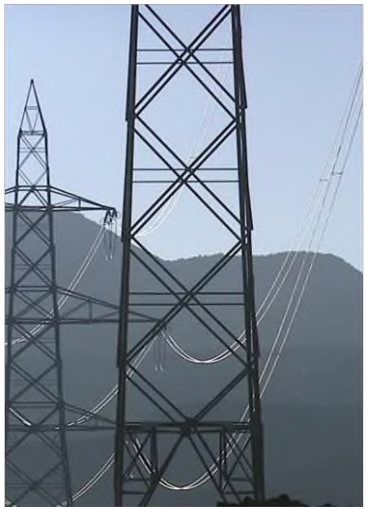
Nepal has earned over Nepalese Rs 11 billion (6.87 billion INR) by selling excess power to India from early June 2022 through December 2022

01.4 Market form of Cross Border Electricity Trade: A Beginning of a new Renaissance



January 1 and March 16 , 2022, Bhutan imported a little over 240MU of electricity from India through the energy exchange at a cost of Nu 798 M.

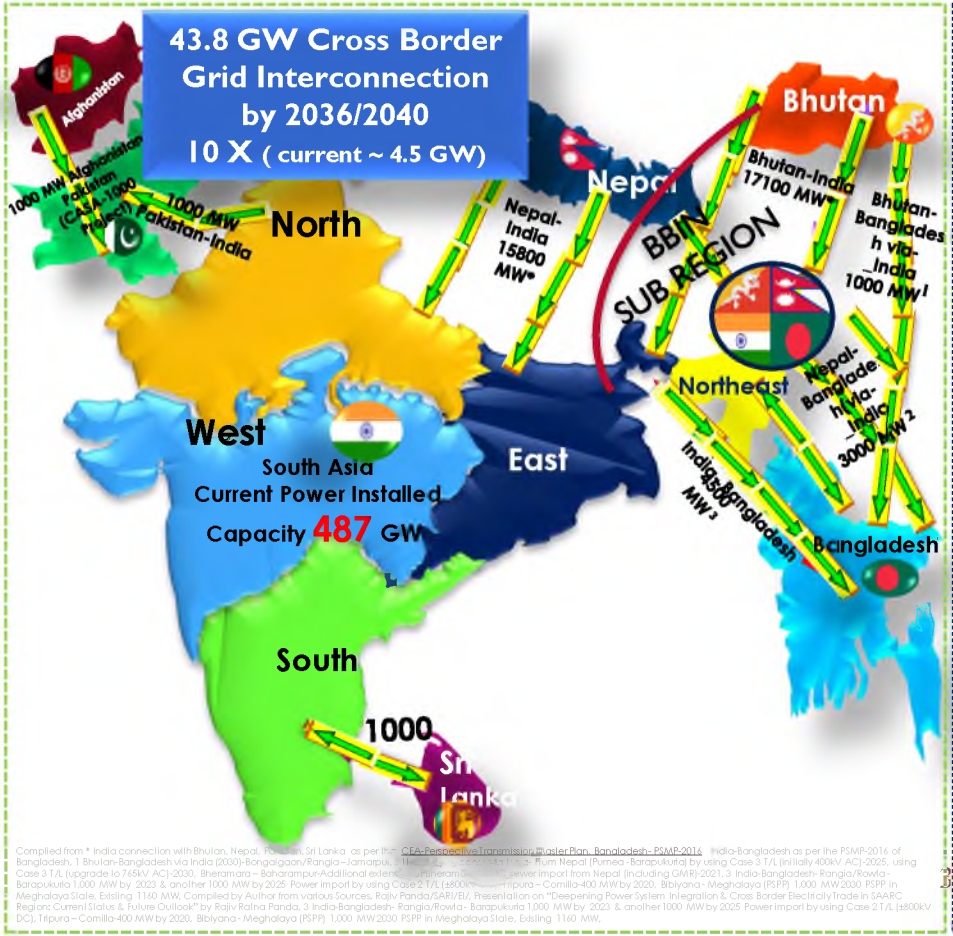




Cross Border Electricity Trade in South Asia

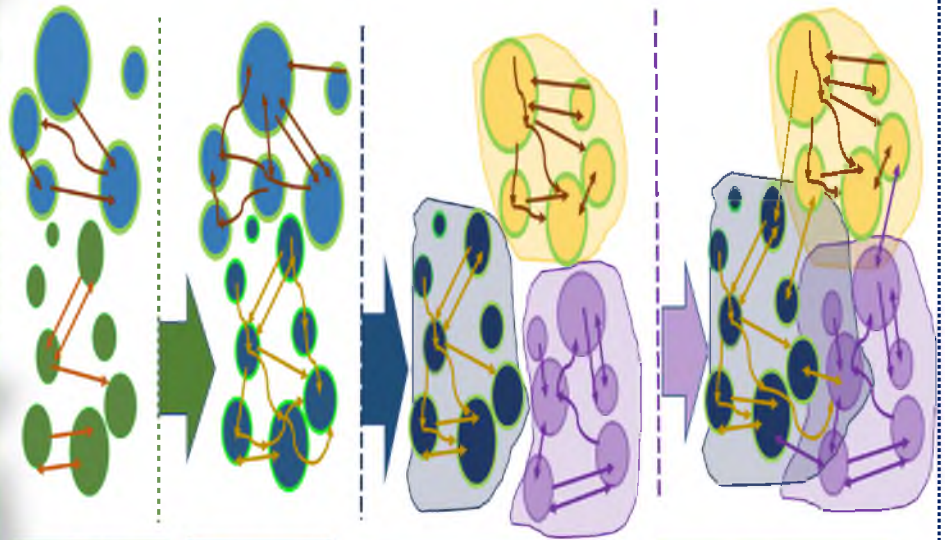
Future Scenario

014 Cross Border Electricity Trade (CBET) in South Asia : Future Scenario



Transition of Cross Border Electricity Grid Integration

Bilateral-Trilateral-Multilateral-Regional Electricity Market Development



Bilateral Integration & Cross Border Electricity Trade (CBET) → Trilateral/Quadrilateral Integration & CBET → Sub regional Integration & Sub-Regional Market → Integrated Regional Grid & Pan-Regional Market

Source: Conceptualized and developed by the Author

Emerging Outlook in South Asia- Opportunity for Deepening CBET and REC

01.5 Emerging Outlook in South Asia : Opportunity for Deepening CBET and REC

Emerging Outlook1

Climate Change induced Renewable Based CBET

Emerging Outlook 2

Impacting Clean Energy Transformation vision through CBET

Emerging Outlook 3

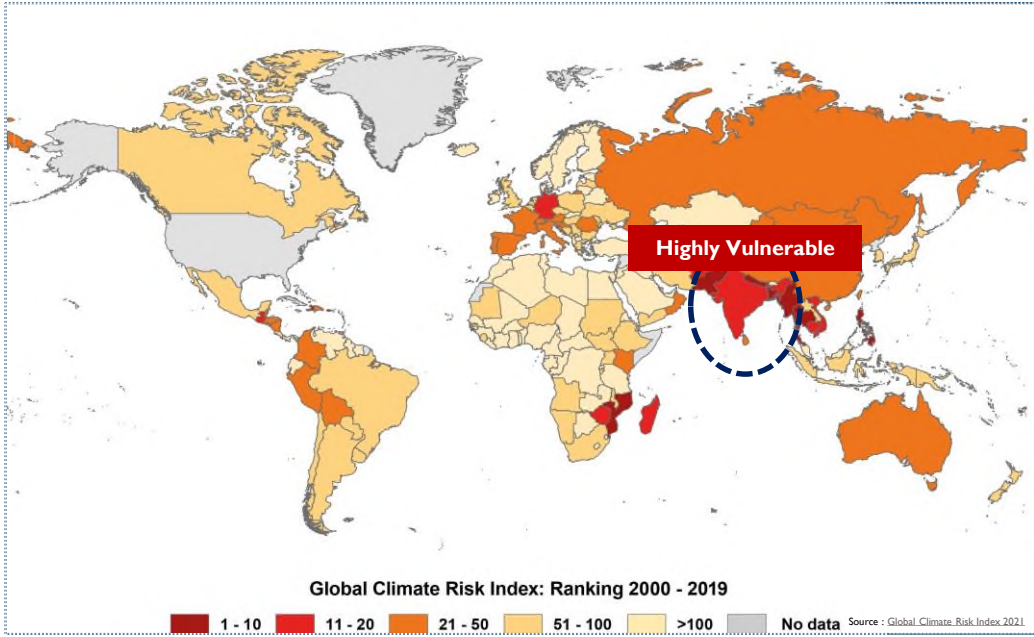
Market Instruments Regional Energy Market Development

Emerging Outlook 4

One Sun One World One Grid (OSOWOG)

01.5.1 Extremely Vulnerable to Adverse Impact of Climate Change

Global Climate Risk Index 2000 – 2019



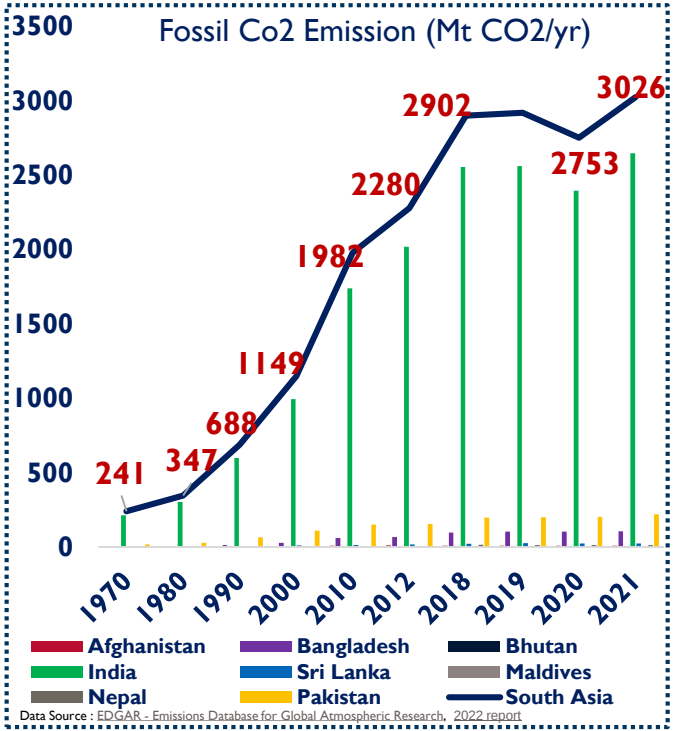
10 Most Affected Countries (2000-2019)

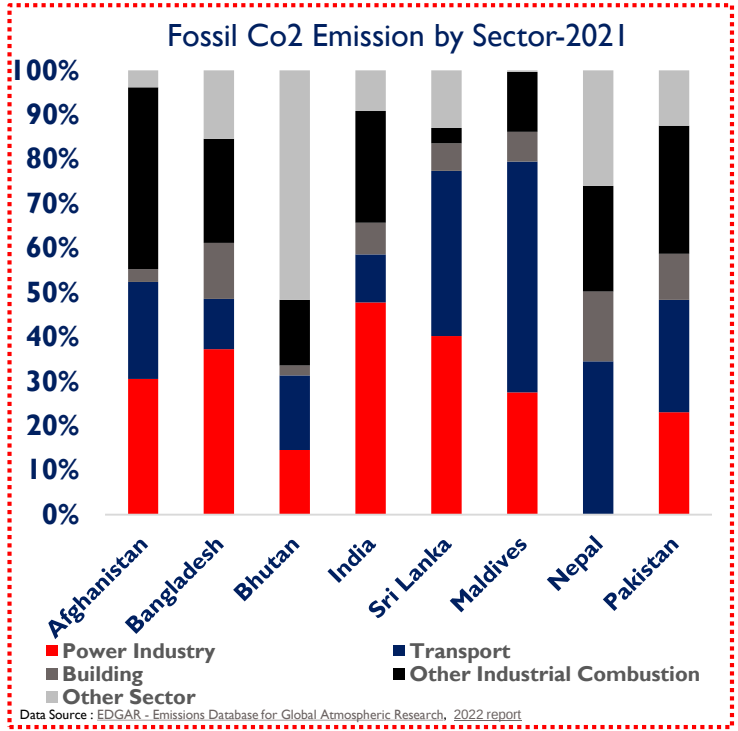
Country	CRI score	Fatalities	Fatalities per 100 000 inhabitants	Losses in million US$ PPP	Losses per unit GDP in %	Number of events (2000–2019)
Puerto Rico	7.17	149.85	4.12	4 149.98	3.66	24
Myanmar	10.00	7 056.45	14.35	1 512.11	0.80	57
Haiti	13.67	274.05	2.78	392.54	2.30	80
Philippines	18.17	859.35	0.93	3 179.12	0.54	317
Mozambique	25.83	125.40	0.52	303.03	1.33	57
The Bahamas	27.67	5.35	1.56	426.88	3.81	13
Bangladesh	28.33	572.50	0.38	1 860.04	0.41	185
Pakistan	29.00	502.45	0.30	3 771.91	0.52	173
Thailand	29.83	137.75	0.21	7 719.15	0.82	146
Nepal	31.33	217.15	0.82	233.06	0.39	191

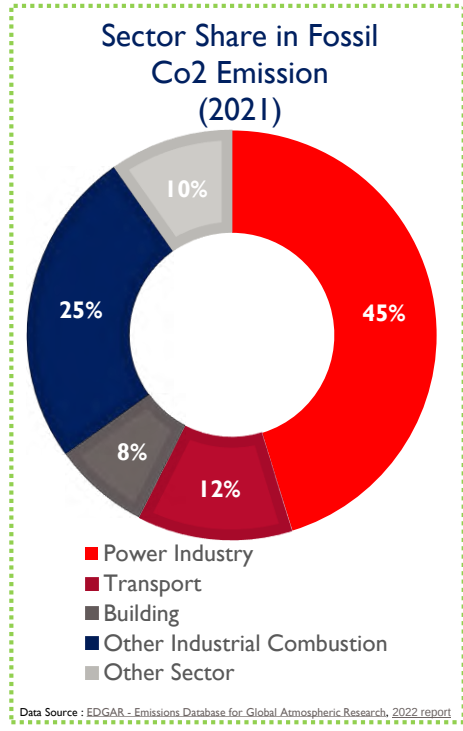
Source : Global Climate Risk Index 2021

Three SA Countries: Bangladesh (7), Pakistan (8) , Nepal (10) among the 10 most affected from 2000-2019 (Average)
Five SA Countries : Bangladesh (7), Pakistan (8), Nepal (10), India (20), Sri Lanka (23) within the initial 30 rankings out of 180

01.5.1 Rising Emissions, Needs Energy Transformation for a Just Sustainable Future







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

Greening Power Sector and Electrifying Transport

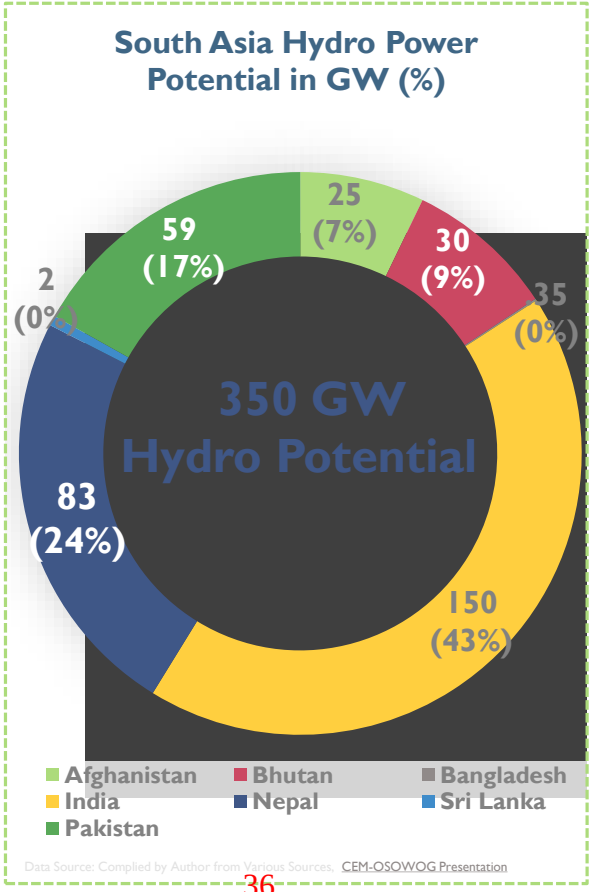
01.5.1 South Asia-Blessed with huge Clean Energy Resources

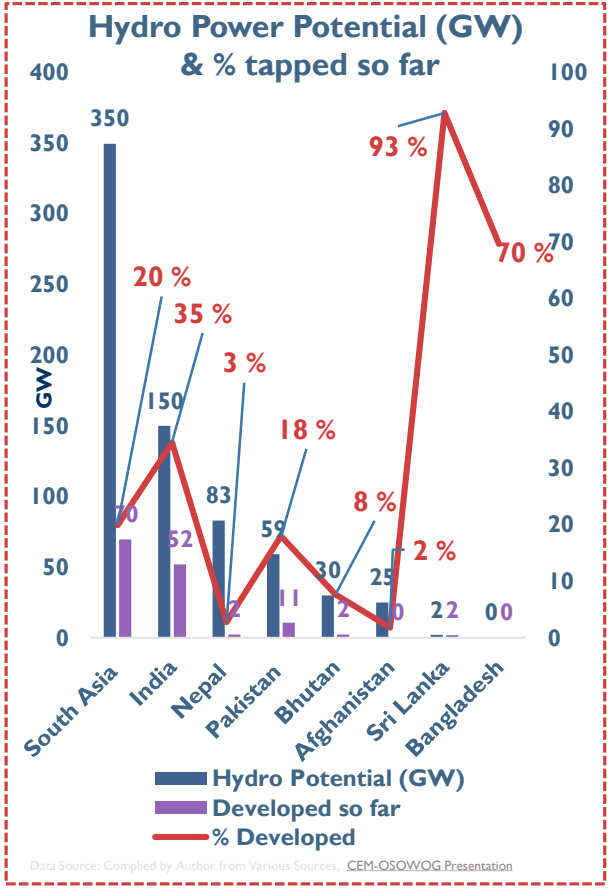
350 GW Hydro, 1289* GW Wind, > 1000* GW Solar Potential

World Bank Study finds:

- Unconstrained flow of electricity across the borders in South Asia can increase the development of hydropower by **2.7 times** over next two decade.
- **8% reduction** of regional power sector CO2 emissions.
- The **share of RE** in total electricity generation during the 2015-2040 period could expands to **31%** under regional cooperation.
- Unrestricted electricity trade provision would **save US$226 billion** (US$9 billion per year) of electricity supply costs over the period (2015–40).

Data Source: * CEM Presentation-OSOWOG , WB Study-WPS8513, WB Study-WPS7341





South Asia : Large Renewable Energy Resource within the Region-Potential for clean energy transition, sustainability & energy security

01.5 Emerging Outlook in South Asia : Opportunity for Deepening CBET and REC

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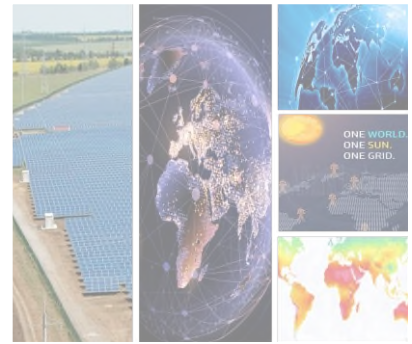


One Sun One World One Grid (OSOWOG)

01.5.2 Impacting Clean Energy Transformation Vision

Mujib Climate Prosperity Plan
30% of energy from renewables by 2030

Source : Mujib Climate Prosperity Plan

To remain Carbon Neutral

Source : Bhutan's 2nd Nationally Determined Contribution

Five nectar elements, 'Panchamrit'
Unprecedented contribution of India to Global climate action

- Non-fossil energy capacity to 500 GW by 2030
- 50% energy requirements from renewable energy by 2030
- Reduce the total projected carbon emissions by one billion tonnes from now till 2030.
- By 2030, India will reduce the carbon intensity of its economy by less than 45 percent.
- by the year 2070, India will achieve the target of Net Zero.

Source: National Statement by Prime Minister Shri Narendra Modi at COP26 Summit in Glasgow

Net zero Emission by 2030

Source: Update of Nationally Determined Contribution of Maldives

Net zero Emission by 2045

(Illustrates Cross Border Energy Trade potential for emissions reductions outside of Nepal)

Source -Nepal's Long-term Strategy for Net-zero Emissions submitted to UNFCC

By 2030, 60 % of all energy will be generated from renewable energy resources (including hydropower)

Source : Pakistan Updated Nationally Determined Contributions

Carbon Neutrality by 2060

Source : UPDATED NATIONALLY DETERMINED CONTRIBUTIONS

Key Initiatives and Recent Developments in South Asia: A Regional Approach will be an Economical, Cost effective, Optimal and sustainable over a long period of time

01.5.2 South Asia Power & Energy System is undergoing transformation

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 and Cross Border Power Transmission

Natural gas, LNG and Region Gas Grid

Source: Presentation on Creating Conducive Environment-Regional Investment Framework for Mobilizing Investment in Regional Energy Infrastructure projects in South Asia

01.5.2 Impacting Clean Energy Transformation Vision- Scale of Transformation

Understanding Scale of Transformation-Case of India

Power sector:

1. Coal-based power- peak by 2040, reduce by 99% in 2040-2060.
2. Solar, 1689 GW by 2050, 5,630 GW by 2070.
3. Wind, 557 GW by 2050 and 1792 GW by 2070.
4. Nuclear, 68 GW by 2050 and to 225 GW by 2070.

Transport sector:

1. % electric cars in car sales, 84 % by 2070.
2. % electric trucks in freight trucks, 79 % by 2070, the rest being fuelled by hydrogen.

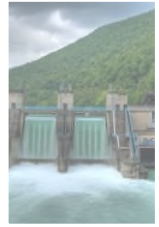
Industrial sector

1. Coal use in industry- peak by 2040, reduce by 97% 2040-2065.
2. Hydrogen share in total industrial energy use (heat and feedstock) must increase to 15 % by 2050 and 19 % by 2070.

Source : Implications of a Net-Zero Target for India's Sectoral Energy Transitions and Climate Policy Vaibhav Chaturvedi and Ankur Malyan

Surplus hydropower potential can be tapped for Green Hydrogen (GH2) electrolysers

Surplus hydropower from the countries can be exported & GH2 can be generated at the point of requirement in the region.



Hydropower generators can integrate electrolysers at or nearby hydropower sites, to produce GH2 as a zero-carbon product & revenue option.

Source : IHA , How South Asia's massive renewable energy potential can boost green hydrogen production

Source : Implications of a Net-Zero Target for India's Sectoral Energy Transitions and Climate Policy Vaibhav Chaturvedi and Ankur Malyan

Cross Border Electricity Trade and Regional Power Market can contribute to Clean Energy Transformation and Green Hydrogen economy in South Asia

01.5 Emerging Outlook in South Asia : Opportunity for Deepening CBET and REC

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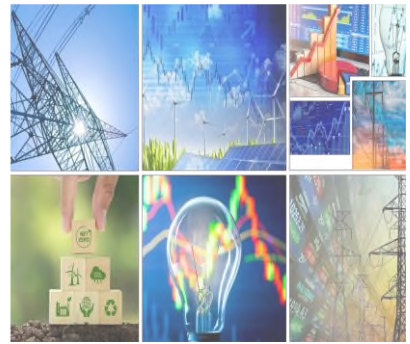


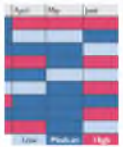
Market Instruments Regional Energy Market Development

Emerging Outlook 4

One Sun One World One Grid (OSOWOG)

01.5.3 Market Instruments, Regional Energy Market Development

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

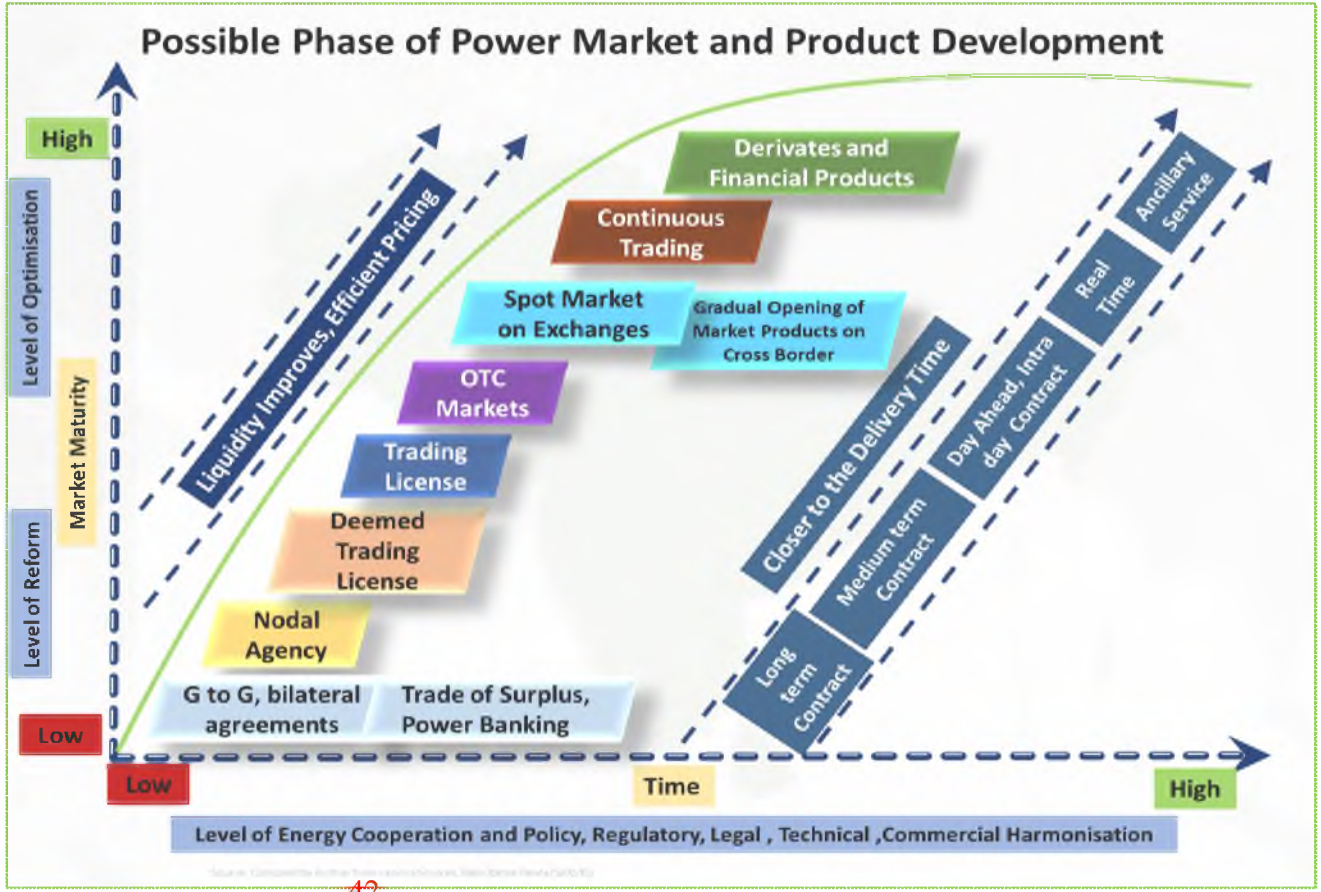


Tapping Demand Diversity- Daily, Weekly ,Monthly, Seasonal

Power Exchange- Competitive price discovery, Auction Platforms

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

Carbon Market, Carbon Credits



A integrated Regional Power Market will facilitate optimal allocation of cost & benefit and clean energy transition

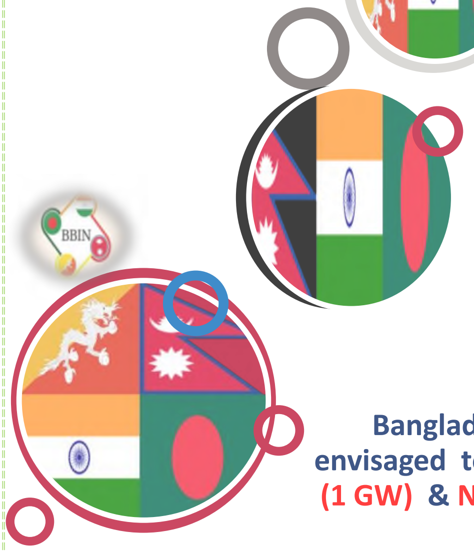
01.5.3 Gradually Transitioning from Bilateral to Trilateral CBET in SA

$2 billion ,1125 MW Dorjilung Project

Proposed Trilateral Project

Bangladesh will import 500 MW of electricity from 900 MW Upper Karnali (GMR) in Nepal @ 7.72 cents/unit for 25 years##

(Price Negotiation is Concluded, Discussion on transmission and other aspects is under consideration)



Bangladesh Master Plan# envisaged to import from Bhutan (1 GW) & Nepal (3 GW) through India

Power System Master plan 2016 (Final)- https://powerdivision.gov.bd/site/page/f68eb32d-cc0b-483e-b047-13eb81da6820/Power-System-Master-Plan-2016

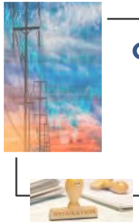
https://kathmandupost.com/money/2020/02/09/bangladesh-issues-letter-of-intent-to-purchase-500-mw-from-upper-karnali-hydro-project

Enabling the Frameworks

Guidelines for the Import / Export (Cross Border)-2018 of Electricity

Clause 3.1, Clause 8.6

Source: Ministry of Power, India



Central Electricity Regulatory Commission (Cross-border Trade of Electricity) Regulations, 2019

Clause 3. (2) , Clause 12. (6)

Source: CERC, India

Procedure for approval and facilitating Import/Export (Cross Border) of Electricity by the DA Authority-February, 2021

Clause 8. , Annex-V

Source: CEA, India

UNDER SUB-REGIONAL COOP MODEL

Nepal-B'desh may be Allowed to Trade Power Through Indian Corridor

Nepal sought approval from Indian authorities to export 40-50 MW of electricity to Bangladesh

Future Plans

A meeting next month between Indian and Nepalese officials is expected to fine-tune proposals leading to a formal arrangement

Nepal's energy exports to Bangladesh will contribute in strengthening the country's energy sector requirements

Bangladesh has also asked India to facilitate power trade between Dhaka and Kathmandu

Bangladesh wants to develop the 683-MW Sunkoshi 3 hydropower project under a joint venture arrangement with Nepal

Nepal and India intend to widen collaboration in the power sector and include partner nations under the BBIN framework

RECENT TALKS

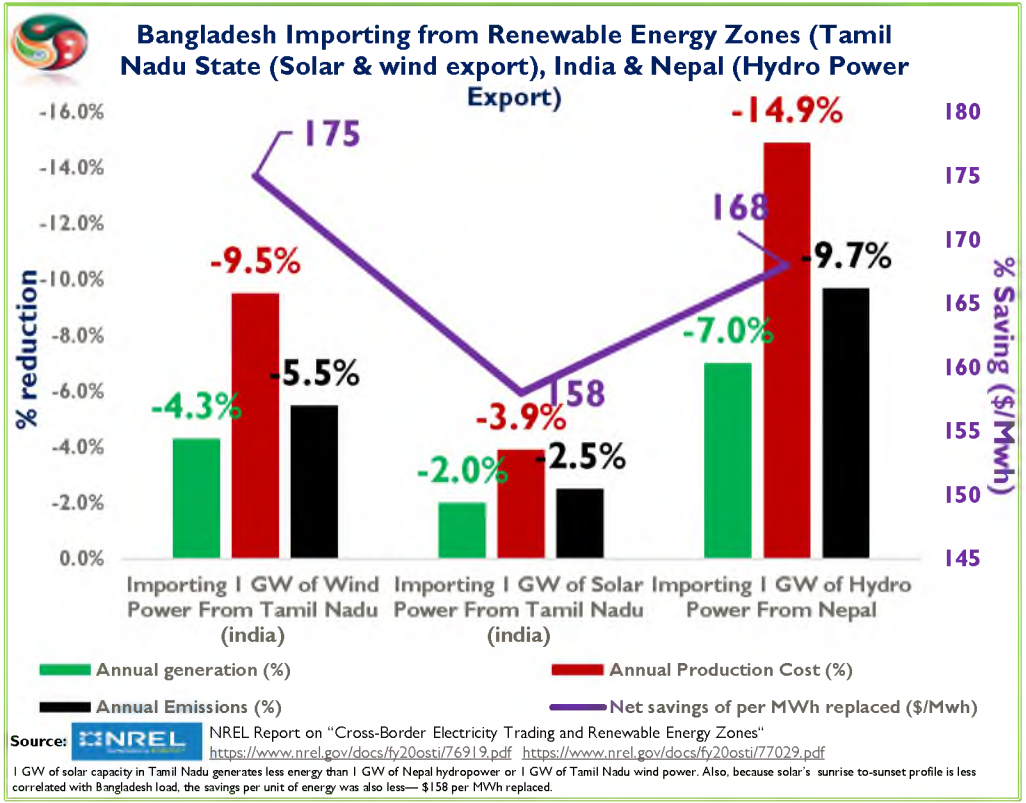
Bangladesh has been recently holding talks with Nepal to meet its renewable energy targets

Source: Economic times

43

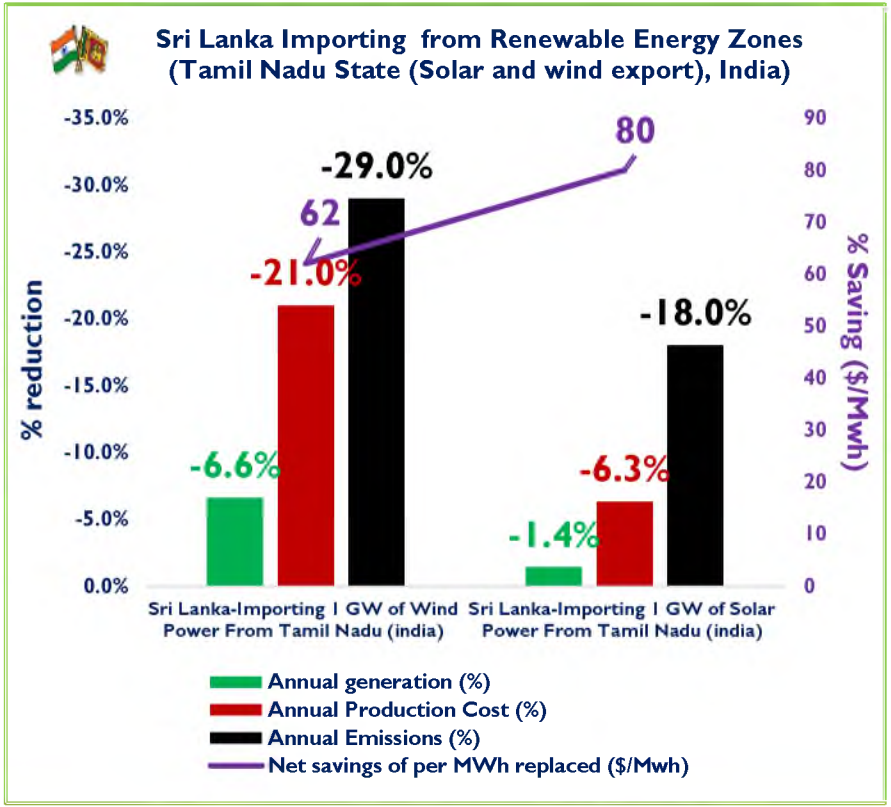
Nepal has sought approval from Indian authorities to export 40-50 MW of electricity to Bangladesh through India's existing transmission infrastructure

01.5.3 Trilateral Cross Border Electricity Trade From Renewable Energy Zones



Source: NREL Report on "Cross-Border Electricity Trading and Renewable Energy Zones"
https://www.nrel.gov/docs/fy20osti/76919.pdf https://www.nrel.gov/docs/fy20osti/77029.pdf

1 GW of solar capacity in Tamil Nadu generates less energy than 1 GW of Nepal hydropower or 1 GW of Tamil Nadu wind power. Also, because solar's sunrise to-sunset profile is less correlated with Bangladesh load, the savings per unit of energy was also less— $158 per MWh replaced.



South Asia : GW scale RE based Trilateral CBET offers cost saving, clean energy transition:-leads to enhance energy affordability & sustainability

01.5 Emerging Outlook in South Asia : Opportunity for Deepening CBET and REC

Emerging Outlook1

Climate Change induced Renewable Based CBET

Emerging Outlook 2

Impacting Clean Energy Transformation vision through CBET

Emerging Outlook 3

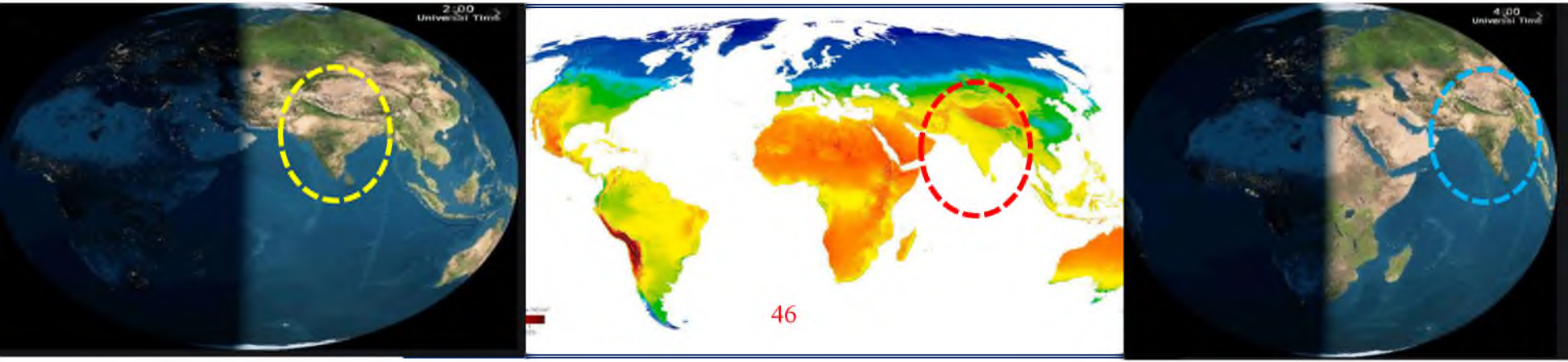
Market Instruments Regional Energy Market Development

Emerging Outlook 4

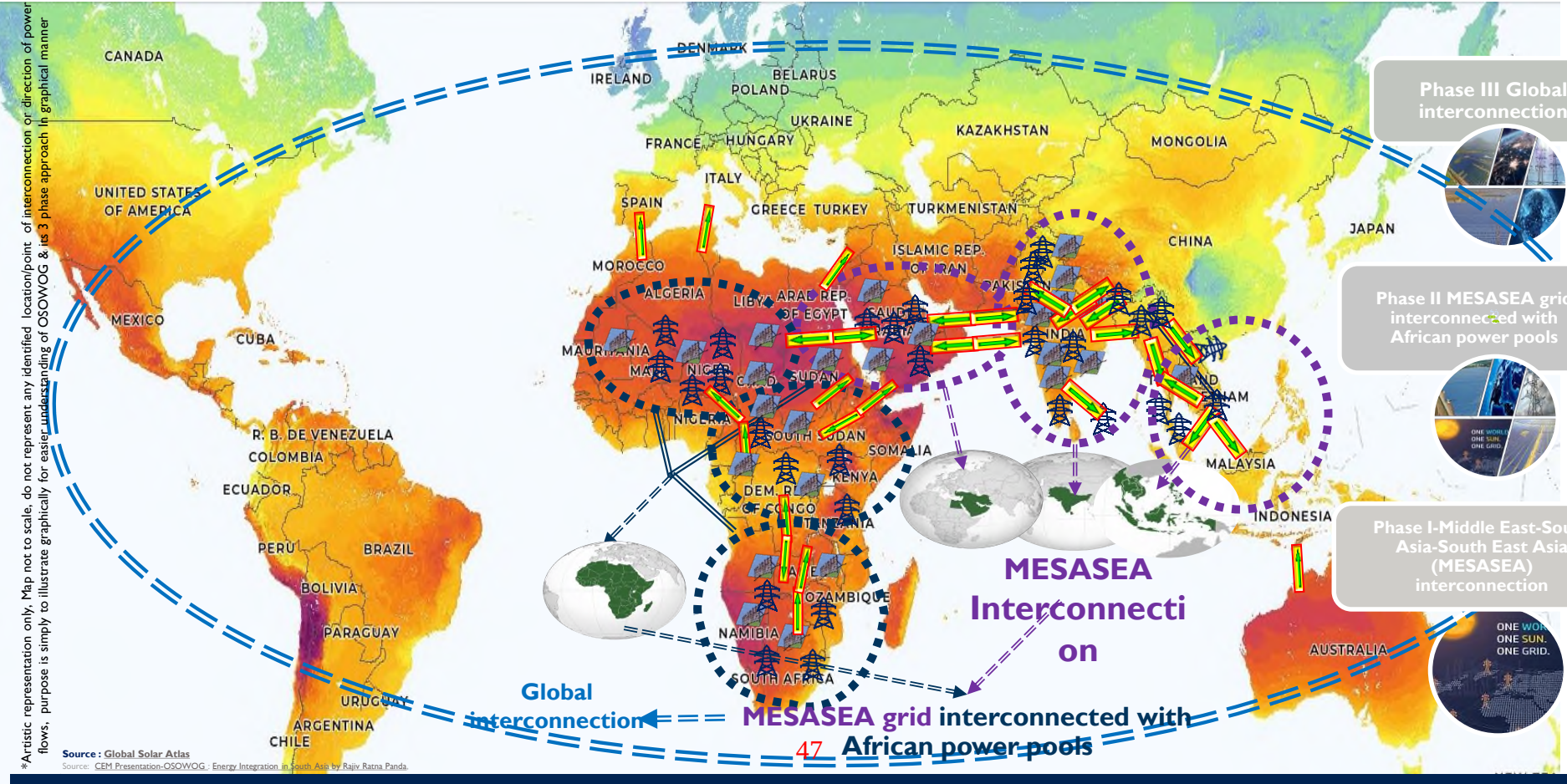
One Sun One World One Grid (OSOWOG)

ne Sun ne Grid ne World

01.5.4 India at Fulcrum - Enabler for OSOWOG



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



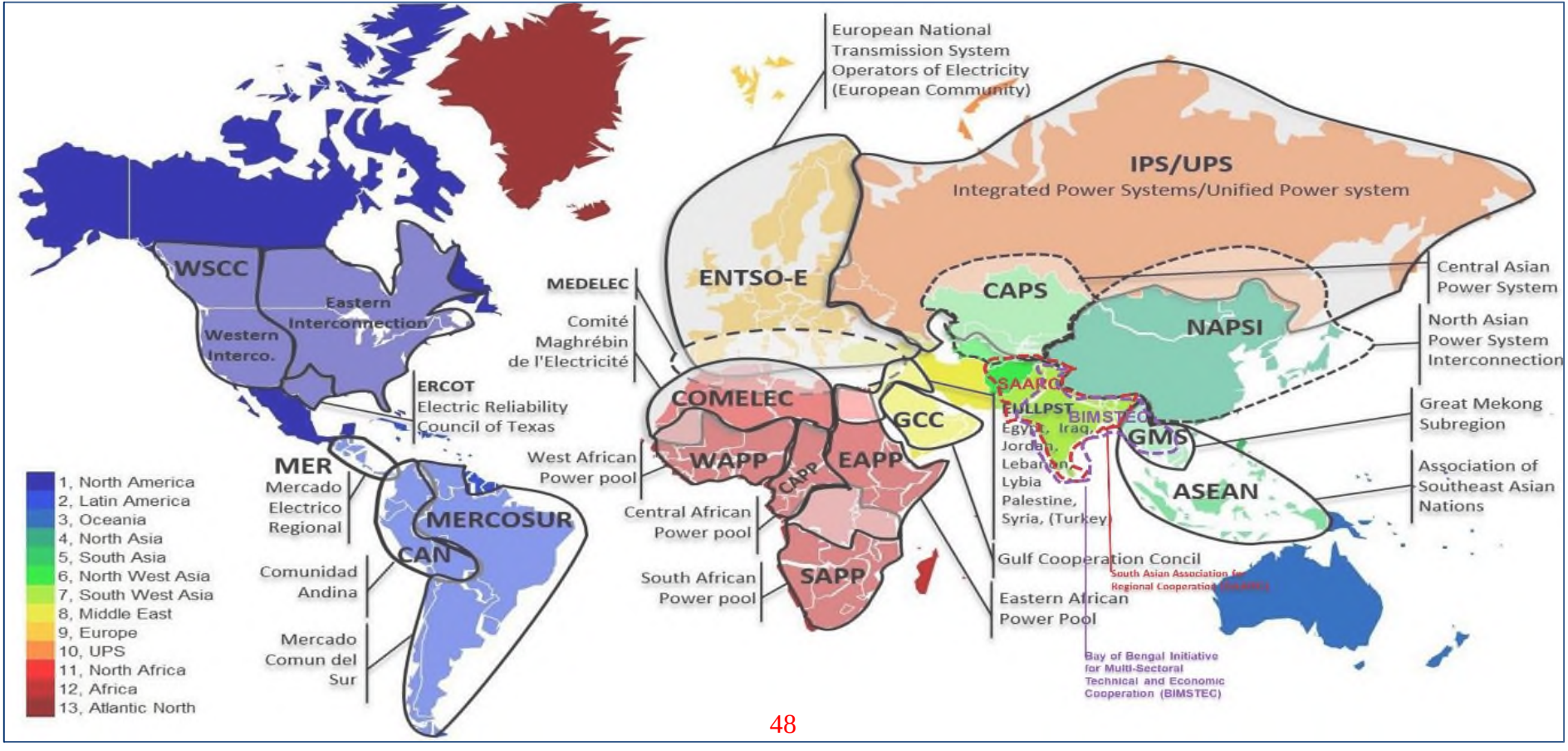
*Artistic representation only, Map not to scale, do not represent any identified location/point of interconnection or direction of power flows, purpose is simply to illustrate graphically for easier understanding of OSOWOG & its 3 phase approach in graphical manner

Source : Global Solar Atlas

Source: CEM Presentation-OSOWOG ; Energy Integration in South Asia by Rajiv Ratna Panda.

Building Regional, Sub-Regional, Continental and Global Consensus on Interconnections will be the key

01.5.4 Various Regional Grid Integration Initiatives across the Globe



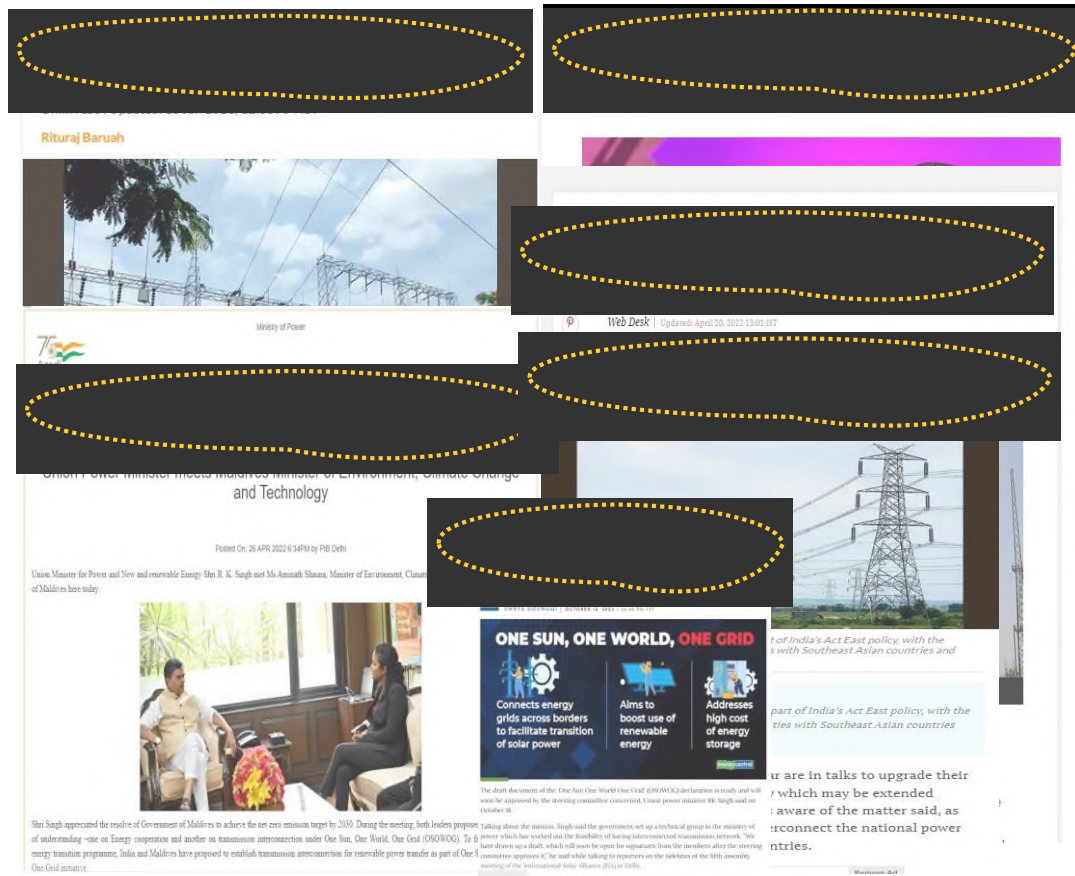
Source : Power system development and Economics, Global electricity network Feasibility study, Reference: 775, September 2019, CIGRE report on "Global electricity network-Feasibility study", and further modification on the image by adding SAARC and BIMSTC Region

01.5.4 One Sun One World One Grid (OSOWOG)-Developments

One Sun, One World, One Grid (OSOWOG)

- MoP constituted **Task Force on OSOWOG** for steering the agenda for OSOWOG.
- The Task Force **studied techno-economic feasibility** of interconnection of regional grids viz. South East Asia, South Asia, Middle East (Gulf Cooperation Council), Africa & Europe for exchange of renewable power and after discussion,
- It was agreed that **initially interconnection with Sri Lanka, Myanmar and Maldives** would be explored to further the objective of OSOWOG.
- An Indian technical team has **visited Maldives** for studying the **technical specifications** of interconnection India-Maldives through Lakshadweep.
- **Charter for OSOWOG** has been finalized, and a Steering Committee for OSOWOG is being set up.

Source: Ministry of Power, YEAR- END REVIEW 2022, Posted On: 27 DEC 2022 3:57PM by PIB



In South Asia Context, OSOWOG will provide further impetus to Power System Integration in South Asia Region

02 **Updates in SAFIR member countries on the Existing Energy /electricity Regulatory framework and Perspective on regulatory cooperation to facilitate knowledge sharing, addressing cross cutting energy/electricity regulatory issues**

02.1 Current Power Market Reform and Integration in South Asia

Country	Power Trading and market Structure	Single Buyer	IPPs	Non-Discriminatory Open access Framework	Transmission System operation (as a part of Transmission Agency)	Independent transmission system operator	Competitive Power Market Power/Gas Exchange Platform	Cross Border Electricity Trade Through Power market
Afghanistan	**Single Buyer** (SB)-DABS, VIU-DABS	■	■		■			
Bangladesh	**Single Buyer** (SB)-BPDB, Multiple Seller ^Partial Unbundling of Transmission	■	■		■			
Bhutan	**Single Buyer without Generation Assets** (SBWGA)-BPC, ^^Un-bundled transmission	■	■			■		■
India	**Multiple Buyer & Seller Competitive Power Market** Platform. Power Exchange (PXs) Completely Un-bundled transmission		■	■		■	■	■
Maldives	**Single Buyer** (SB), VIU-FENAKA	■	■		■			
Nepal	**Single Buyer** (SB)-NEA, Multiple Seller VIU-NEA	■	■		■			■
Pakistan	**Single Buyer without Generation Assets**-CPPA-G (Market Operator)^^, Multiple Seller	■	■	■	■		^^^	
Sri Lanka	**Single Buyer** (SB)-CEB, Multiple Seller	■	■		■			

^Bangladesh- PGCB owns and operates the transmission grid, PGCB is a subsidiary of BPDB which undertakes generation and distribution ^^ Distribution Part of transmission

^^^Pakistan –Pakistan is working on the power market transition from the current single buyer to competitive market- Competitive Trading Bilateral Contracts Market (CTBCM) is designed and It is at advanced stage of launch/implementation. In May, 2022, the Authority has granted market operator licence and approved market commercial code (MCC). As per the approved MCC; (a) the single buyer regime will end and DISCOs will be procuring power through centrally organized auctions run through the Independent Auction Administrator (IAA), (b) bulk power consumers (more than 1 MW load) will be given choice to procure power either from distribution company (DISCO) or it's competitive supplier and (c) market sales on merchant basis will also be allowed to interested generation plants including those retiring from legacy generation fleet or connected with the national grid as captive generating plants.

02.2 Bangladesh–Legal Updates/Recent Regulations by Bangladesh Energy Regulatory Commission (BERC)

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02.2 Bangladesh–Legal Updates/Recent Regulations by Bangladesh Energy Regulatory Commission (BERC)

❑ BERC (Amendment) Act, January 31, 2023

{*The purpose of this Amendment allows government to adjust the tariffs of gas and electricity tariffs by notification or official gazette.*

"34a. ***Power of Government to fix, re-fix or adjust tariffs****._ of this Act*

Notwithstanding anything contained in any other provision, in particular the Government, in the Government Gazette By notification, with a view to coordinating subsidies, in the public interest, agriculture, industry, fertilisers, trade and Enforce effective measures for their production, processing, transportation and marketing Facilitating power generation, energy transmission, storage, marketing, supply, distribution and ***Tariffs may be fixed, re-fixed or adjusted at the consumer level.****"}**

** Translated through google translation*

❑ BERC Dispute Settlement Regulations, 2021"

{*The purpose of this Regulation (Published on 17-06-2021) provides dispute settlement* ***mechanism*** *and* ***detailed process*** *of dispute settlement}*

❑ BERC (Amendment) Act, 2020

{*The purpose of this Amendment (Published on 26-11-2020)* ***empowers the BERC to change tariff more than once per financial year****.}*

02.3 Bhutan–Recent Regulations by Electricity Regulatory Authority (ERA)

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02.3 Bhutan–Recent Regulations by Electricity Regulatory Authority

❑ System Operator Charges Regulation (2022)

{*The purpose of this Regulation is to provide* ***guidelines for the determination of System Operator charges*** *in accordance with the Act.*}

❑ Distribution code (Amendment) regulation (2022)

{*The purpose of this regulation is to enumerate the* ***terms and conditions of supply of electrical energy to Customers served by Distribution Licensees*** *and to provide* ***broad guidelines to both Customers and Distribution Licensees*** *in* ***ensuring uniform practices of standard of supply and rules in extending and maintaining the electricity supply.***}

❑ Regulation for grid integration of alternative renewable energy sources (2021)

{*The purpose of this Regulation shall be to: (1) Provide* ***minimum technical requirements for seamless integration of Alternative Renewable Energy Generating Facilities*** *to the Transmission or Distribution System; and (2)* ***Ensure reliable and efficient operation of the Power System***.}

❑ Safety Code (Amendment) 2021

{*This Safety Code specifies the Authority's* ***minimum electrical safety requirements for the design, construction, operation and maintenance of electric power plant and equipment*** *under the control of Licensees. These minimum requirements shall be incorporated by Licensees into the Safety Rules and Safety Management Systems developed by Licensees in accordance with the requirements of the Safety Regulation.* }

❑ Rules for fines & penalty 2020

{*The purpose of this Rule is to* ***streamline a procedure to ensure transparency, fairness and reasonableness*** *while* ***imposing fines on a person who breaches provisions*** *of the Electricity Act and rules, regulations, standards, codes, licenses or contracts executed thereunder.*}

02.4 India–Recent Regulations by Central Electricity Regulatory Commission (CERC)

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CERC

02.4 India – Recent Regulations by Central Electricity Regulatory Commission (CERC)

- **CERC (Terms and Conditions for Dealing in Energy Savings Certificates) (First Amendment) Regulations, 2022**
  {*The purpose of this Amendment Regulation is to define Floor Price and set Floor Price.*}

- **CERC (Connectivity and General Network Access to the inter-State Transmission System) Regulations, 2022**
  {*Preamble- Whereas it is necessary to provide for a regulatory framework* ***to facilitate non-discriminatory open access to licensees or generating companies or consumers for use of inter-State transmission system through General Network Access*** *and to consolidate the regulations on the subject, it is hereby specified as under*}

- **CERC Order, Detailed Procedure for calculations of specific metrics for Key Performance Indicators, May 2022 under Regulation 32 of the CERC (Fees and Charges of Regional Load Despatch Centre and other related matters) Regulations, 2019)** {*The order* ***approves the Procedure***. *The procedure lay down the detailed explanation of* ***KPIs****, specify* ***annual targets****, performance measurement, proofs of achievement and mapping of performance into marks of NLDC, RLDC.*}

- **Guidelines for Registration and Filing Application for Establishing and Operating Over the Counter (OTC) Platform, 2022.** {*"Over the Counter (OTC) Platform" is an* ***electronic platform for exchange of information*** *amongst the* ***buyers and sellers*** *of electricity.*}

- **CERC (Terms and Conditions for Renewable Energy Certificates for Renewable Energy Generation) Regulations, 2022.** {*The purpose is for the development of market in power from renewable energy sources through renewable energy certificates.*}

02.4 India – Recent Regulations by Central Electricity Regulatory Commission (CERC)

- **CERC Order, Procedure for Short Term Open Access in inter-State Transmission System through National Open Access Registry (NOAR)", 1st April 2022, under Regulation 4 of the CERC (Open Access in inter-State Transmission) (5th Amendment) Regulations, 2018.** *{The order **approves the Procedure**. NOAR is a common **electronic platform for facilitating** the short-term open access **(STOA)** in inter-State transmission system **(ISTS**)}*

- **CERC (Payment of Fees) (Third Amendment) Regulations, 2022** *{The lays down rules for transmission license, OTC Platform, mode of payment}*

- **CERC Order, Detailed Procedure on "Methodology of Payment of Certificate Retainer-ship" under Regulation 33 of the CERC (Fees and Charges of Regional Load Despatch Centre and other related matters) Regulations, 2019.** *{The order **approves the Procedure.**}*

- **CERC (Deviation Settlement Mechanism and Related Matters) Regulations, 2022.** *{This regulations seek to **ensure, through a commercial mechanism** that **users of the grid do not deviate from and adhere to their schedule of drawal and injection of electricity** in the interest of security and stability of the grid.}*

- **CERC (Ancillary Services) Regulations, 2022.** *{While it is **desirable in the interest of grid security that adequate reserves are maintained locally at the State level for each state control area** as per the Grid Code or the State Grid Code as the case may be, these **regulations aim to provide mechanisms for procurement, through administered as well as market-based mechanisms, deployment and payment of Ancillary Services at the regional and national level for maintaining the grid frequency** close to 50 Hz, and restoring the grid frequency within the allowable band as specified in the Grid Code and for relieving congestion in the transmission network, to ensure smooth operation of the power system, and safety and security of the grid.}*

02.4 India – Recent Regulations by Central Electricity Regulatory Commission (CERC)

- **CERC (Terms and Conditions of Tariff) (Second Amendment) Regulations, 2021.** *{The regulation shall apply in all cases where a generating company has the arrangement for supply of coal or lignite from the integrated mine(s) allocated to it, for one or more of its specified end use generating stations, whose tariff is required to be determined by the Commission under section 62 of the Act read with section 79 thereof }*

- **CERC Order Revised procedure for "Grant of connectivity to projects based on renewable sources to inter-state transmission system, 2021.** *{The order **approves the Procedure.**}*

- **CERC Order, Detailed Procedure on "Methodology of Payment of Certificate Retainer-ship" under Regulation 33 of the CERC (Fees and Charges of Regional Load Despatch Centre and other related matters) Regulations, 2019.** *{The order **approves the Procedure.**}*

- **CERC (Power Market) Regulations, 2021.** *{This regulations covers Power Exchange, Market Participants other than Power Exchange, OTC Market and **covers aspects and introduces concept like Market Coupling, OTC Platform, Market Oversight** etc. }*

- **CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2020.**

- **CERC (Sharing of Inter-State Transmission Charges and Losses) Regulations, 2020.** *{The regulation covers various aspects-s **Principles** of sharing transmission charges, components and sharing of ISTS charges & losses, Sharing of Transmission Losses, charges for Short Term Open Access etc..}*

- **CERC (Procedure, Terms & Conditions for grant of trading licence and other related matters) Regulations, 2020**
  *{The regulation covers various aspects such as **qualifications, procedure for grant of licence, disqualification, Trading Margin**, terms and conditions etc.}*

02.5 Nepal –Recent Regulations by Electricity Regulatory Commission (ERC)

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02.5 Nepal–Recent Directives/Regulations by Electricity Regulatory Commission

- **Directive relating to monitoring and pre-approval for issuance of shares, 2078 (2021) dated September 23, 2021.**

  *{This directive **specifies criteria** that must be met by **licensees** for qualifying for public issuance of shares. It also provides procedures that shall be adopted by ERC to evaluate and decide on such petitions etc.}*

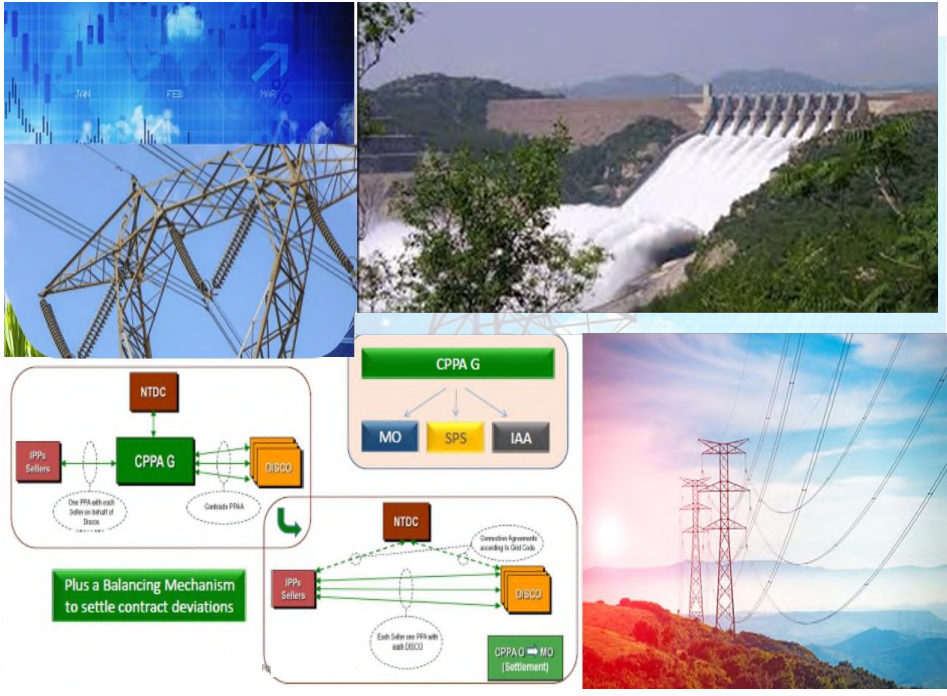
- **Directive relating to merger, acquisition, amalgamation, transfer of shares, purchase, and sale of plant, 2077 (2020) dated August 17, 2020.**

  *{This directive **specifies terms and conditions** to be met by licensees while applying to ERC seeking approval for performing activities such as merger, acquisition, amalgamation, transfer of shares, purchase and sale of plant and prescribes formats of applications and forms to be filled up for the same.}*

- **Directive relating to operation of public hearing of ERC, 2076 (2020) dated February 13, 2020.**

  *{This directive regulates how ERC shall conduct the public **hearings and prescribes code of conduct** for attendees of the public hearing.}*

02.6 Pakistan–Recent Regulations by National Electric Power Regulatory Authority (NEPRA)



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02.6

Pakistan–Recent Regulations by National Electric Power Regulatory Authority (NEPRA)

- **NEPRA (Electric Power Procurement) Regulations, 2022.** {*The regulations provides details related to **procurement planning, obligation to plan, business plan. power acquisition** programme, power procurement implementation, competitive **auctions and duties of the independent auction administrator**, pre-qualification of bidders & bidding documents, **import of electric power**, approval of power purchase agreement etc.*}

- **NEPRA Licensing (System Operator) Regulations, 2022.** {*The regulations provides details related to **Grant of licence , Functions of system operator, Fees, Term of the licence, General obligations, System operation and central dispatch, Administration of ancillary services Security of supply** etc.*} *[Facilitates CTBCM]*

- **NEPRA Open Access (Interconnection and Wheeling of Electric Power) Regulations,2022.** {*The regulations provides details related to **Interconnection facilities-**Financing, construction and operation, **open access, wheeling of electric power** etc.*}

- **NEPRA (Security of Information Technology and Operational Technology) Regulations, 2022.** {*This regulation provides details on **IT & OT assets security policy**, Security controls, conducting regular security **risk assessment! vulnerability assessment, PowerCert**. etc.*}

- **NEPRA (Electric Power Trader) Regulations, 2022.** {*This regulations provides the details for **Grant of licence, Functions of electric power trader, Term of the licence, Tariff for electric power trader**, General **duties and responsibilities**, **Financial & organisational** affairs, **Dispute resolution** etc.*} *[Facilitates CTBCM]*

- **NEPRA Licensing (Market Operator) Regulations, 2022.** {*This regulations provides the details for **Grant of licence, Functions of market operator, Term of licence, General obligations,** annual market report, **Prohibition against anti-competitive** practices, **Market Commercial Code** etc.*} *[Facilitates CTBCM]*

- **NEPRA Licensing (Electric Power Supplier) Regulations, 2022.** {*This regulations provides the details for **Grant of licence**, Term of the licence, , Tariff for **competitive supplier**, Tariff for **supplier of last resort**, Power acquisition programme, Investment programme of supplier of last resort etc.*} *[Facilitates CTBCM]*

- **NEPRA Performance Standards (Electric Power Suppliers) Regulations, 2022.** {*This regulations provides the details for **performance standards, reporting requirements** etc.*} *[Facilitates CTBCM]*

02.6 Pakistan–Recent Regulations by National Electric Power Regulatory Authority (NEPRA)

- **NEPRA Market Commercial Code, June 2022.** *{This regulations covers various amendments etc.} [Facilitates CTBCM]*
- **NEPRA Consumer Eligibility Criteria (Distribution Licensee) Regulations, 2022.** *{The regulations provides details related to **eligibility criteria** for consumers of distribution licensees, **extension and reinforcement** of the Common Distribution System, Operation and maintenance etc. } [Facilitates CTBCM]*
- **NEPRA Consumer Eligibility Criteria (Electric Power Suppliers) Regulations, 2022.** *{Regulations provides details related to **eligibility criteria** for consumers of competitive supplier, for consumers of supplier of last resort, multiple electric power supplier, non-discriminatory treatment by supplier of last resort etc. } [Facilitates CTBCM]*
- **NEPRA Licensing (Distribution) Regulations, 2022.** *{The Regulations provides details related to **grant & terms of licence, general duties and responsibilities** of a distribution licensee, **tariff and charges** , distribution service manual, open access, distribution code etc.} [Facilitates CTBCM]*
- **NEPRA (Registration) Regulations, 2022.** *{This regulation provides details on **Activities requiring registration**, Registration **application process**, Grant of **registration, Duties and responsibilities,** Prohibition against **anti-competitive practices** etc.} [Facilitates CTBCM]*
- **Amendments in NEPRA (Alternative & Renewable Energy) Distributed Generation and Net Metering Regulations 2022.**
- **NEPRA Licensing (Microgrid) Regulations, 6th July 2022.** *{This regulations provides the details for **Microgrids**, Application **Process, Minimum Standards, Tariff**, Standard **Operating Procedures** etc.}*
- **NEPRA Licensing (Application, Modification, Extension and Cancellation) Procedure Regulations, 2021.** *{This regulations provides the details for **Grant of license** , Eligibility criteria, Application procedure, Consideration of application, **Modification** & **Cancellation** of license etc.} [Facilitates CTBCM]*
- **NEPRA Power Safety Code for Licensees 2021, NEPRA (Fees) Regulations, 2021, NEPRA (Fine) Regulations, 2021.**

- **NEPRA Amendment in NEPRA (Import of Electric Power Regulations, 2020.** *{This regulations covers various amendments etc.}*

02.7 Sri Lanka–Recent Regulations by Public Utilities Commission of Sri Lanka (PUCSL)

Public Utilities
Commission of Sri Lanka

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02.7 Sri Lanka–Recent Updates/Regulations by Public Utilities Commission of Sri Lanka (PUCSL)

- **Guidelines on Rooftop Solar PV installation for Utility Providers – Revision 1, 2022.** {*This document provides a **general guideline and best practices guide** for the **installation of rooftop solar PV systems** in Sri Lanka for utility providers.*}
- **Guidelines on Rooftop Solar PV Installation for Solar Service Providers – Revision 1, 2022.** {*This document provides a **general guideline and best practices guide** for the **installation of rooftop solar PV systems** in Sri Lanka for solar service providers.*}
- **Regulatory Manual 2022.** {*This provides a guide to the work of the PUCSL.*}
- **Guidelines on Shifting of Electricity Meters in Consumer Premises, 2022.**
- **Draft Final Report Development of Merit Order Dispatch Procedures ,August 2021.**
- **Guidelines for provision of Multiple Electricity Supplies for a Location, 2020.**
- **Annual Levy for Electricity Sector Licensees -2020, 2020.**
- **Distribution Code Of Sri Lanka 2019.** {*This code covers general code and code related to the planning, connection, operation, metering code of distribution etc. etc.*}

02.8 Perspective on regulatory cooperation- knowledge sharing, addressing cross cutting regulatory issues

02.8 Perspective on Regulatory Cooperation-Knowledge Sharing, addressing cross cutting regulatory issues

- Power and energy sector are highly regulated in South Asia.
- SA countries have different stage of evolution in terms of legal, regulatory & Policy framework. Need for developing complementing regulatory frameworks.
- Strong political –Economy of the electricity/energy sector, strategic nature.
- Development of cross border projects, mitigation of Investment risks requires a robust legal, regulatory and policy framework.
- While each country is sovereign by itself, there is a need to coordinate/ harmonise the laws/rules/regulations related to CBET to the extent possible.
- Harmonized/coordinated policy and regulatory framework for CBET brings consistency, predictability and minimize perception of regulatory and Policy risks.

CERC CBTE regulation relied upon existing Regulation and Policy Frameworks

1. Tariff Policy
2. Tariff Regulations
3. Open access Regulation
4. Connectivity Regulation
5. Metering Regulation
6. Sharing of Inter State Transmission Charges and Losses
7. DSM Regulations
8. Scheduling and Dispatch rule……..
9. ……

CBTE: Cross Border Trade of Electricity

- Climate urgency & clean energy priorities offers renewed needs to intensifying regulatory cooperation.

Sharing of regulatory experience, success stories and transfer of expertise and knowledge will be key in accelerating cross border electricity trade, regional energy market development, advancing clean energy transition.

Thank You

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rajivratnapanda@gmail.com
+91-9650598697

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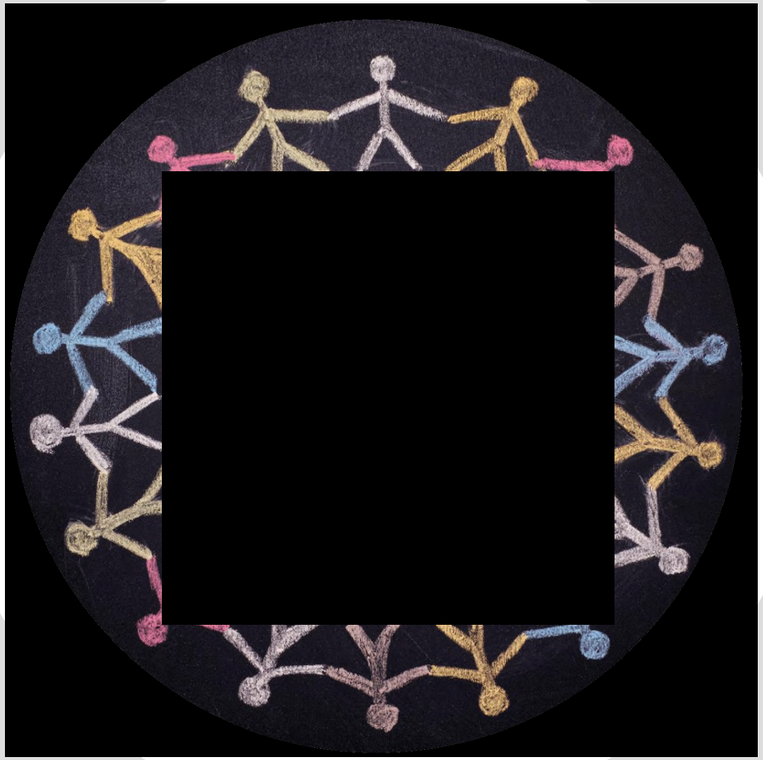
Disclaimer

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.



Presentation to SAFIR Working Group

Study on 'South Asia Energy/Electricity Regulations to develop Regulatory Road Map for Electricity/Energy Exchange and Energy Cooperation among South Asian Countries'

February 2023

Index

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID).

Key components of the report

Common Minimum Harmonized and Standardized Template of energy/electricity regulations for Energy Cooperation

A master regulation / regulatory template that can be adopted by the South Asian countries after undertaking country specific customizations

Country wise regulatory roadmap

The broader process of adoption of the "common minimum template" and associated regulatory changes considering intermediate and long term scenarios

Country wise action plan

Action plan for regulatory amendments or introduction of new regulations, beyond what is specified in the "common minimum template"

Suggestions and comments obtained during stakeholder consultations (July 2022)

Bangladesh

- Govt. of Bangladesh is also considering a CBET policy document to be issued
- Policy clarity required on BERC's role on CBET
- A few more definitions to be added in the common minimum template

Bhutan

- Role of Govt. is crucial
- Possibility of common vs country specific deviation settlement mechanisms may be explored

Sri Lanka

- The recent crisis has prompted rethink on strategies.
- Law does not have any provision for CBET.
- CEB has to identify areas of regional coordination such as purchase of energy, ancillary services etc.

Nepal

- Multiple suggestions on common template – frequency of information system, clarity on curtailments, meter reading, dedicated lines etc.

India

- Need for MBMS model, deviation settlement etc.

Recommendations for regulatory changes in South Asia

Regulatory & Institutional changes required to support Energy Cooperation and Trade

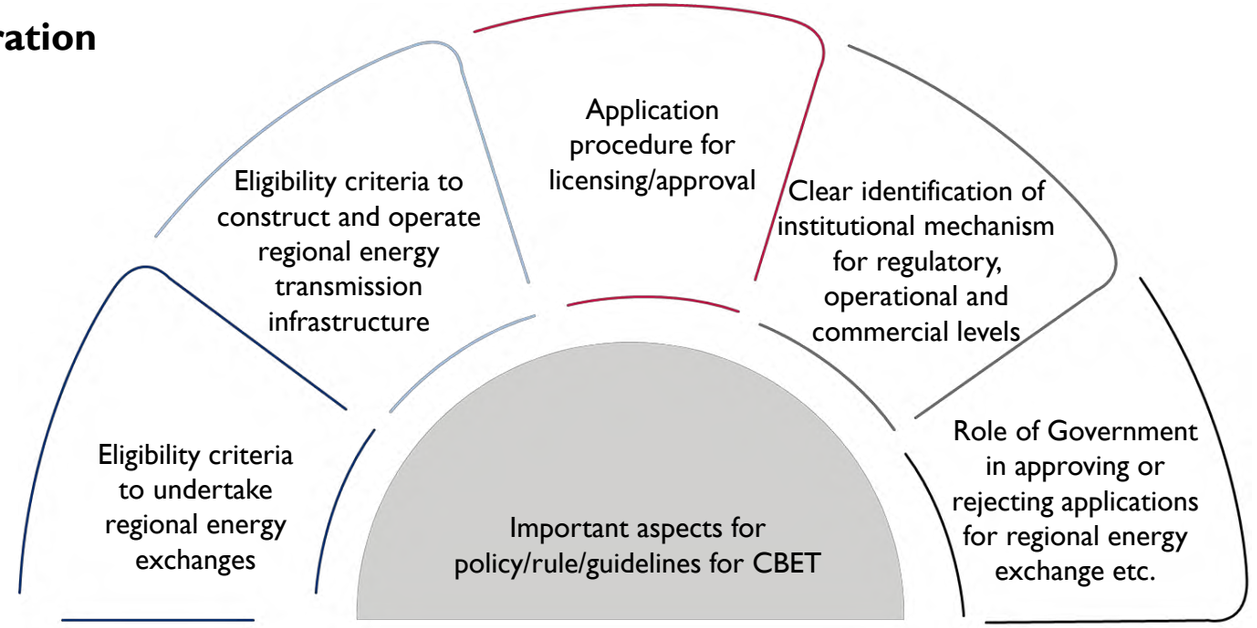
Recommendations for Regulatory changes in South Asia

Regulatory changes required to support Energy Cooperation and Trade

1. Policy/rule of the Government, relating to regional energy cooperation

- In South Asia (for countries other than India, & Maldives), a regional level agreement was made in 2014, the SAARC Framework Agreement for Energy Cooperation (Electricity). However, it requires the member countries to allow CBET on a voluntary basis, subject to laws, rules and regulations of respective countries and based on bilateral / trilateral / mutual agreement between member countries.

- **A policy/rule/guideline specifically relating to CBET, from the Government** (for countries other than India, & Maldives) can substantially reduce the ambiguities on regional energy cooperation and will also help in reducing the perceived investment risk in regional energy projects.



Regulatory changes required to support Energy Cooperation and Trade

2. Master regulation on regional Energy Cooperation

Member countries (other than India, Maldives & Pakistan to some extent) may come up with a **comprehensive guideline on matters related to regional energy cooperation and exchange**, which shall cover the following aspects:

- Open access to network for undertaking regional energy exchange
- Transmission Pricing framework for compensating the transmission owner and for use of transmission lines for regional energy exchange
- Scheduling, system operation, curtailment etc.
- Any specific issues related to approval, operation and access to cross border transmission infrastructure
- Deviation settlement mechanism to be adopted at a country level, limited to regional energy exchange transactions

Guidelines as per an earlier study of SARI/EI on development of a model regulation to implement open access to promote CBET in South Asia proposed in the model framework

- Introduction of enabling provisions for open access
- Features and eligibility criteria for connectivity and open access
- Fixation of open access charges
- Terms and conditions, and information system for open access
- Procedure for grant of connectivity and open access
- Establishing the operational and commercial mechanisms
- Encouraging regional mechanisms for co-ordination in CBET

Regulatory changes required to support Energy Cooperation and Trade

3. Wholesale market

The member countries (other than India, Maldives & Pakistan to some extent) shall clarify the following aspects, as part of their licensing framework/regulations:

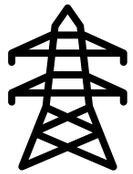
- Whether wholesale market is available for cross border transactions or not?
- Whether traders will be allowed to participate in regional energy cooperation/exchange? If yes, what shall be the eligibility criteria.
- Whether entities will be allowed to set up energy exchanges? If yes, what shall be the eligibility criteria.
- The overall roadmap for allowing entities other than the single-buyer entity, to participate in regional energy exchange.

Guidelines as per an earlier study of SARI/EI on development of a model regulation to implement trading license framework to promote CBET in South Asia proposed in the model framework

- Operationalization of legal and regulatory framework for trading licensees
- Extending / applying the trading license framework in the context of cross border trade
- Categories of trading licensees and qualification criteria
- Grant and revocation of trading license
- Terms, conditions and obligations of trading licensees
- Market development
- Encouraging regional mechanisms for co-ordination in CBET

Regulatory changes required to support Energy Cooperation and Trade

4. Grid code



A grid code clarifies and formalizes various aspects related to grid connectivity, commissioning, scheduling and operations

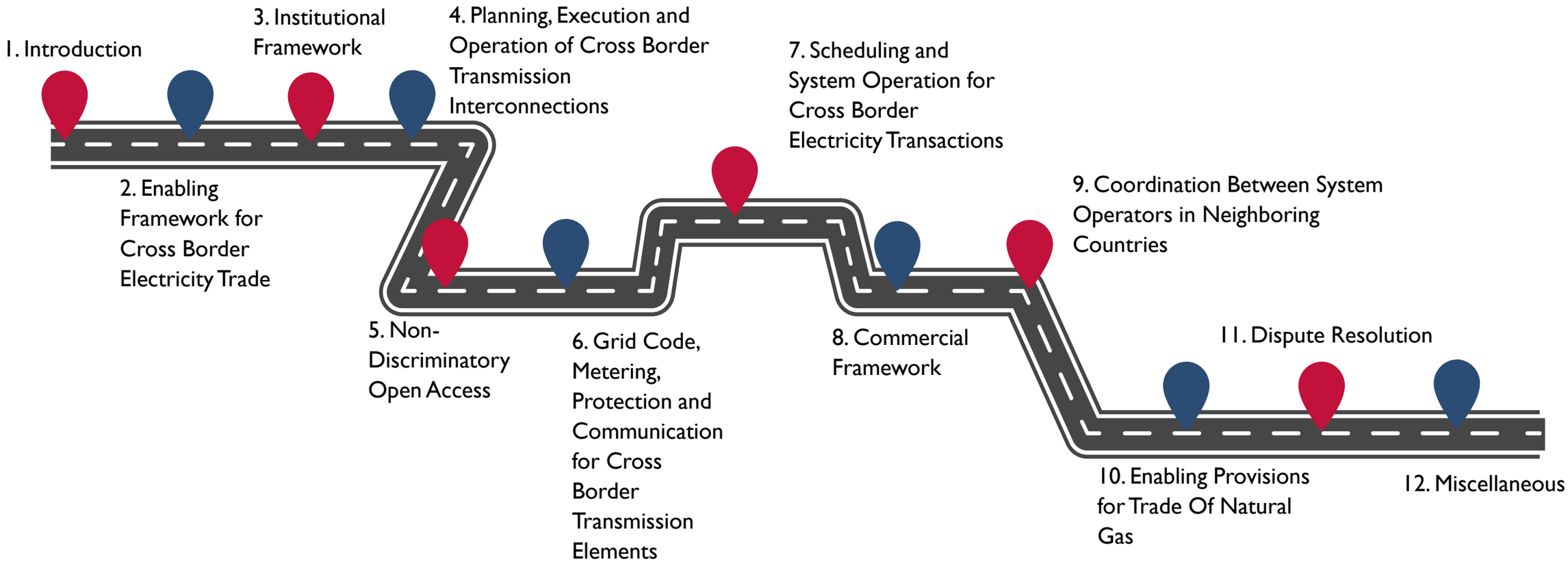
The South Asian countries other than Maldives can continue with the existing work initiated by SARI/EI on developing a "Common Minimum Grid Code" template. This will help in maintaining the overall document and priorities in the grid code as per preferences of the Government and some level of unity among the various sections of grid code.

5. Trade of natural gas

Similar to the case of electricity, for trade of natural gas, it is preferable that the Government comes up with a policy/guideline/rule on the same. This will then define the further steps for evolution of market in this regard.

Common Minimum Harmonized and Standardized Template of energy/electricity regulations for Energy Cooperation

Contents of Common Minimum Harmonized and Standardized Template



Key features of Common Minimum Harmonized and Standardized Template (1/6)

Key terms defined:

CBET Authorization	Authorization granted by the Government to a Participating Entity for participating in CBET
Authorized Participating Entities	Participating Entities which have obtained Authorization for CBET
Dedicated Interconnection	Cross Border Transmission Interconnections constructed for the use of single or multiple Participating Entities, for the entire lifetime of such interconnections
National Transmission Utility	Entity which has overall responsibility for operating and maintaining the national transmission network
National System Operator	Agency entrusted with the scheduling and operational of national level transmission grid of each Country
Open Access (OA)	Non-discriminatory provision for the use of transmission network by any Participating Entities
Open Access Nodal Agency	STOA Nodal Agency, MTOA Nodal Agency or LTOA Nodal Agency for processing OA applications
Regulatory Authority	Regulatory body, which is entrusted with the regulation of electricity sector at the national level, in each Country
Settlement Nodal Agency	Nodal agency as notified Government of each country for settlement of grid operation related charges with the entities in neighboring countries
Shared Interconnection -	Cross Border Transmission Interconnections which are constructed without any permanently identified users
Short Term, Medium Term and Long Term OA	OA for up to one month; three month to five years; and not less than fifteen years respectively
Transmission Planning Agency	Agency designated so by the Government of each Country for undertaking transmission planning at national level
Transmission Service Provider	Entity which owns and operates a transmission line

Key features of Common Minimum Harmonized and Standardized Template (2/6)

Role of key entities

Regulatory Authority	• Approve guidelines for OA • Notify OA nodal agencies • Develop transmission pricing framework, and determine transmission tariffs • Develop transmission loss determination mechanism • Define terms and conditions for power traders, and power market platforms
Transmission Planning Agency	• Plan new CBET interconnections • Finalize specifications for metering, network protection and communication facilities for Cross Border Transmission Interconnections
National System Operator	• Operate the national system including cross border transactions • Conduct system studies and publish corridor wise total transmission capacity, available transmission capacity, and available transmission margins, for the current period and forecast for the future period
CBET Transmission Service Provider	• Own, operate and maintain Cross Border Transmission Interconnections, including the associated metering systems, network protection systems, voice and data communication systems • Provide adequate information and data to National System Operator and Open Access Nodal Agencies, for matters relating to energy accounting, settlement and Open Access.

Key features of Common Minimum Harmonized and Standardized Template (3/6)

Transmission Planning

Shared Interconnections

- TPA to assess the need for new interconnections, at least once in a year
- Participating Entities can also request TPA to consider new lines
- Tariff to be determined / adopted by Regulatory Authority

Dedicated Interconnections

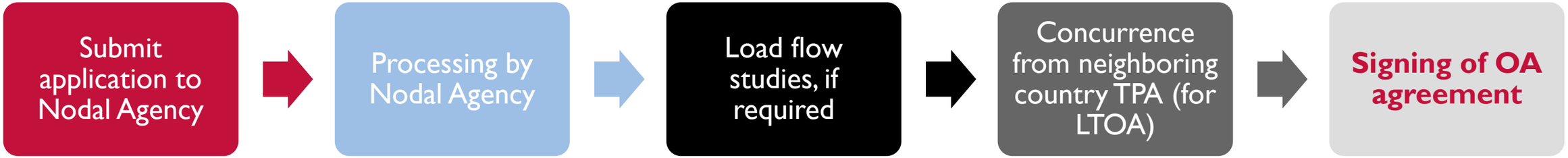
- To be built by the relevant Participating Entities, after obtaining approval of TPA
- Not bound to ensure Open Access

Key features of Common Minimum Harmonized and Standardized Template (4/6)

Open Access

- Authorized Participating Entities shall have the right to obtain **Open Access** to transmission network, covering the **national transmission grid and Shared Interconnections**, for undertaking Cross Border Trade.

- **Procedure for approval**



Key features of Common Minimum Harmonized and Standardized Template (5/6)

Key technical aspects

GRID CODE	Strive to ensure harmony – Common Minimum Grid Code
METERING, PROTECTION AND COMMUNICATION	TPA to finalize metering, and protection system specification, after consulting with System Operator System Operator to finalize communication system specification, after consulting with TPA
SCHEDULING	Done for each Cross Border Transmission Interconnection point, for each 15 minute time interval. Schedule to be submitted before 5 PM IST of prev. day
SYSTEM OPERATION	System Operation as per respective grid codes Deviation Settlement mechanism as per applicable country regulations National System Operator of Remote Country to be informed about major outages

Key features of Common Minimum Harmonized and Standardized Template (6/6)

Other aspects

Energy accounting

A committee constituted by the National System Operator, with representatives from National Transmission Utility and CBET Transmission Service Providers shall be constituted to prepare monthly energy accounts at the national level for CBET

Dispute Settlement

In case of disputes relating to Cross Border Electricity Trade between entities registered under different Countries, if the dispute cannot be resolved in an amiable manner, the parties may approach an international arbitration forum at a neutral country for dispute resolution

Emergency Procedures

Black start support to neighboring country's system operator (on commercial basis)

Information Sharing

System operators to ensure seamless information sharing with system operator of neighboring country

87

Roadmap and action plan

The broader process of adoption of the "common minimum template"

88

Country wise roadmap (1/2)

Components	Current scenario	Intermediate scenario	Ideal target scenario
Common components for Afghanistan, Bangladesh, Bhutan, Nepal, Sri Lanka			
Adoption of harmonized template regulations for regional energy cooperation	Specific regulations for regional energy cooperation do not exist	Harmonized template regulations customized to the needs of Afghanistan prepared	Harmonized template regulations customized for Afghanistan adopted and implemented
Afghanistan			
Regulatory interventions other than adoption of harmonized template regulations	Grid code does not exist	Formation of a team for development of grid code	Grid code developed and adopted
Bangladesh and Bhutan			
Regulatory interventions other than adoption of harmonized template regulations	Detailed regulations for scheduling, system balancing, and deviation settlement does not exist	Formation of a team for development of regulations for scheduling, system balancing, and deviation settlement	Regulations for scheduling, system balancing, and deviation settlement developed and adopted

Country wise roadmap (2/2)

Components	Current scenario	Intermediate scenario	Ideal target scenario
Nepal			
Regulatory interventions other than adoption of harmonized template regulations	Regulations for scheduling, system balancing, deviation settlement, power trading, open access and transmission pricing does not exist	Formation of a taskforce/ working group/technical assistance team for development of regulatory framework	Regulations for scheduling, system balancing, deviation settlement, power trading, open access and transmission pricing developed and adopted
Pakistan			
Regulatory interventions other than adoption of harmonized template regulations	Competitive market trial operations are undergoing	Regulatory interventions identified based on results of CTBCM trial operations	Regulatory interventions implemented based on results of CTBCM trial operations
Sri Lanka			
Regulatory interventions other than adoption of harmonized template regulations	Regulatory framework for transmission pricing exists as part of overall bulk supply tariff determination	Formation of a taskforce/ working group/technical assistance team for amendment of Tariff Methodology, to cover transmission pricing as a standalone element	Tariff Methodology amended to cover transmission pricing as a standalone element

Thank You

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID).

Assessment of Potential Benefits of Cross Border Electricity Trade & Framework for Ancillary Services Market in South Asia

Integrated Research and Action for Development (IRADe)

February 2023

KPMG.com/in

Table of Contents

Objective of the Study

Assessing the Potential Benefits of Cross Border Electricity Trade for Affordable Supply of Electricity, Facilitating, Grid Balancing of Renewable Energy Integration, and Suggesting a Framework for Ancillary Service Market in the South Asia

Uniqueness of the study

- *Detailed Modelling of power system operations of BBINS over 8760 hours*
- *Nuanced Cost Sensitivity Analysis for transmission enhancement, regional supply balance, and cross border sharing of reserves*
- *Convexification of non-linear unit startup/ shutdown decision modelling*
- *Computation of capacity credits of RE generation under regional cooperation*

Scope of Work

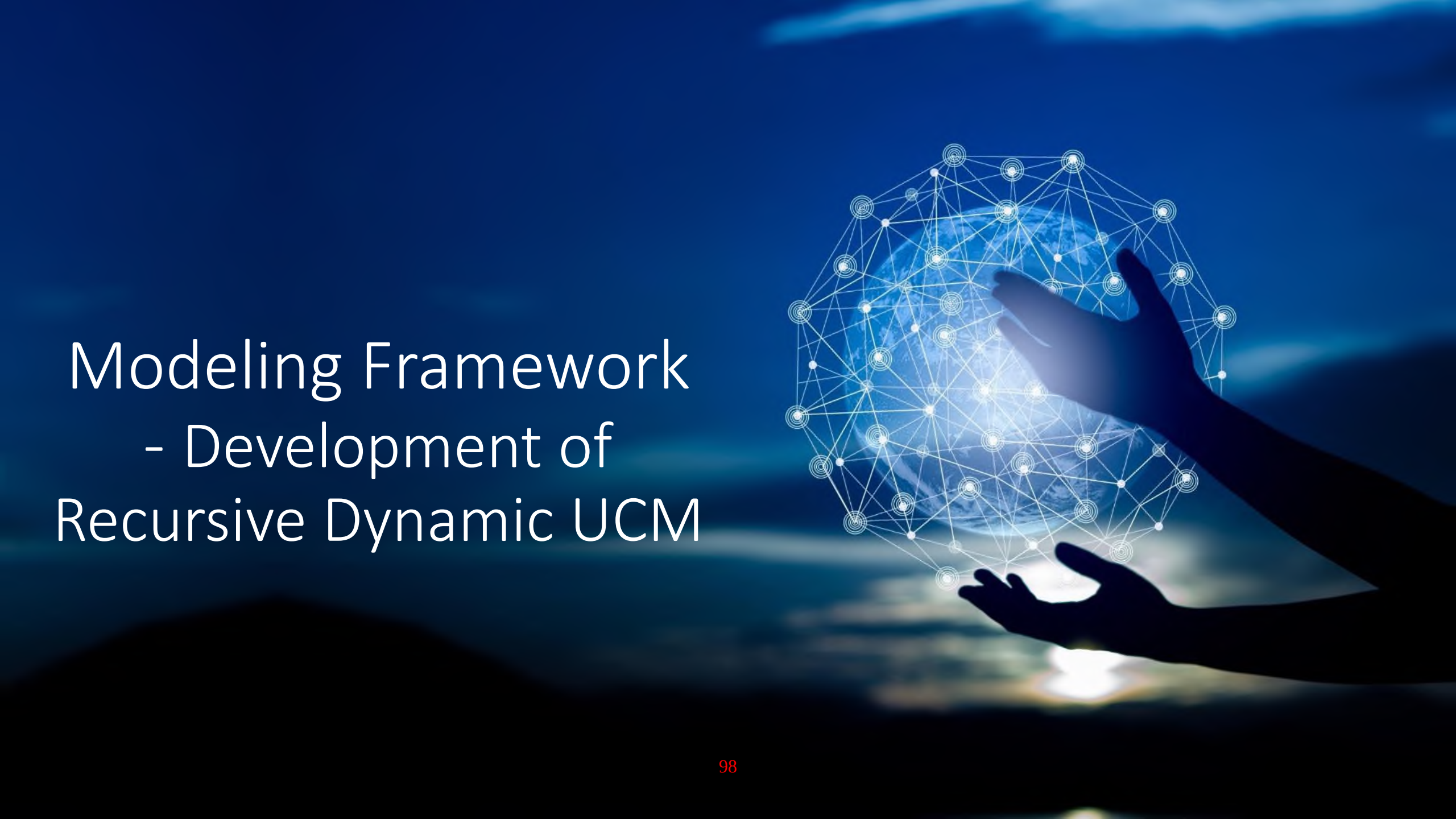
Scope of Work

Quantification of the economic benefits of enhanced South Asian regional cooperation and integration

Objective 1	Review and Analyze the current and future demand – supply positions of each South Asian country, including growth of renewables, for the next 15 years
Objective 2	Carry out comprehensive energy modelling exercise to assess the impact of various constraints on power system operations (Taking the reserve requirements into consideration)
Objective 3	Review and analyze the existing market mechanism related to grid balancing in each country and the region and its associated policy, regulatory, legal and technical frameworks.
Objective 4	Suggest a draft roadmap (regional and country wise) as well as an action plan for implementation of the regional framework for ancillary services market in the region.

Methodology & Approach

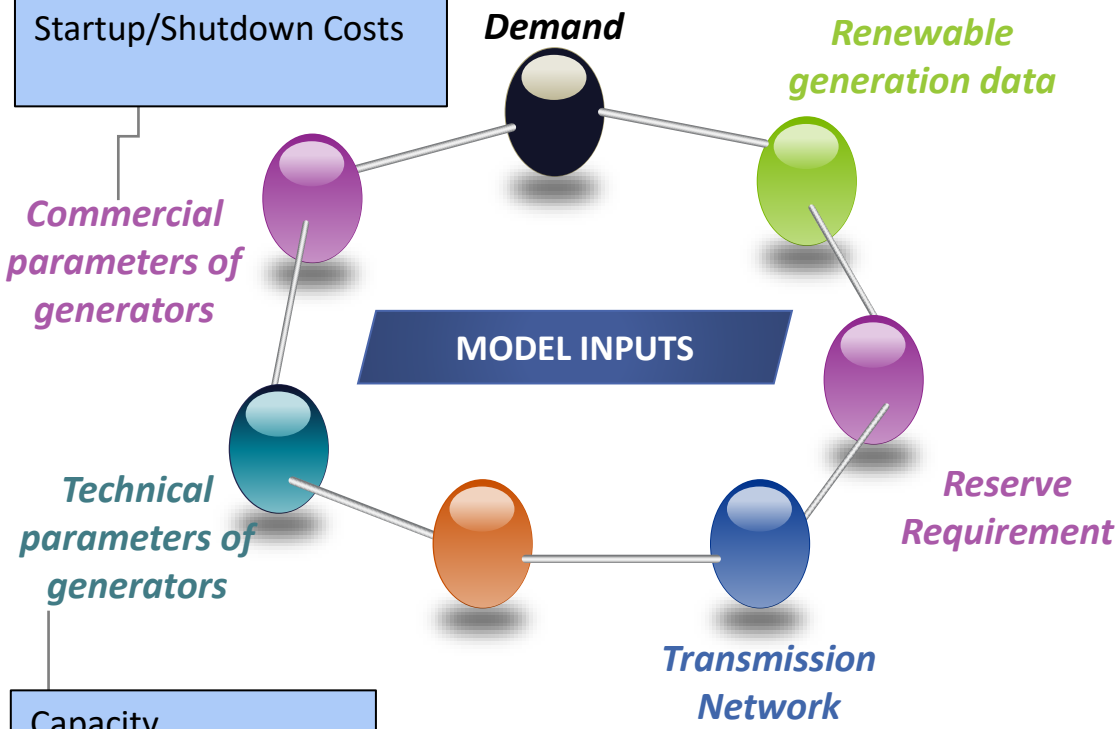
Modeling Framework - Development of Recursive Dynamic UCM



Methodology: Unit Commitment Modelling for 2019-20

UCM runs for 10 days at a time, in a recursive dynamic way (where the final "state" of the power system for the previous day would be assumed as a "start point" for the following day), summing up to model runs for 8760 hours in a year

Variable costs
Fixed costs
Startup/Shutdown Costs



Capacity
Ramp Rates
Technical minimum output
Minimum up/down time

Optimization Engine

Mixed Integer Linear Programming

(Convexification)

MODEL Outputs

- Optimal schedules of generators
- Optimal quantum of power to be bought or sold
- Transmission flows
- Optimal reserves to be maintained

Model Size

Component	Unit Commitment for 2019
Total generators	775
Zones	33
Transmission lines	60 interzonal connections
Number of Hours Considered	8760
Number of Variables in the Model	85-95 Lakhs per quarter
Number of Constraints	85-95 Lakhs per quarter
Number of Scenarios	7

Model Characteristics	Unit Commitment for 2019
Software Used	GAMS
Maximum RAM Utilized per quarter	30 GB
Processor Speed	2.39 GHz
Model Run Time	3-5 hours per quarter per scenario on 256 GB RAM Machine
Number of Simulations	28 (4 simulations per scenario, one for each quarter)

Scenarios considered for the study

Scenario	Assumption on Inter Country Transmission	Assumption of Reserve Management
Scenario 1	No Transmission	Local Management of Reserves for each zone
Scenario 2	Existing Transmission (Constrained)	Local Management of Reserves for each zone
Scenario 3	Existing Transmission (Constrained)	At least 50% of reserves to be maintained locally in each zone
Scenario 4	Existing Transmission (Constrained)	No restriction on import of reserves
Scenario 5	Unconstrained Transmission	Local Management of Reserves for each zone
Scenario 6	Unconstrained Transmission	At least 50% of reserves to be maintained locally in each zone
Scenario 7	Unconstrained Transmission	No restriction on import of reserves

Key Analysis & Findings

How does 2019 analysis shed light on the next steps for enhanced cooperation?

- What are the cost savings from South Asian regional integration?
- How sensitive are the costs to
  - Regional Trading of Electricity (Merit Order Dispatch)
  - Cross border Transmission Enhancement
  - Cross border sharing of reserves

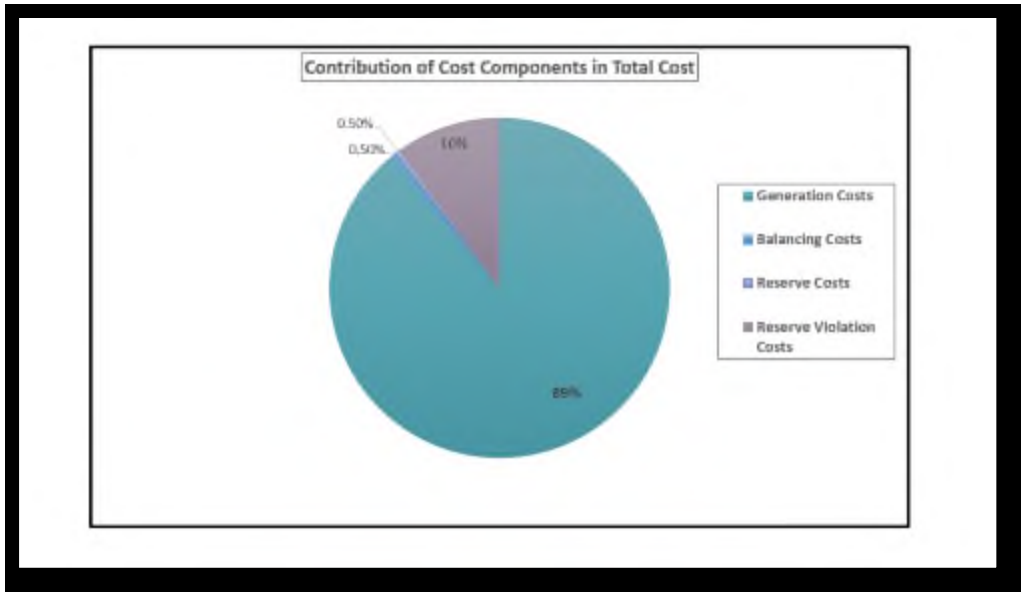
TOTAL COST COMPARISON IN 2019 - 2020

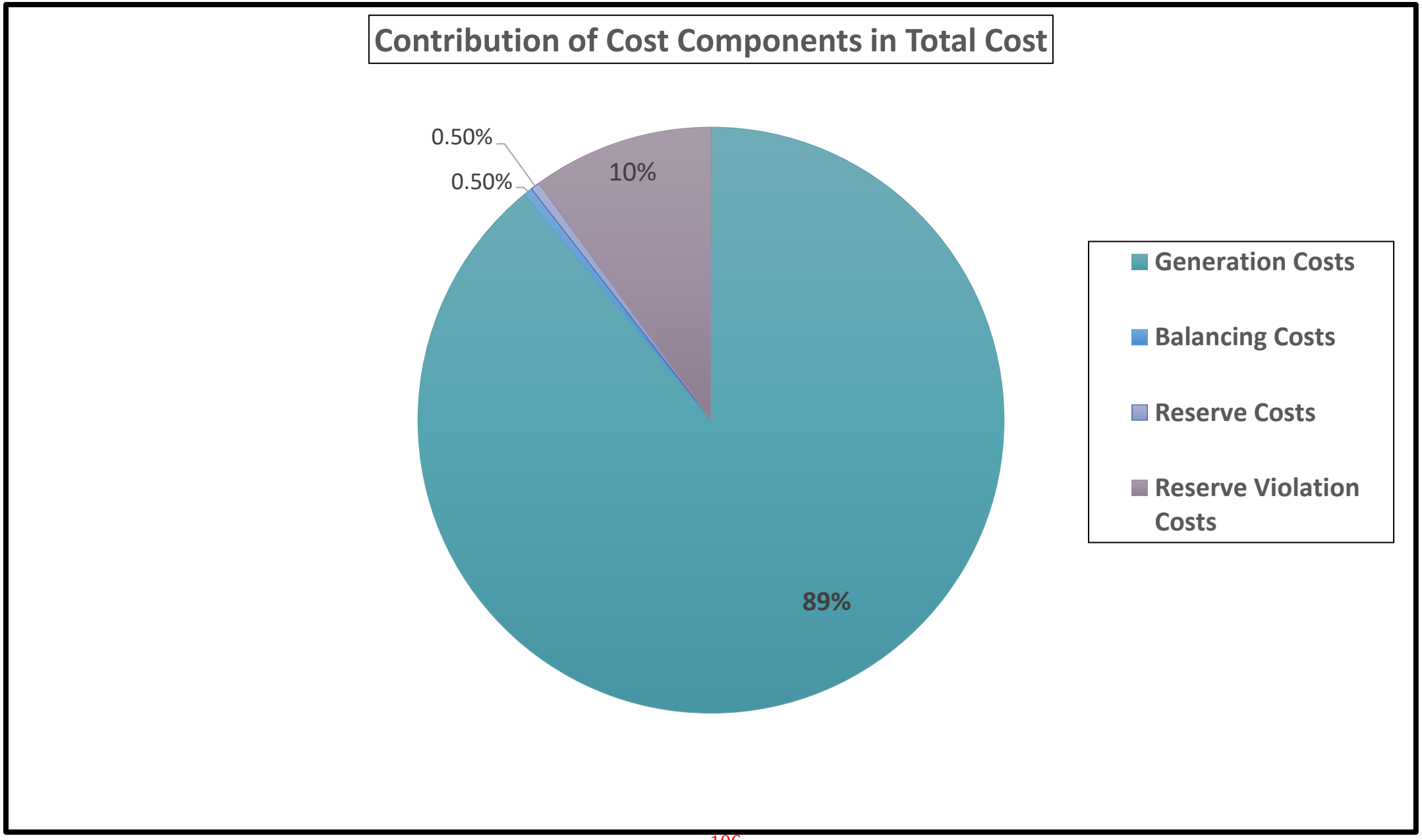
Scenario	BANGLADESH	BHUTAN	INDIA	NEPAL	SRI LANKA	TOTAL	BENEFIT OF REGIONAL COOPERATION (%)
No Transmission	2386	1752	30096	1671	1052	36957	-
Constrained Transmission, Local Reserves	1853	1752	30387	1557	1051	36600	1%
Constrained Transmission, Imported Reserves (50%)	1842	1752	30235	1554	1053	36435	1.5%
Constrained Transmission, Imported Reserves (100%)	1841	876	29956	690	1051	34415	7%
Unconstrained Transmission, Local Reserves	1185	876	30923	699	406	34089	8%
Unconstrained Transmission, Imported Reserves (50%)	1201	0	30746	79	420	32446	12%
Unconstrained Transmission, Imported Reserves (100%)	1211	0	30620	0	431	32262	13%

Cost Components

The benefits of regional cooperation have been assessed in terms of variable costs of generation, balancing costs, costs of maintaining reserves and cost of reserve violations.

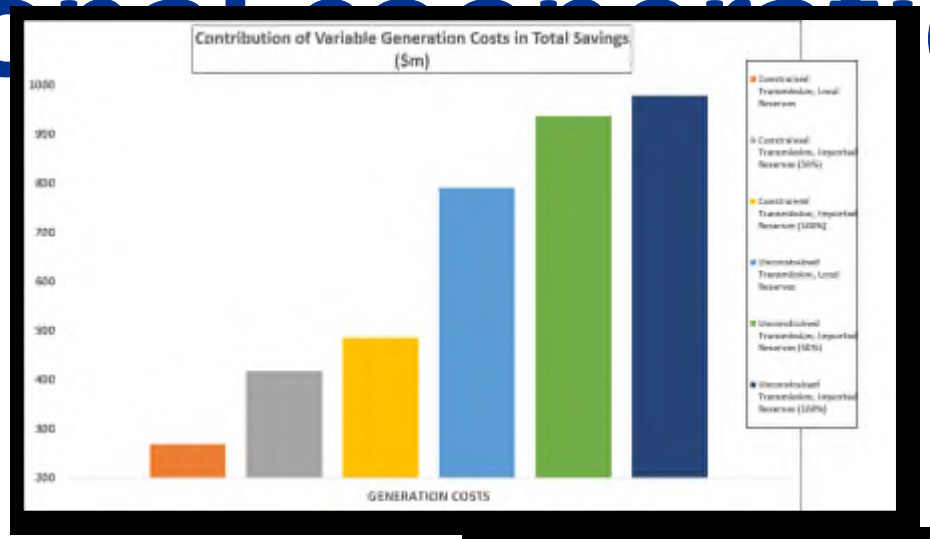
Generation Costs	The variable costs per unit of production of energy.
Balancing Costs	The startup and the shutdown costs of the generators.
Reserve Costs	The costs incurred while maintaining a quantum of reserves.
Reserve Violation Costs	The costs/penalty incurred for meeting the unmet reserves.



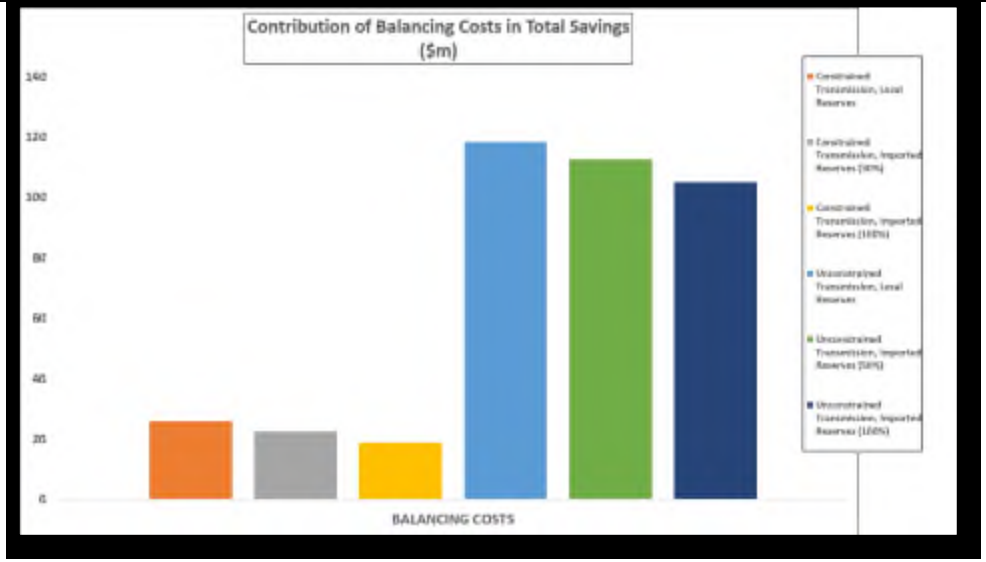

Contribution of Cost Components in Total Cost
0.50%
0.50%
10%
89%
Generation Costs
Balancing Costs
Reserve Costs
Reserve Violation Costs

Savings in Cost Components via regional cooperation

GENERATION COSTS

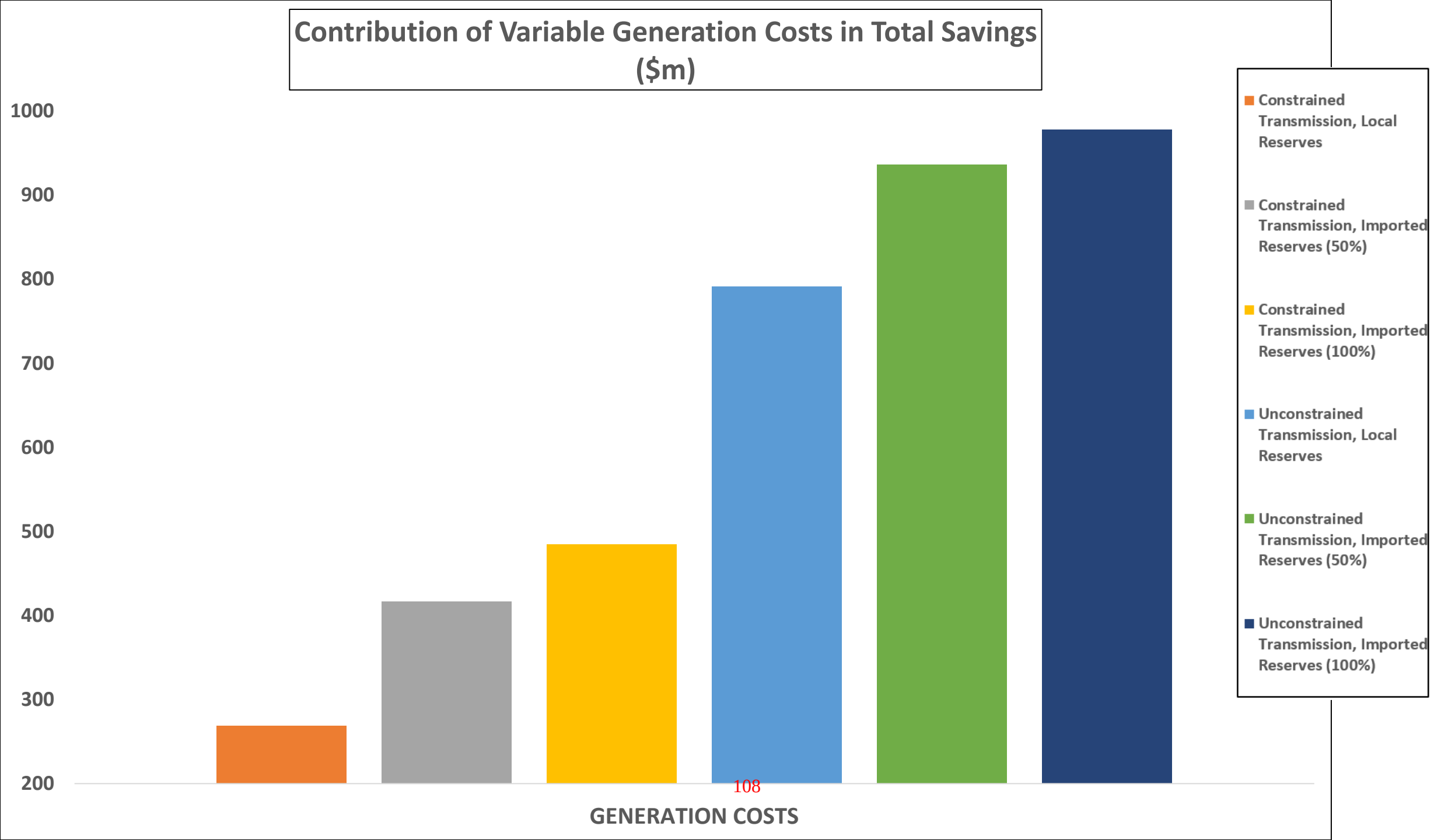


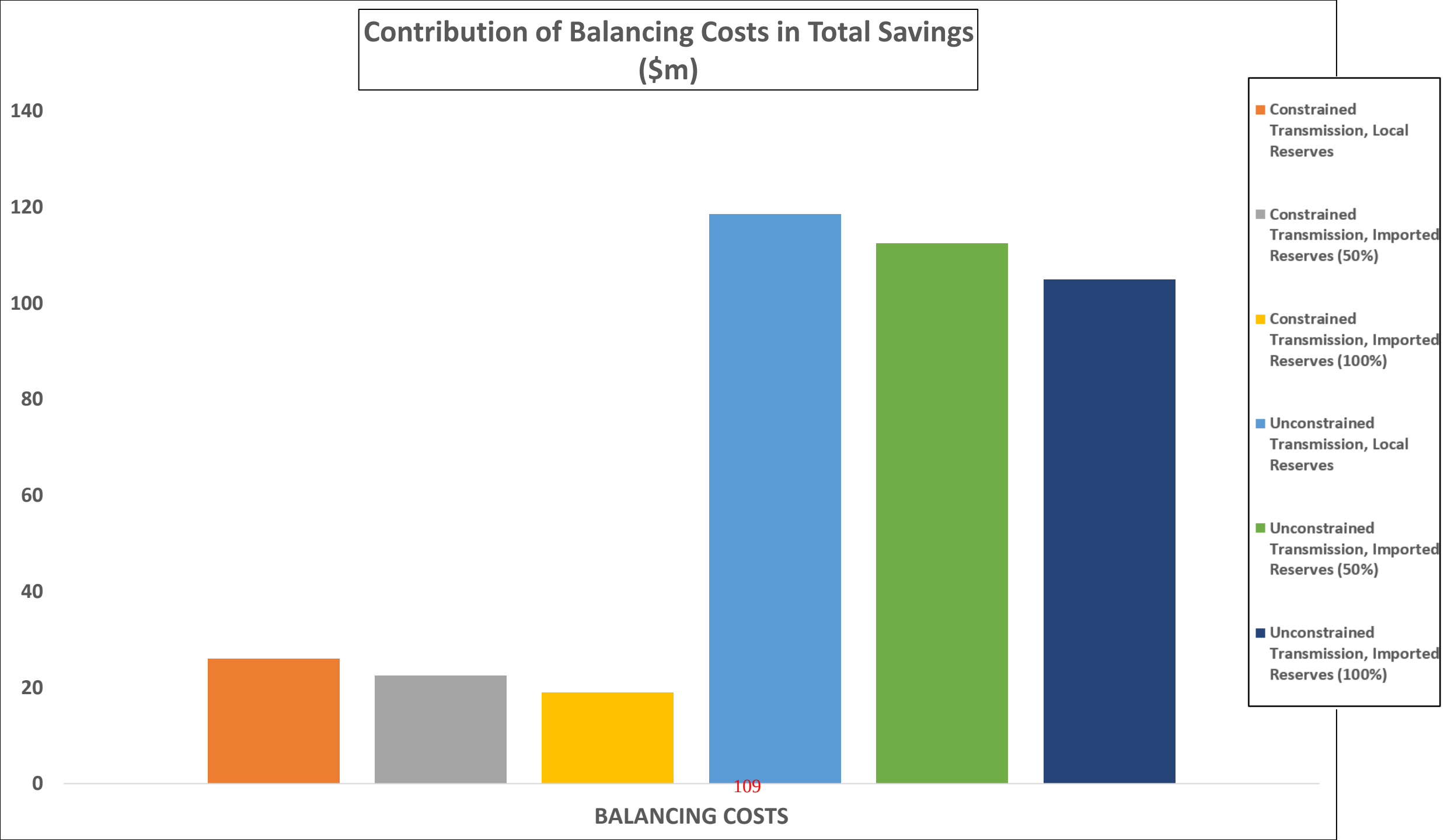
RESERVE VIOLATION COSTS

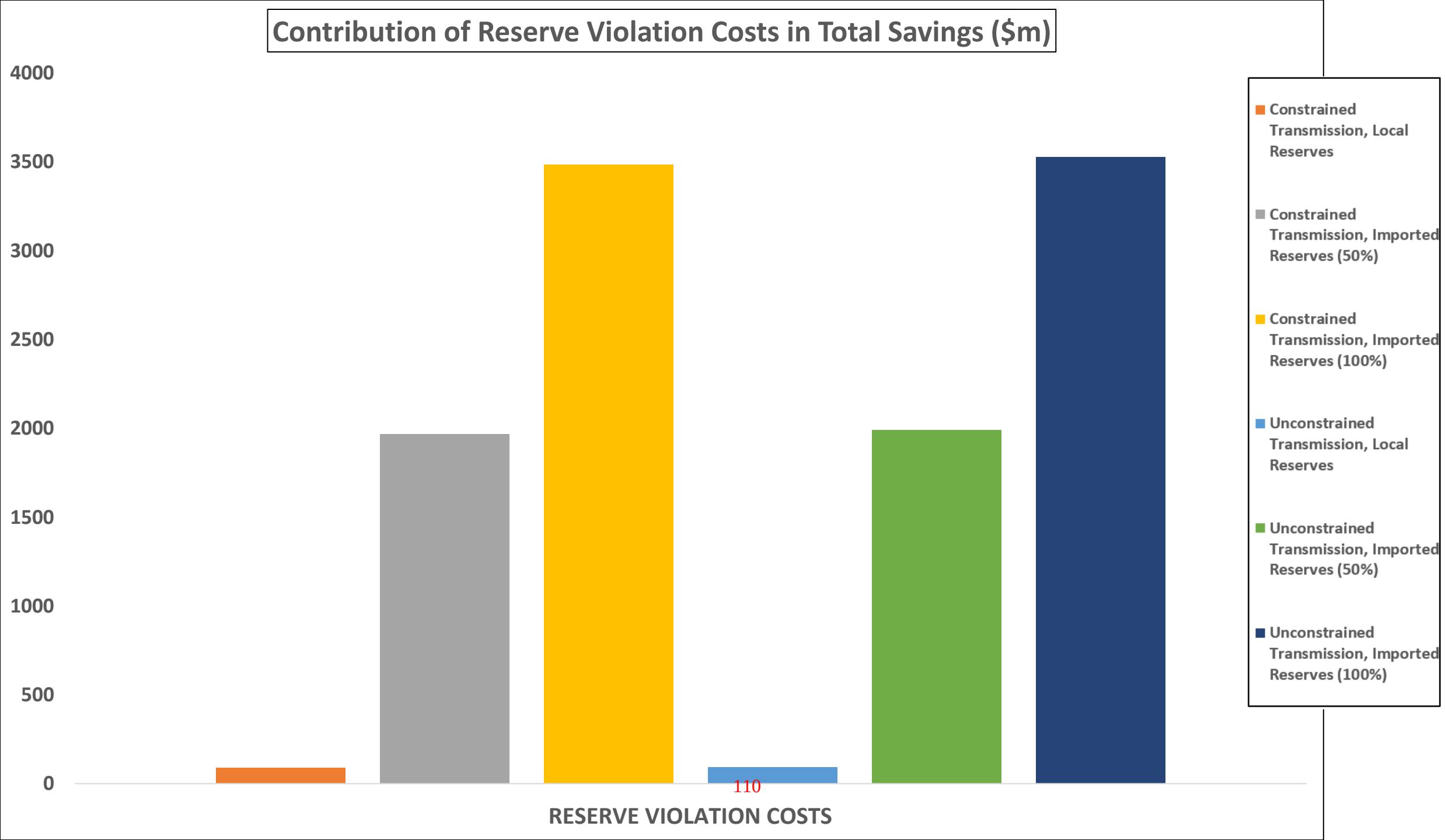


BALANCING COSTS

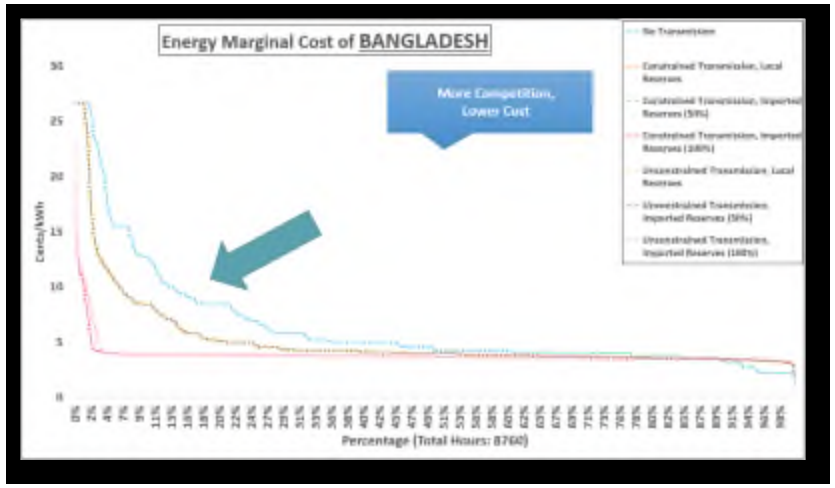
Contribution of Variable Generation Costs in Total Savings ($m)



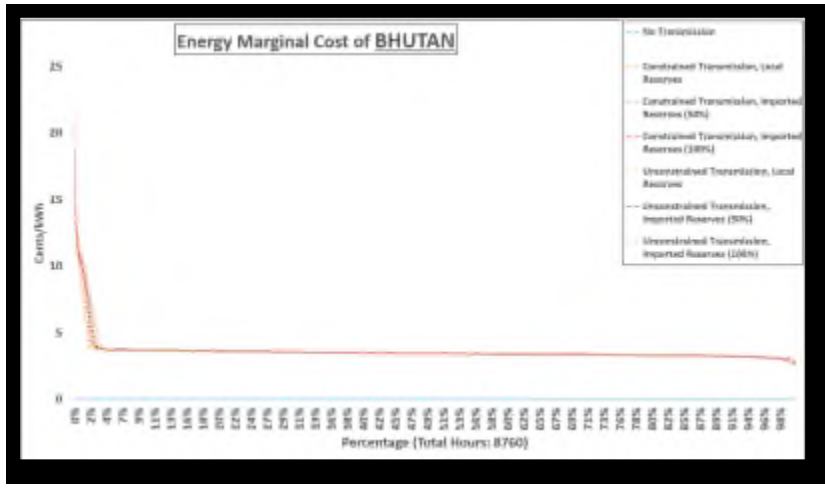

Contribution of Balancing Costs in Total Savings ($m)
140
120
100
80
60
40
20
0
Constrained Transmission, Local Reserves
Constrained Transmission, Imported Reserves (50%)
Constrained Transmission, Imported Reserves (100%)
Unconstrained Transmission, Local Reserves
Unconstrained Transmission, Imported Reserves (50%)
Unconstrained Transmission, Imported Reserves (100%)
BALANCING COSTS


Contribution of Reserve Violation Costs in Total Savings ($m)
4000
3500
3000
2500
2000
1500
1000
500
0
Constrained Transmission, Local Reserves
Constrained Transmission, Imported Reserves (50%)
Constrained Transmission, Imported Reserves (100%)
Unconstrained Transmission, Local Reserves
Unconstrained Transmission, Imported Reserves (50%)
Unconstrained Transmission, Imported Reserves (100%)
RESERVE VIOLATION COSTS

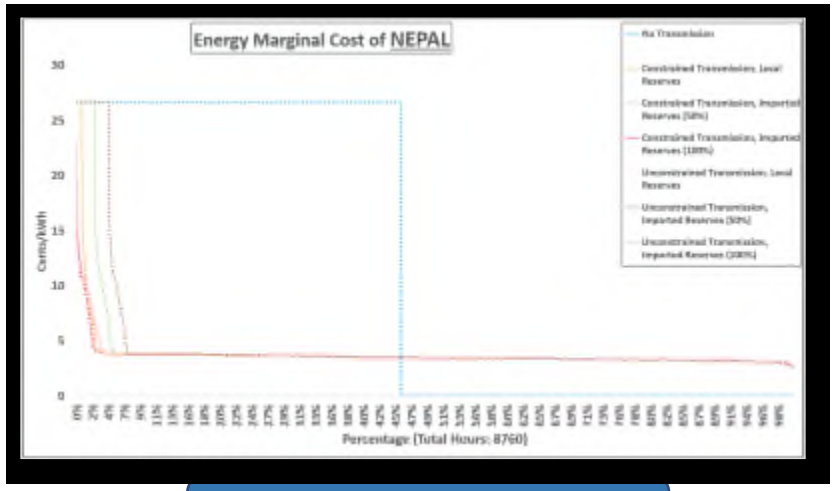
How sensitive are the costs to regional electrical energy cooperation?



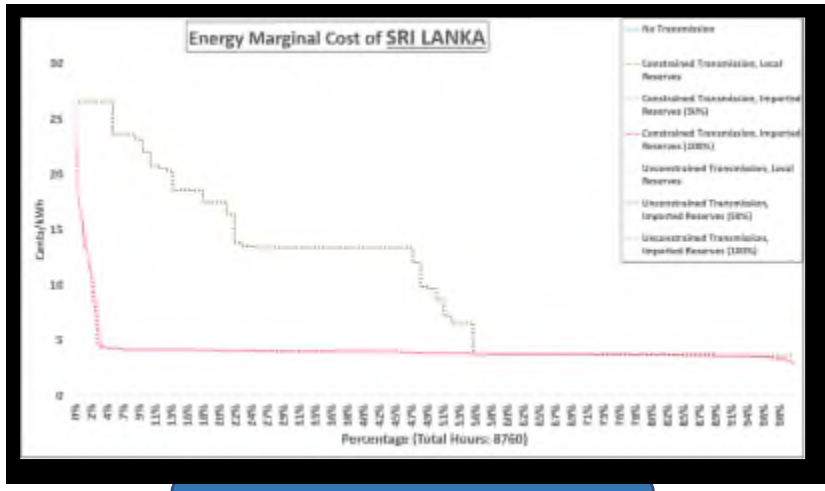
BANGLADESH



BHUTAN

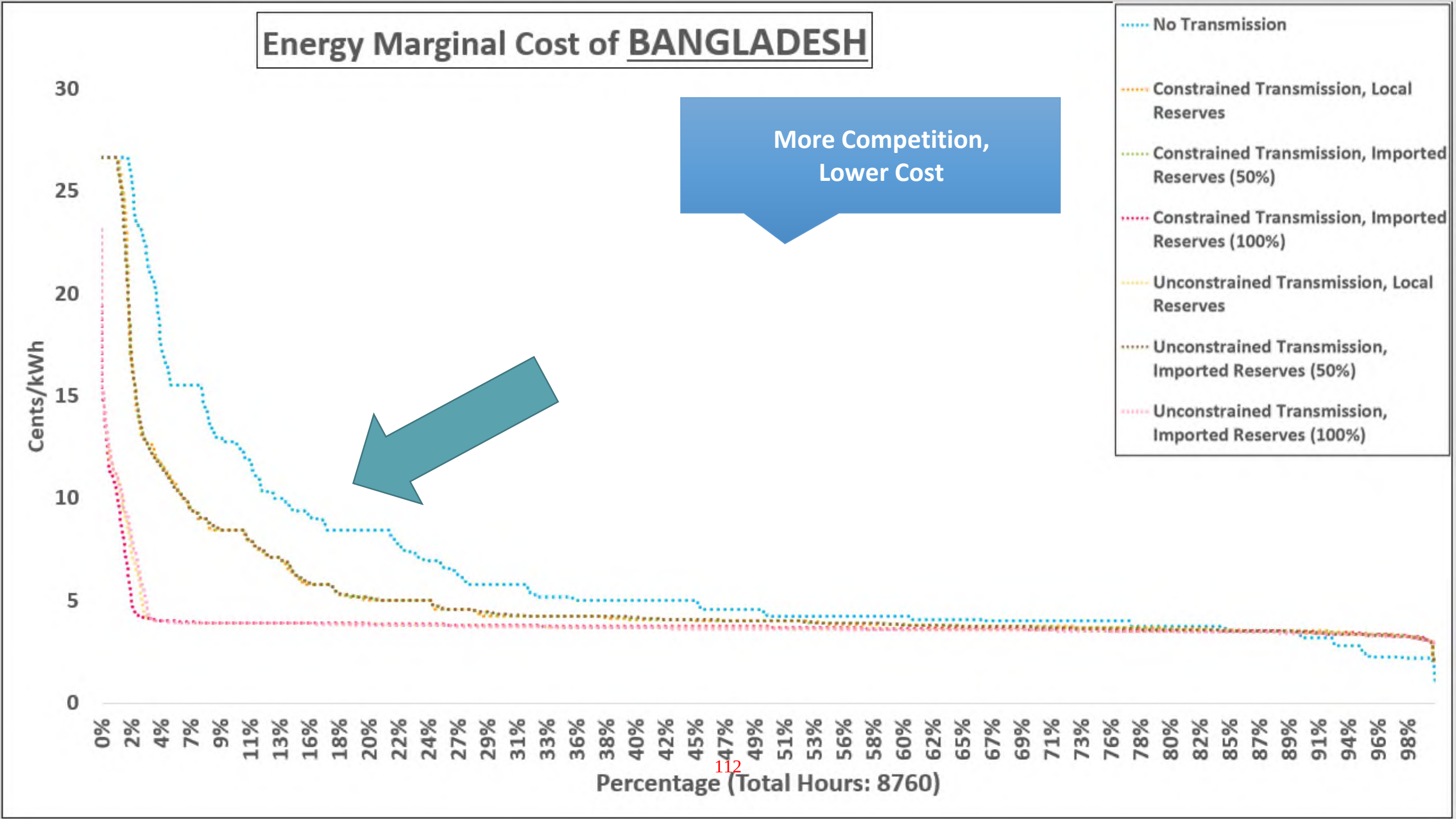


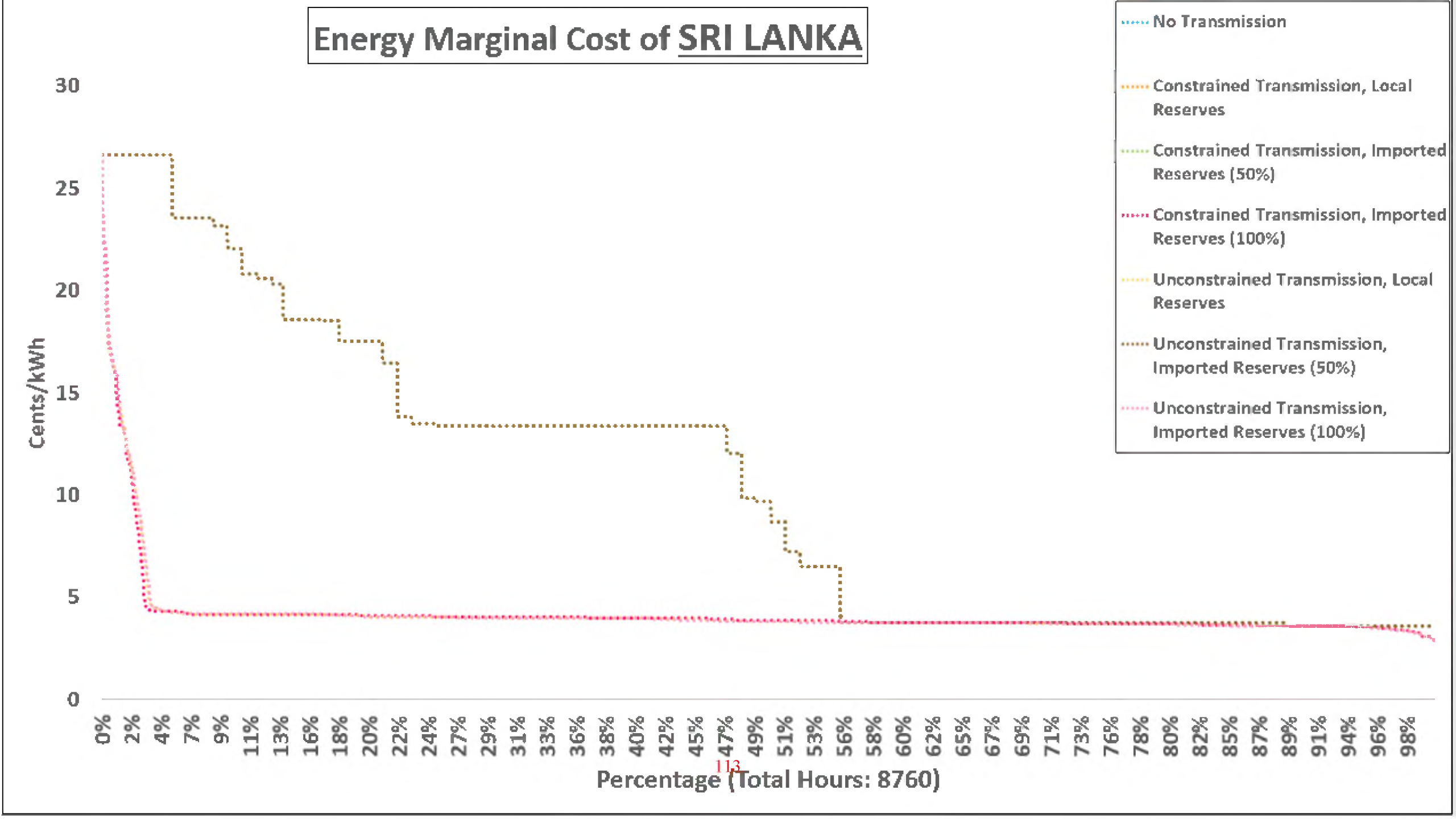
NEPAL

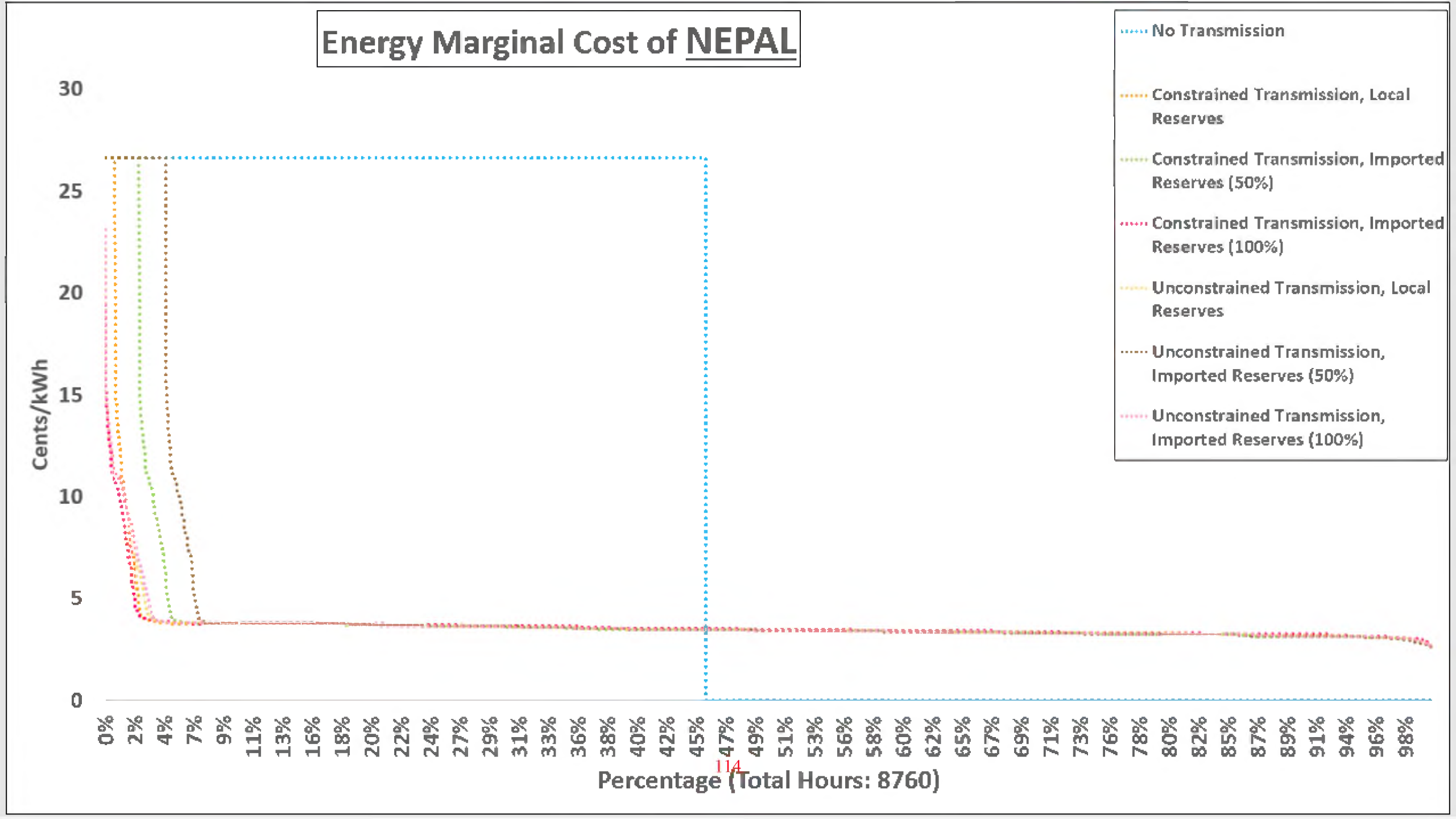


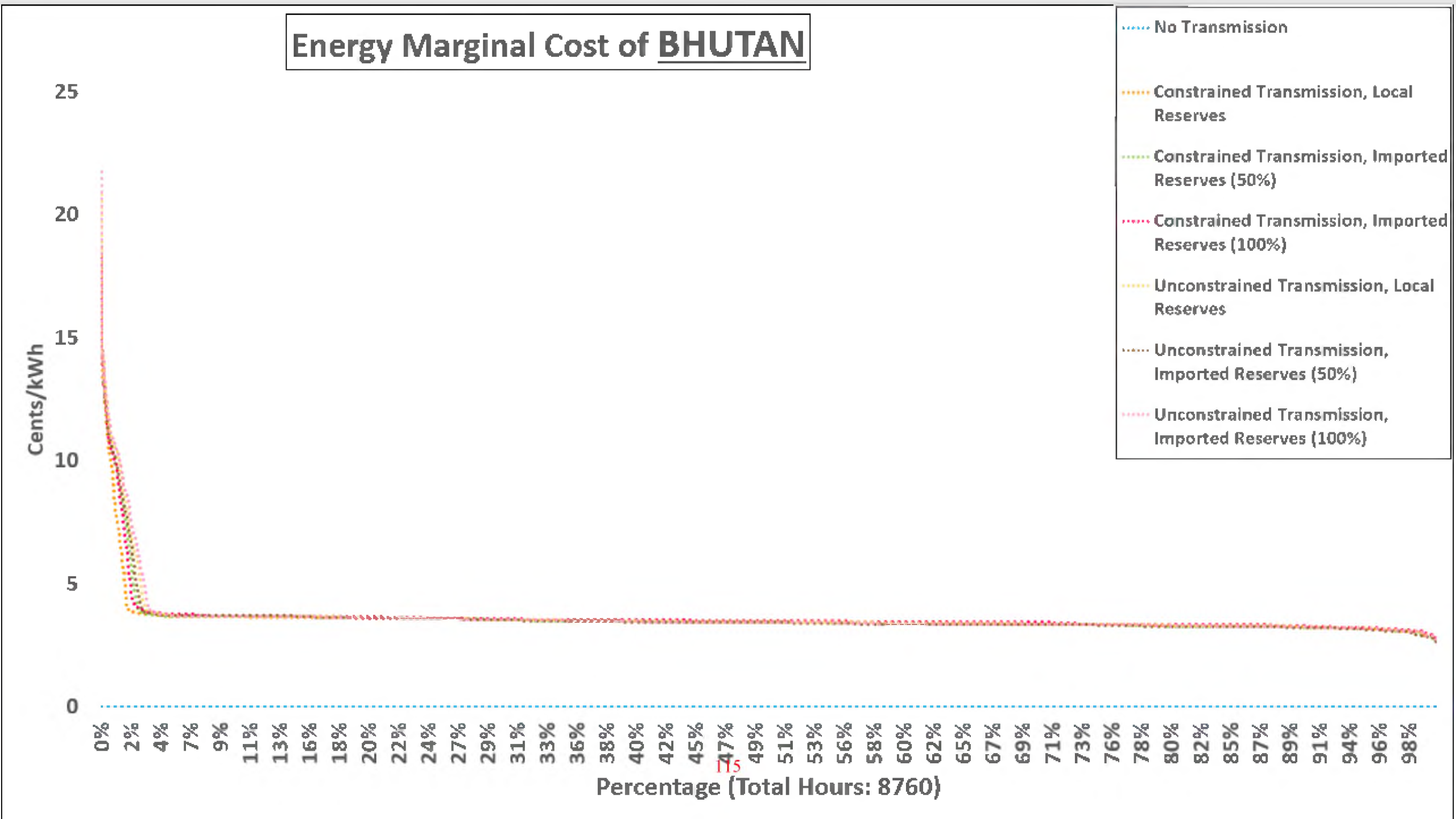
SRI LANKA

Energy Marginal Cost of BANGLADESH

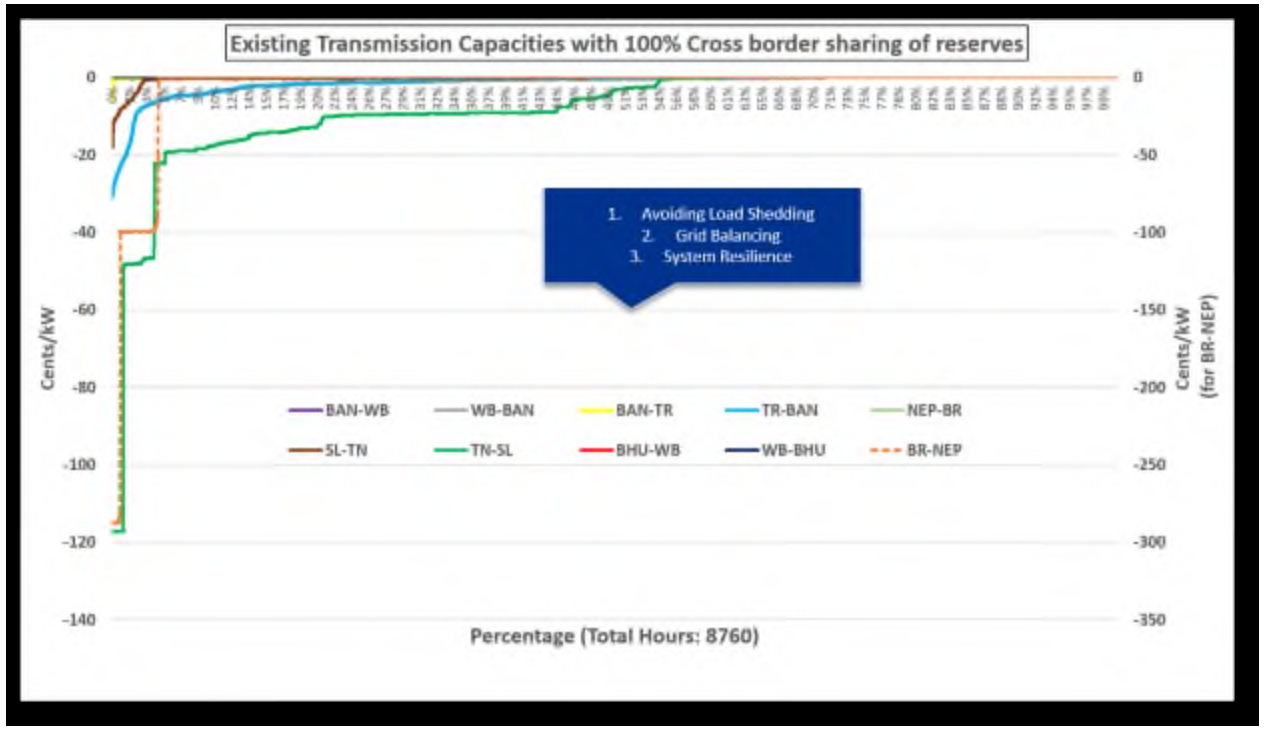



Energy Marginal Cost of SRI LANKA
No Transmission
Constrained Transmission, Local Reserves
Constrained Transmission, Imported Reserves (50%)
Constrained Transmission, Imported Reserves (100%)
Unconstrained Transmission, Local Reserves
Unconstrained Transmission, Imported Reserves (50%)
Unconstrained Transmission, Imported Reserves (100%)
Cents/kWh
30
25
20
15
10
5
0
0%
2%
4%
7%
9%
11%
13%
16%
18%
20%
22%
24%
27%
29%
31%
33%
36%
38%
40%
42%
45%
47%
49%
51%
53%
56%
58%
60%
62%
65%
67%
69%
71%
73%
76%
78%
80%
82%
85%
87%
89%
91%
94%
96%
98%
Percentage (Total Hours: 8760)


Energy Marginal Cost of NEPAL
No Transmission
Constrained Transmission, Local Reserves
Constrained Transmission, Imported Reserves (50%)
Constrained Transmission, Imported Reserves (100%)
Unconstrained Transmission, Local Reserves
Unconstrained Transmission, Imported Reserves (50%)
Unconstrained Transmission, Imported Reserves (100%)
Cents/kWh
30
25
20
15
10
5
0
0%
2%
4%
7%
9%
11%
13%
16%
18%
20%
22%
24%
27%
29%
31%
33%
36%
38%
40%
42%
45%
47%
49%
51%
53%
56%
58%
60%
62%
65%
67%
69%
71%
73%
76%
78%
80%
82%
85%
87%
89%
91%
94%
96%
98%
Percentage (Total Hours: 8760)

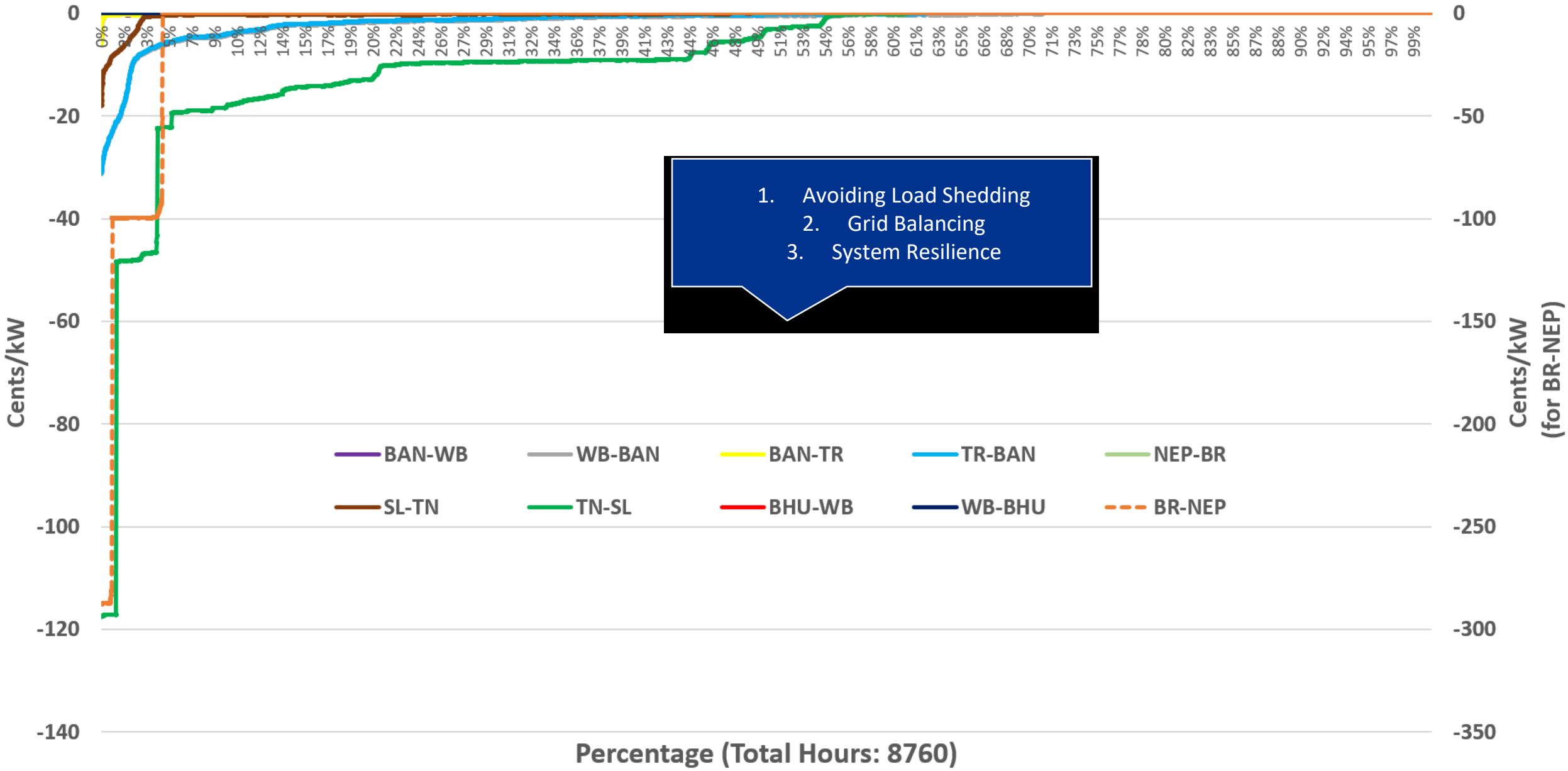

Energy Marginal Cost of BHUTAN
No Transmission
Constrained Transmission, Local Reserves
Constrained Transmission, Imported Reserves (50%)
Constrained Transmission, Imported Reserves (100%)
Unconstrained Transmission, Local Reserves
Unconstrained Transmission, Imported Reserves (50%)
Unconstrained Transmission, Imported Reserves (100%)
Cents/kWh
25
20
15
10
5
0
0%
2%
4%
7%
9%
11%
13%
16%
18%
20%
22%
24%
27%
29%
31%
33%
36%
38%
40%
42%
45%
47%
49%
51%
53%
56%
58%
60%
62%
65%
67%
69%
71%
73%
76%
78%
80%
82%
85%
87%
89%
91%
94%
96%
98%
Percentage (Total Hours: 8760)

How sensitive is the cost to transmission enhancement between various nations?

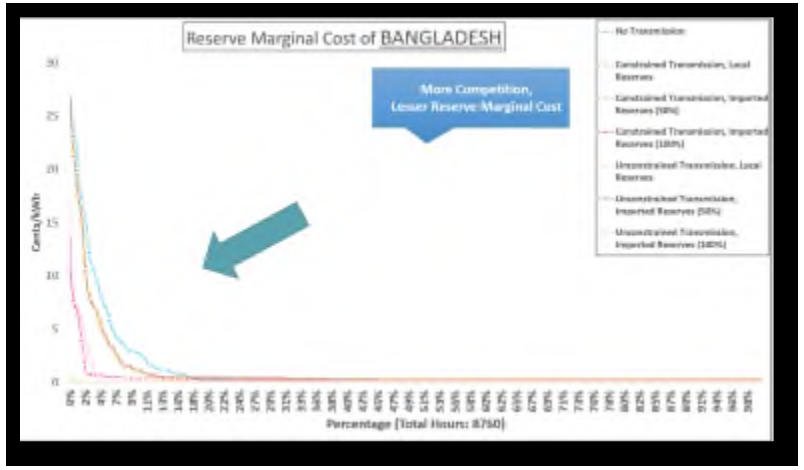


Existing Transmission Capacities with 100% cross border sharing of reserves

Existing Transmission Capacities with 100% Cross border sharing of reserves

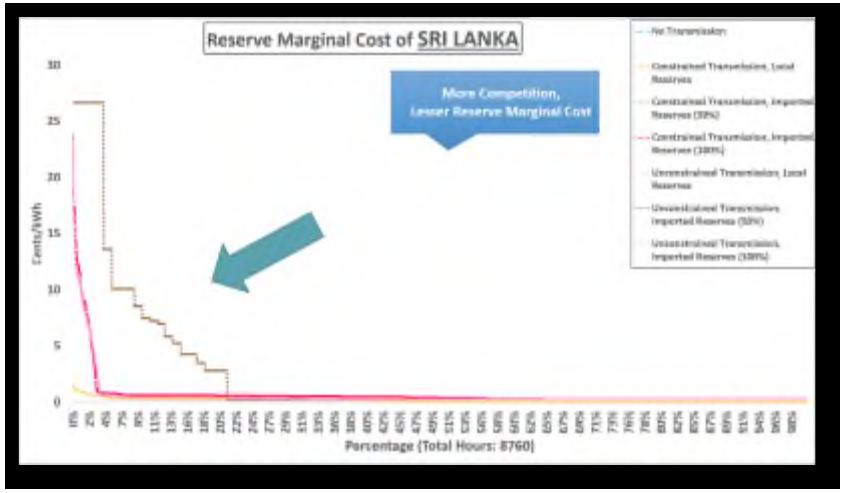


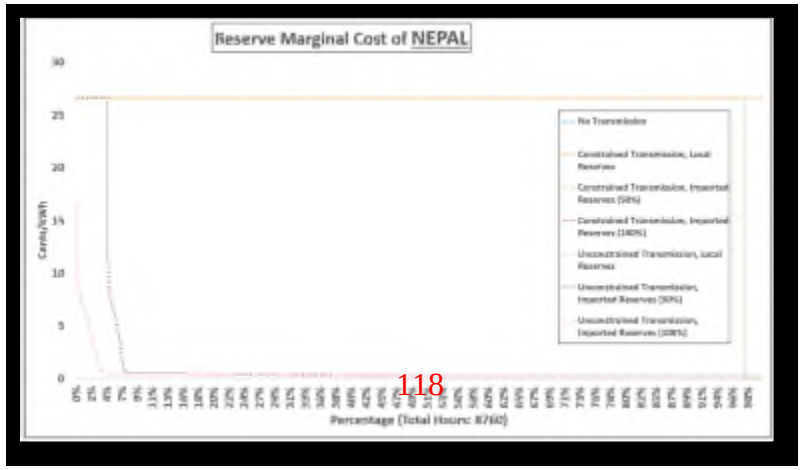
How sensitive are the costs to regional cooperation in ancillary services?



BANGLADESH

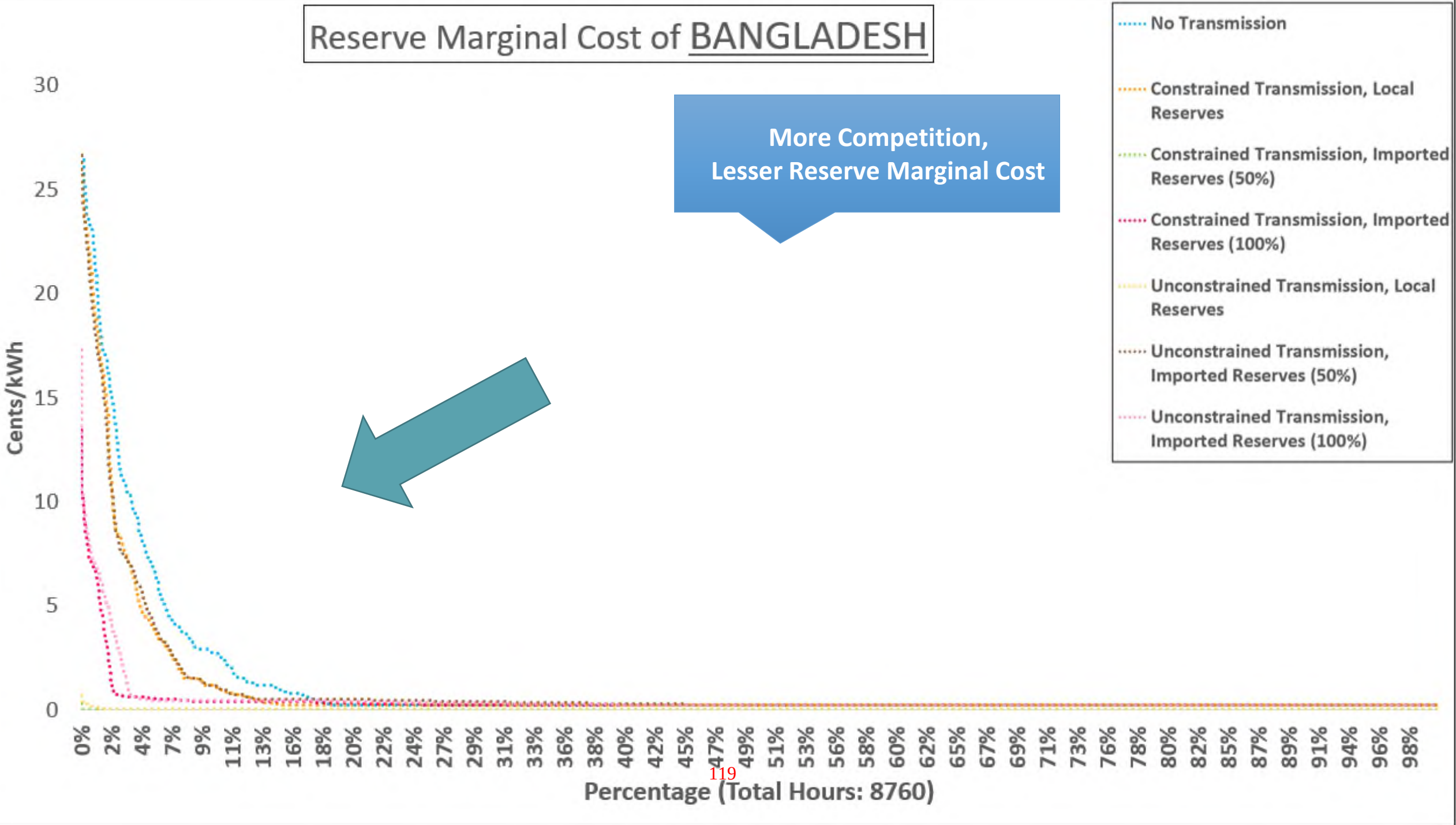
SRI LANKA



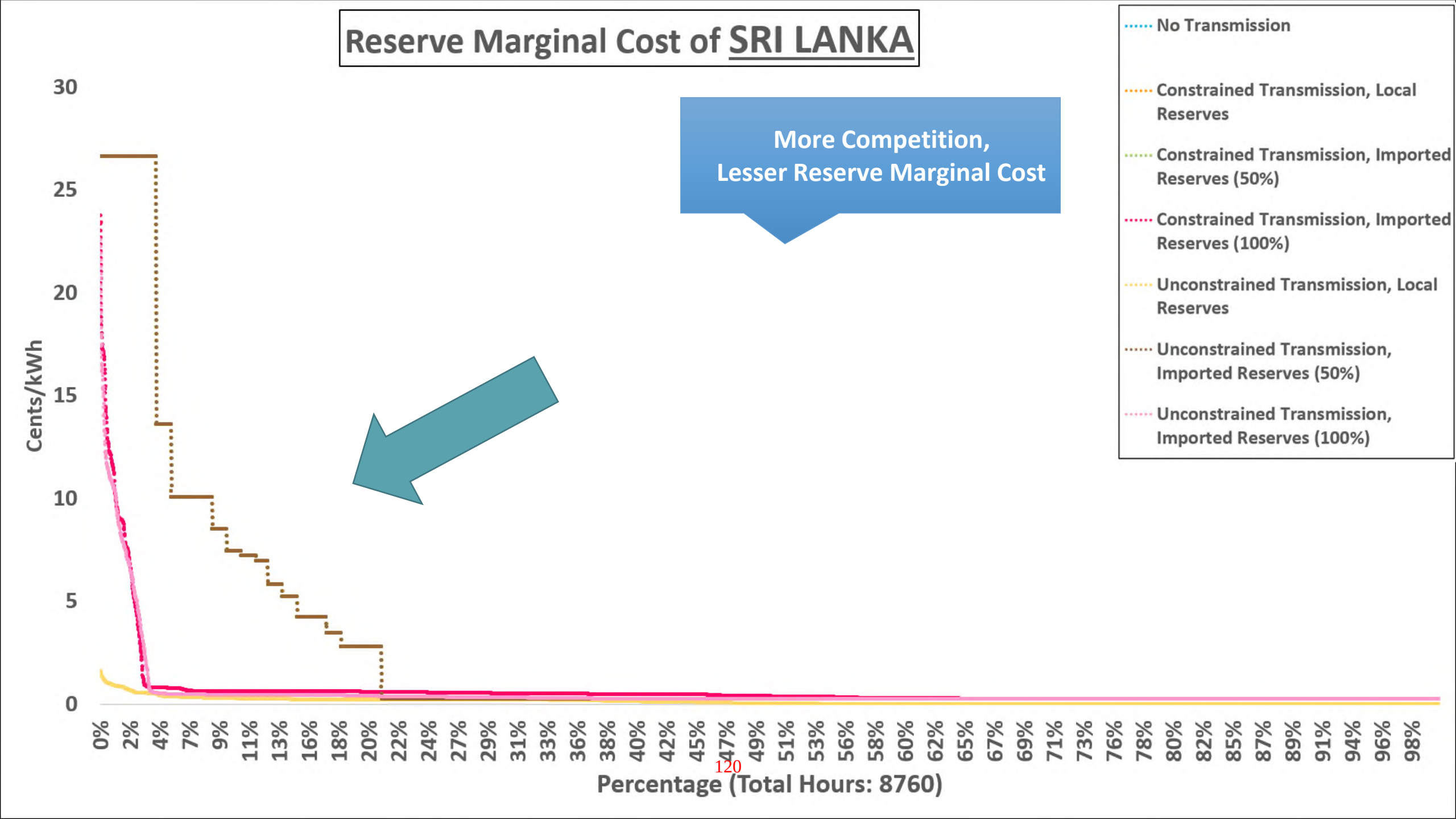


NEPAL

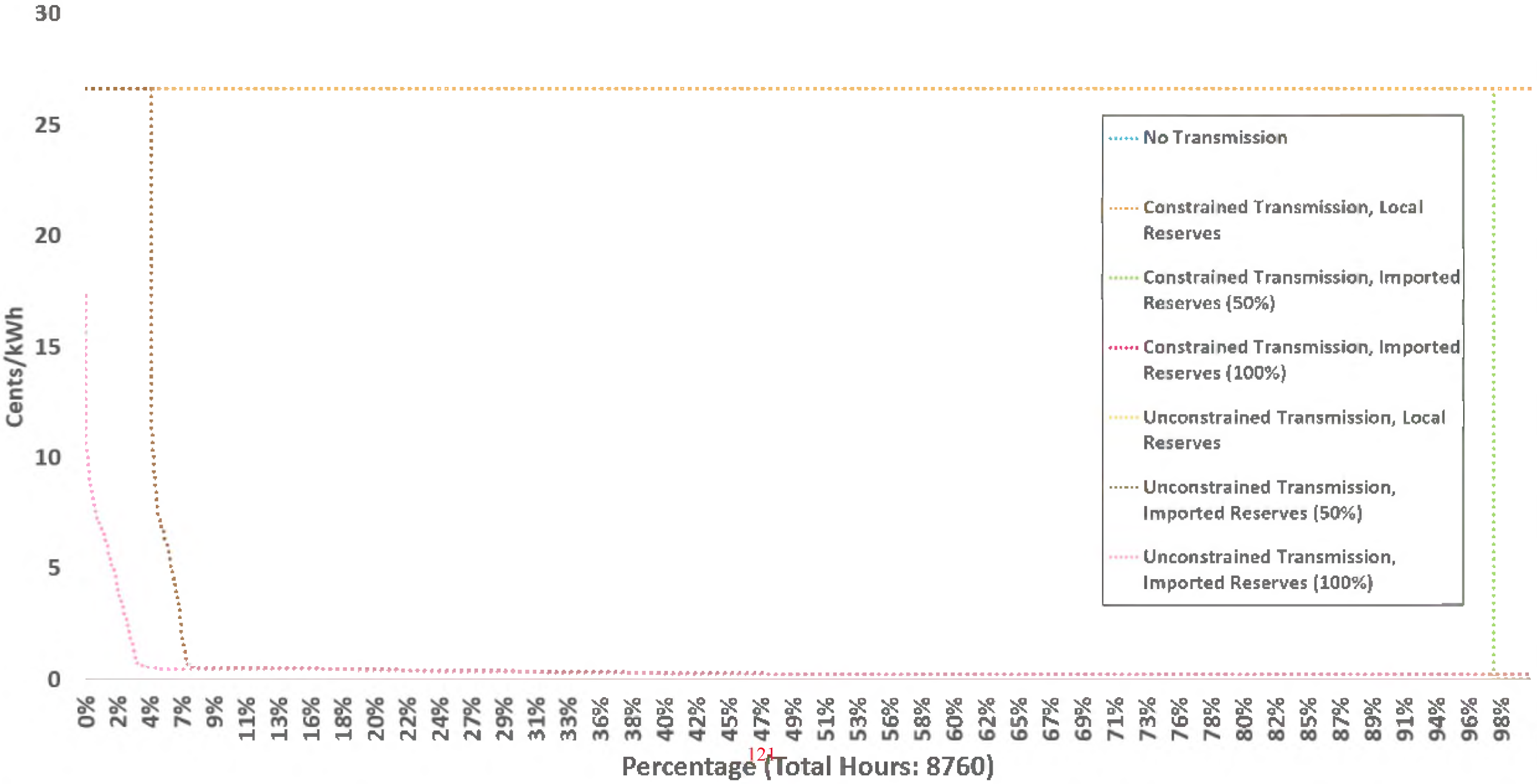
Reserve Marginal Cost of BANGLADESH



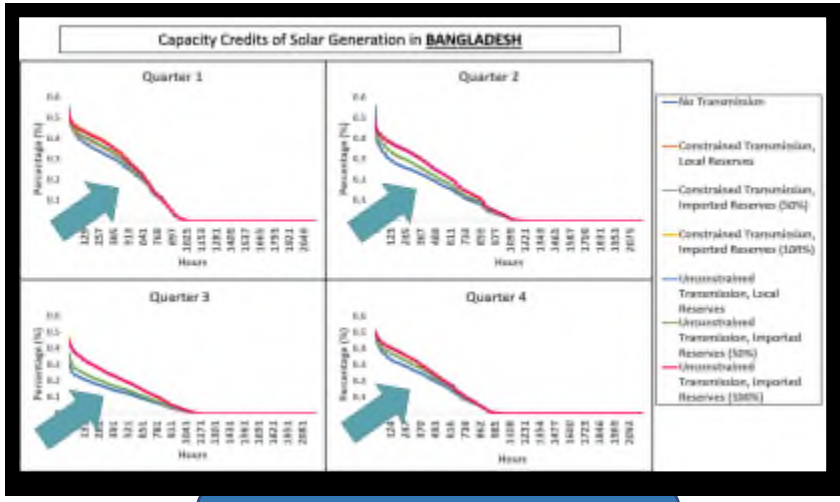
Reserve Marginal Cost of SRI LANKA



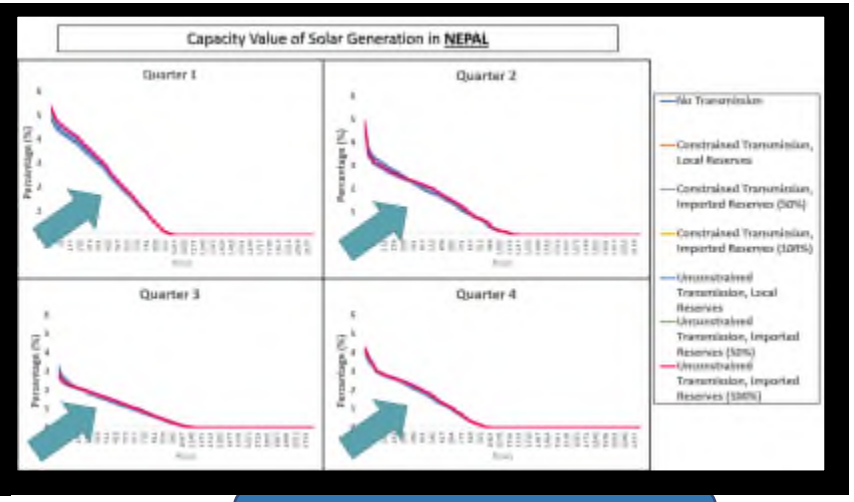
Reserve Marginal Cost of NEPAL



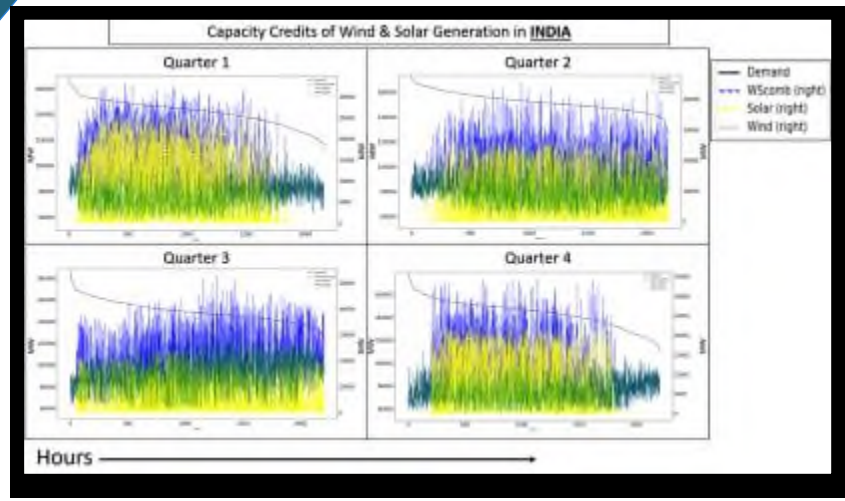
Capacity Credits of Solar & Wind Power Generation



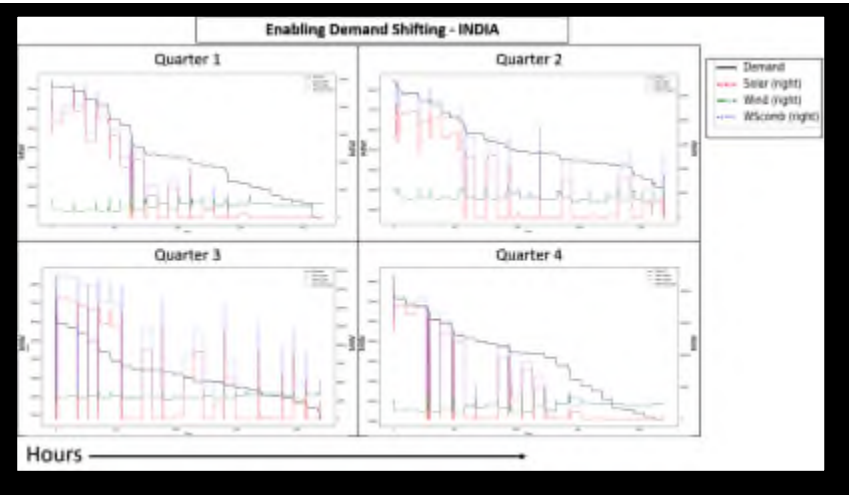
BANGLADESH



NEPAL

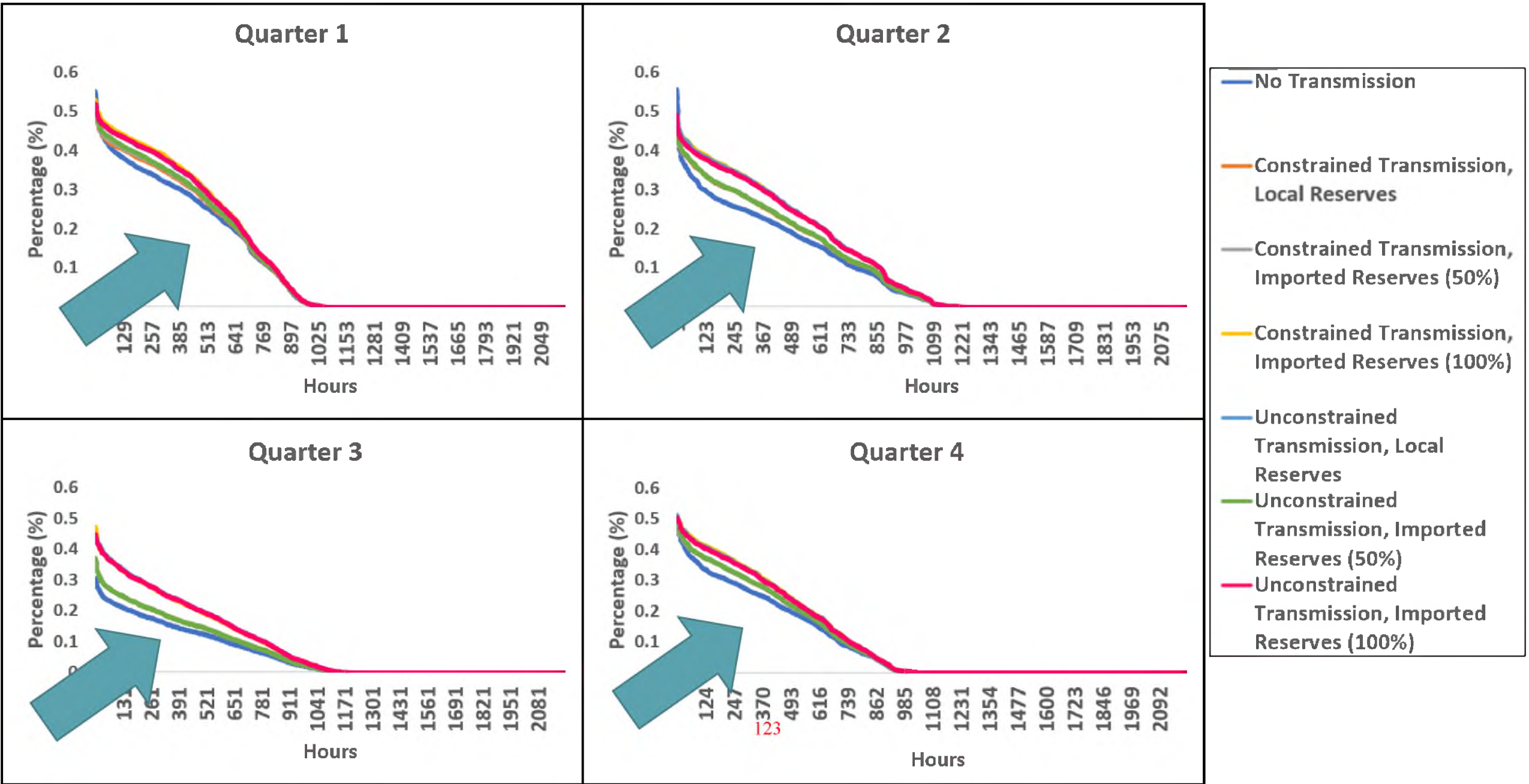


INDIA

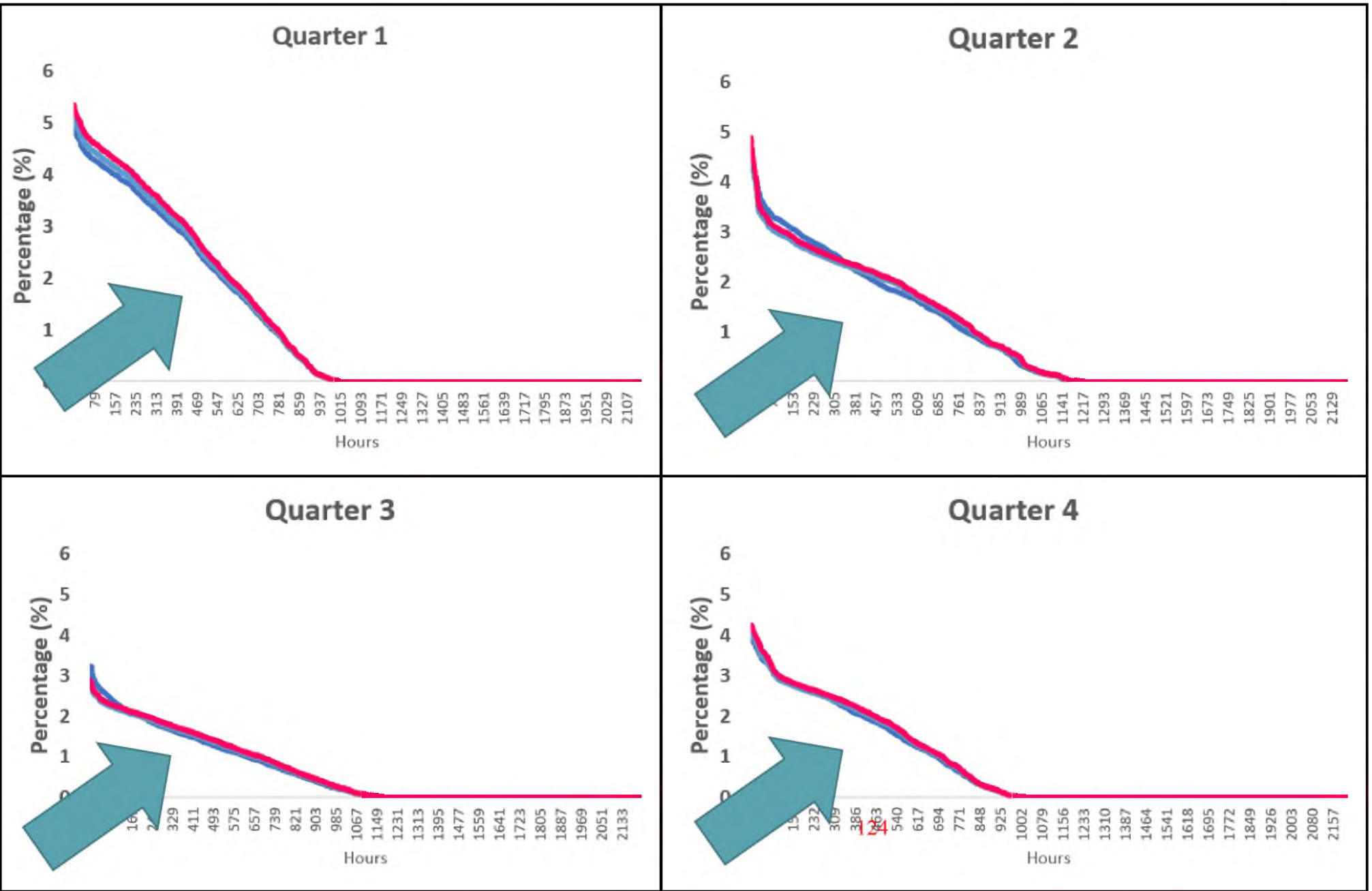


INDIA- ENABLING DEMAND SHIFTING

Capacity Credits of Solar Generation in **BANGLADESH**

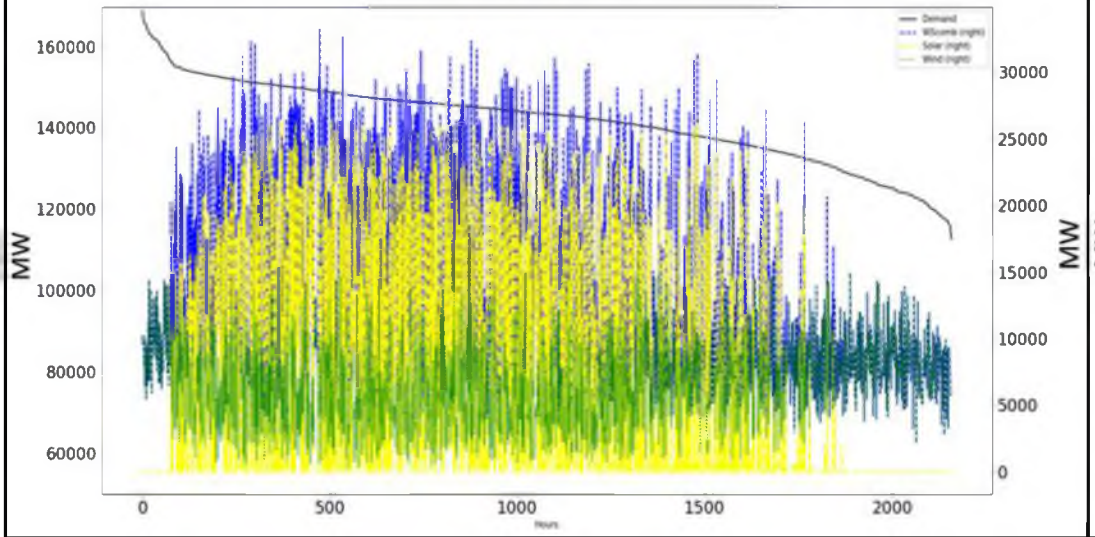


Capacity Value of Solar Generation in **NEPAL**

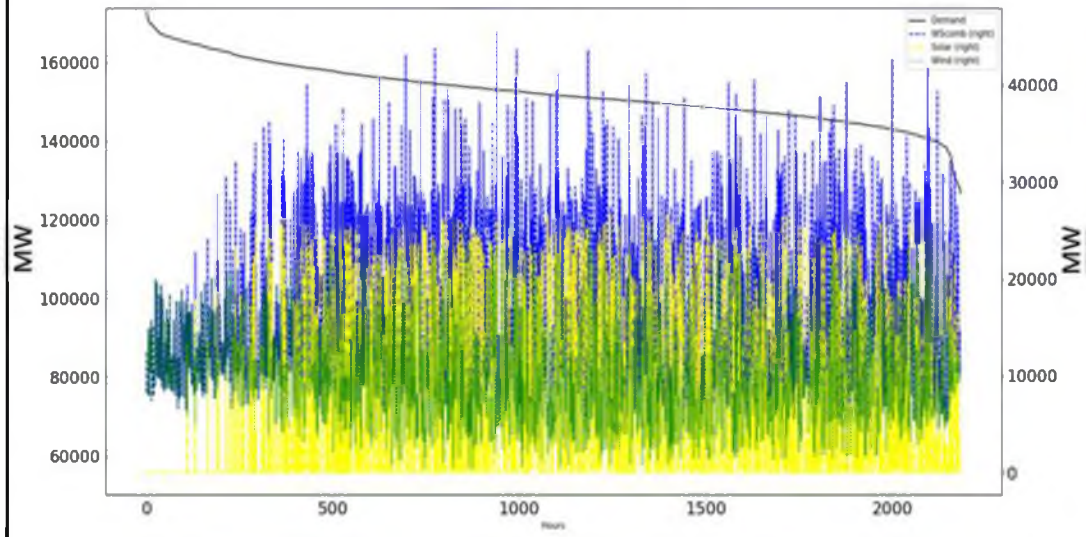


Capacity Credits of Wind & Solar Generation in **INDIA**

Quarter 1

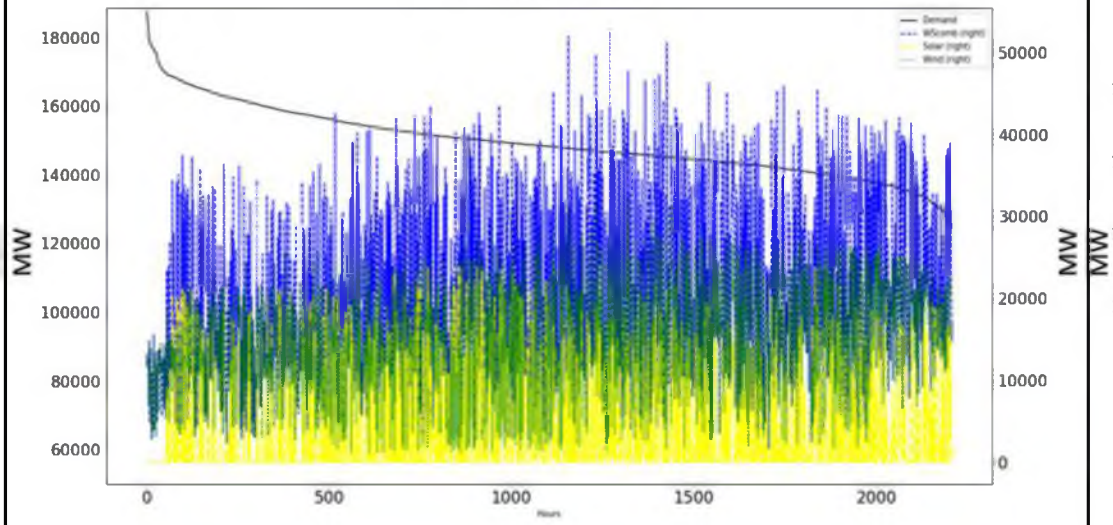


Quarter 2

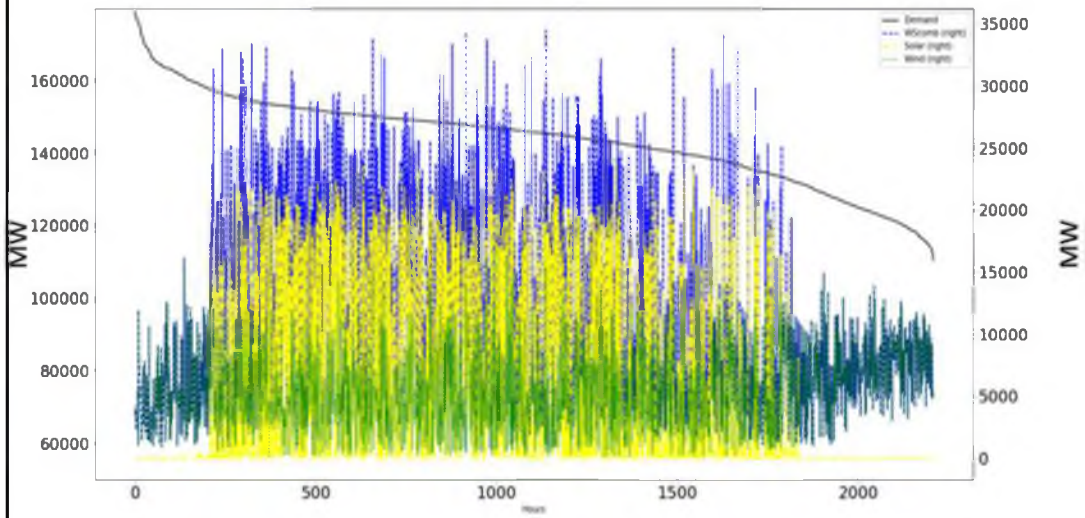


Demand
WScomb (right)
Solar (right)
Wind (right)

Quarter 3



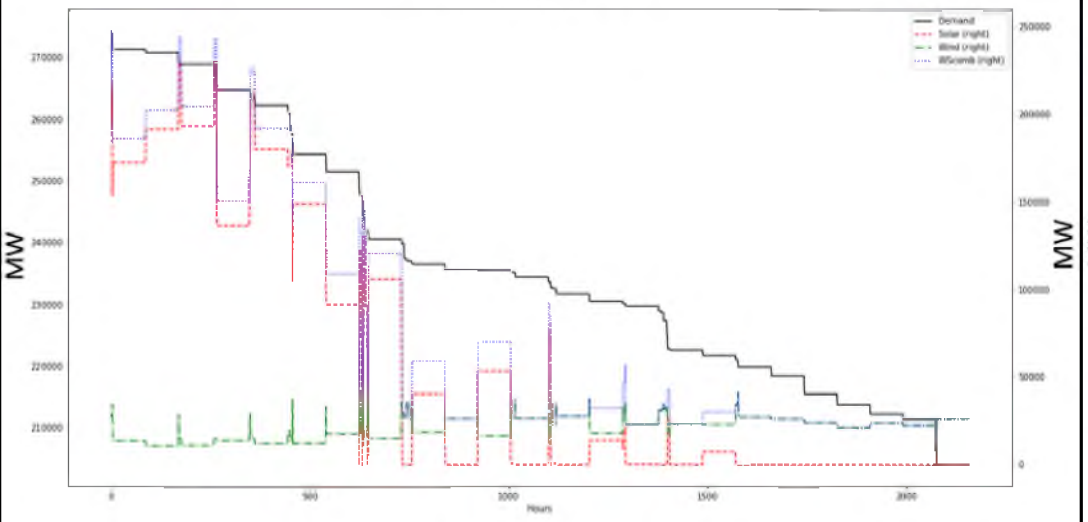
Quarter 4



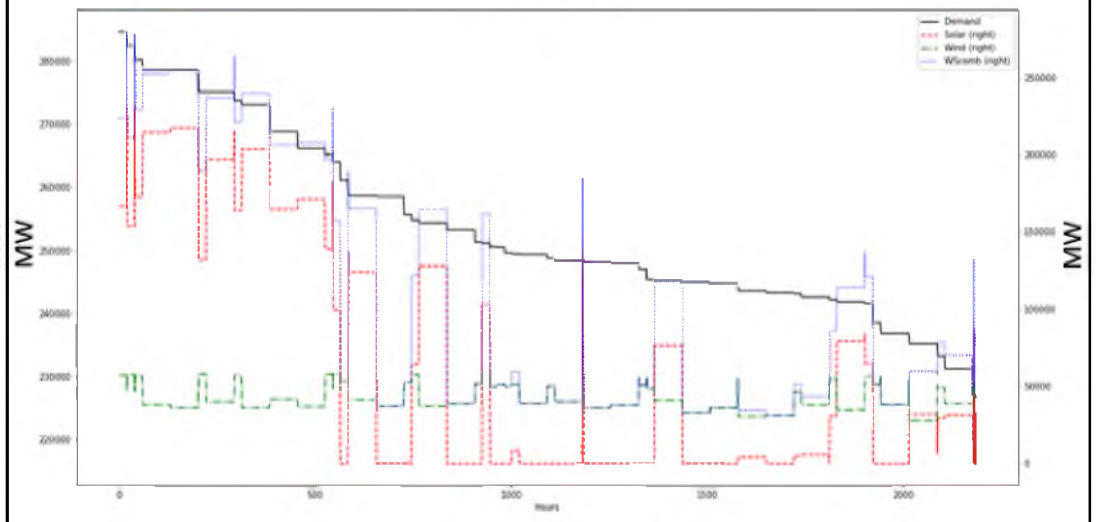
Hours →

Enabling Demand Shifting - INDIA

Quarter 1

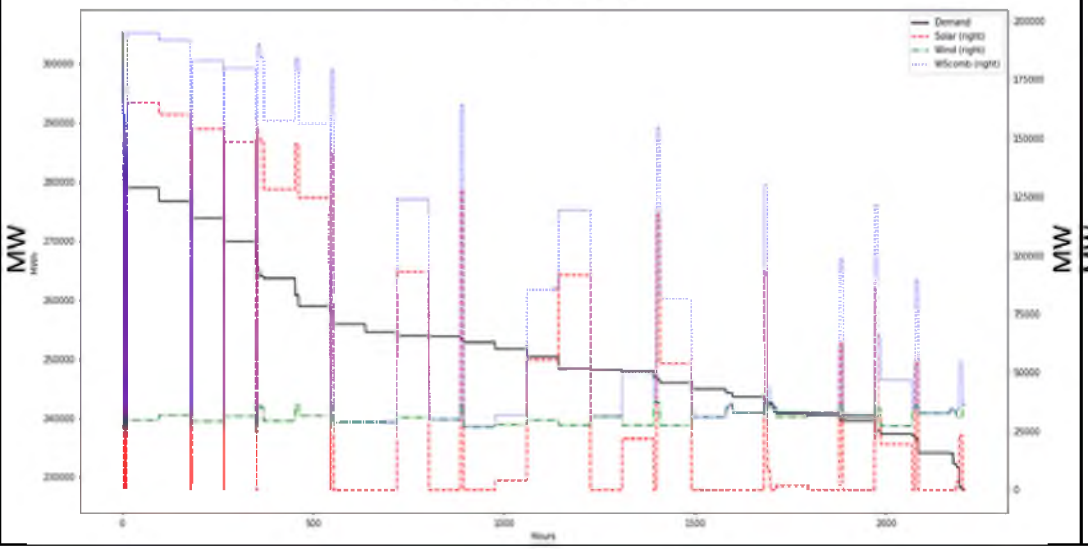


Quarter 2

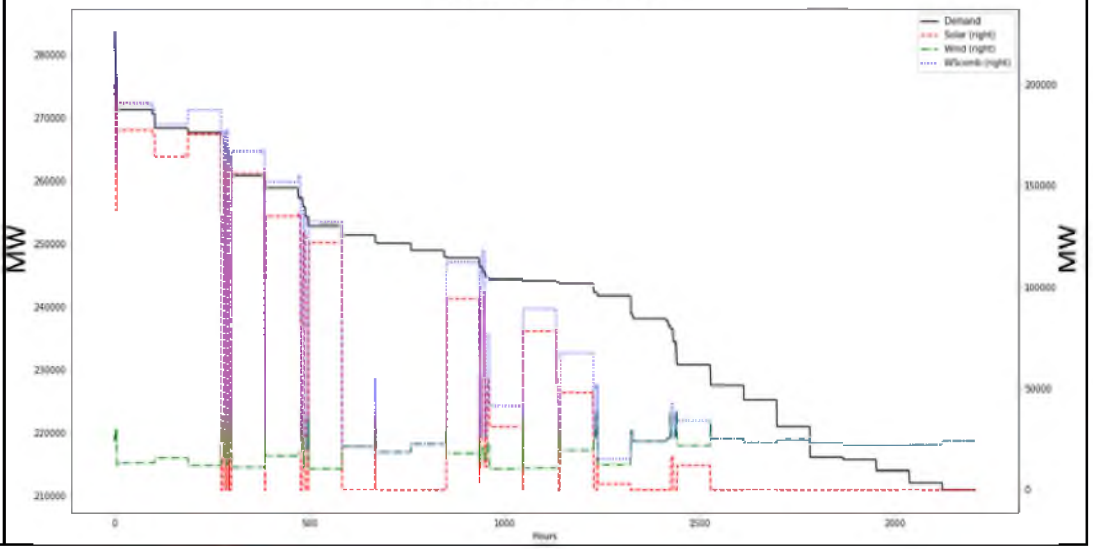


Demand
Solar (right)
Wind (right)
WScomb (right)

Quarter 3



Quarter 4



Hours →

Conclusions

- Allowance of cross border utilization of reserves, with enhanced transmission capacities can lead to up-to 13% reduction in overall costs
- With enhanced regional cooperation, cheaper resources get better utilized to provide energy and balancing needs
- Enhancement of transmission capacities allows for balancing across large areas and hence, leads to reduction in balancing costs
- Marginal cost of reserves declines with regional cooperation as the opportunity value of reserves are much higher when they are required to be maintained locally
- Enhancement of transmission capacities seems to have the highest benefit in terms of reduction of nodal energy prices as well as the volatility in nodal prices in the South Asian region

Thank You

South Asia Regional Energy Partnership (SAREP)

Session 3: Updates on the Current Activities of the SAFIR Working Group (SWG)

&

Session 4: Work Plan for FY 2023-24

Fourth Meeting of SAFIR Working Group on "Regulatory Cooperation to Facilitate Knowledge sharing, addressing Cross cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia"
14.00 -16.30 Hrs. 14th and 15th February 2023, Trisuli Hall Conference Hall, Kathmandu Marriott Hotel, Kathmandu, Nepal

Presented by
Rajiv Ratna Panda

Session 3: Updates on the Current Activities of the SAFIR Working Group

14.00 -15.30 Hrs.

Content

Updates on the current activities of the SAFIR Working Group (SWG)

Study/Research on South Asia energy/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in SA

01.1 Study/Research on South Asia energy/electricity regulations to develop regulatory pathway/Road Map for electricity/energy exchange and Energy Cooperation (EC) in SA

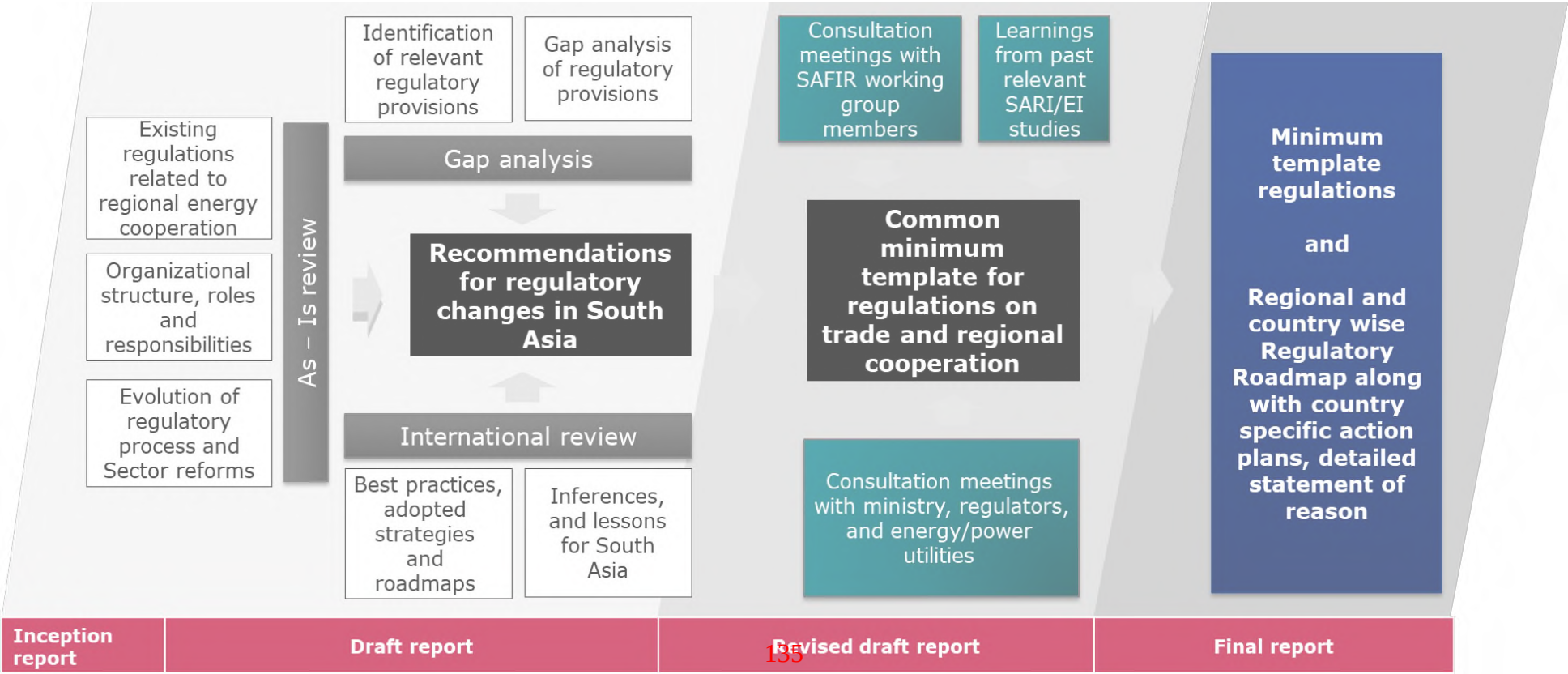
Objective of the Study :

❖To review, study and analyse the existing energy/electricity regulations of each South Asian countries to develop regulatory pathway/Road Map for Electricity/Energy exchange, cross border electricity/energy trade and Energy Cooperation (EC) in South Asia.

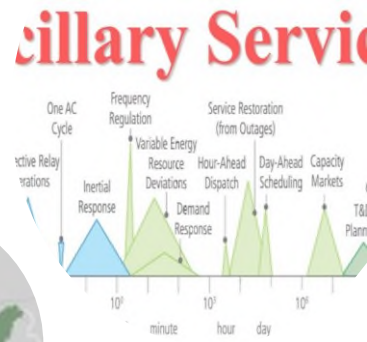
❖Identify and analyse the relevant provisions in all existing energy/electricity regulations that have an impact on optimal, reliable and economic Electricity/Energy exchange, cross border electricity/energy trade and carry out a detailed gap analysis for the same, from the perspective of enhanced cross border electricity/energy trade.

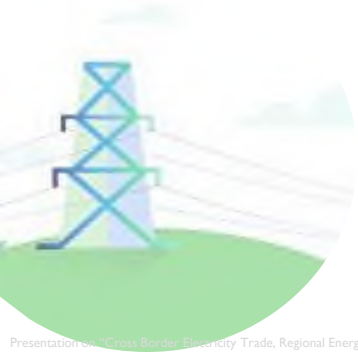
Suggest and recommend the necessary changes/additions or new regulations that is required in the respective countries' for advancing Electricity/Energy exchange, cross border electricity/energy trade and EC in South Asia.

01.1 Study/Research on South Asia energy/electricity regulations to develop regulatory pathway/Road Map for electricity/energy exchange and Energy Cooperation (EC) in SA



Study assessing the Potential Benefits of Cross Border Electricity Trade (CBET) for affordable supply of electricity, facilitating grid balancing of renewable energy integration, and suggesting a framework for Ancillary Service Market in the South Asia (SA) region.



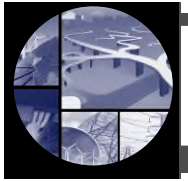


01.2 **Study assessing the Potential Benefits of Cross Border Electricity Trade (CBET) for affordable supply of electricity, facilitating grid balancing of renewable energy integration, and suggesting a framework for Ancillary Service Market in the South Asia (SA) region.**

Objective of the Study :

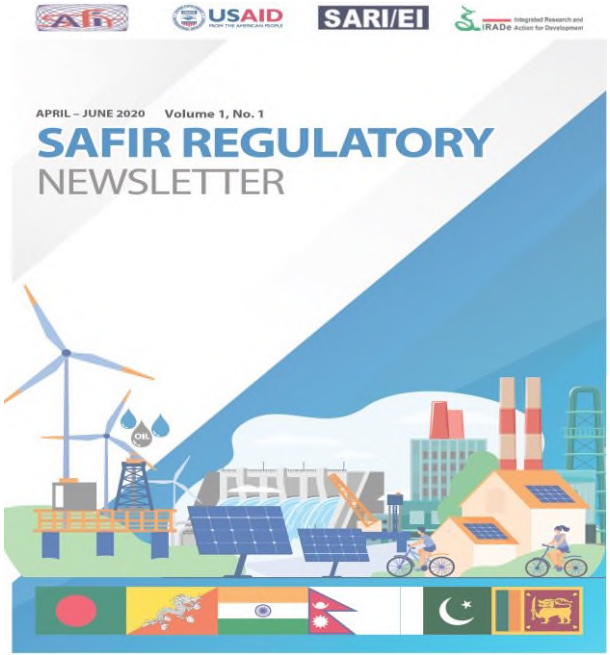
❖The extent of **potential reduction in average cost of supply of electricity** in SA countries due to increased CBET for optimal utilization of generation assets in SA, as well as due to reduction of reserves, and quantification of the overall economic benefits to the region over the next fifteen and twenty-five years.

❖The role of CBET in the context of accelerating the Renewable energy integration in SA countries presently and in the next fifteen and twenty-five years, considering the rapid expansion in renewable energy (RE) in the SA region for reduction of carbon emissions. **Calculation of the cost of balancing** for each country on standalone basis and that on a combined SA basis & therefore **quantification of the benefits of regional grid balancing** due to net fluctuations of demand and variable RE.



For both the above point, comprehensive and detailed modelling exercise has to be done for **likely capacity addition and different scenarios of capacity addition**. Propose the optimal capacity addition in each country, considering regional energy cooperation.

Analysis of the various market mechanisms in vogue internationally, for **grid balancing and ancillary services**, and to **propose an appropriate fair, transparent market structure suitable for SA** , and the broad framework for ancillary service market in the Region.



SAFIR Regulatory Newsletter (SRNL)

01.3 SAFIR Regulatory Newsletter (SRNL)

✓Regulatory updates & Policy Developments in the Region

✓Captures Important development, can have Guest Columns outside of the Region

✓From the Regulator's Desk Coloum, Country wise updates, covers power, oil and gas sector

✓Cross Border Transactions in the BBIN Regional Grid

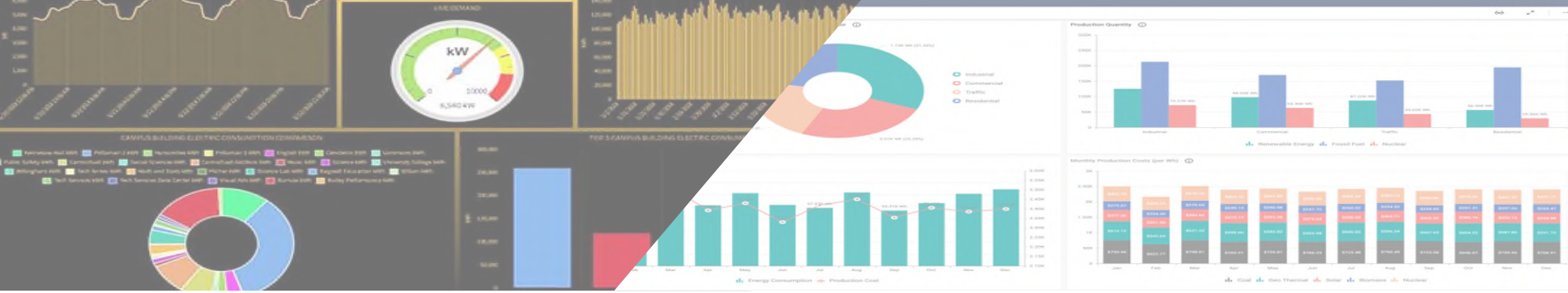
✓Circulated in SA Countries (Quarterly)

Combined Edition is Planned to be released in the SAFIR Conference

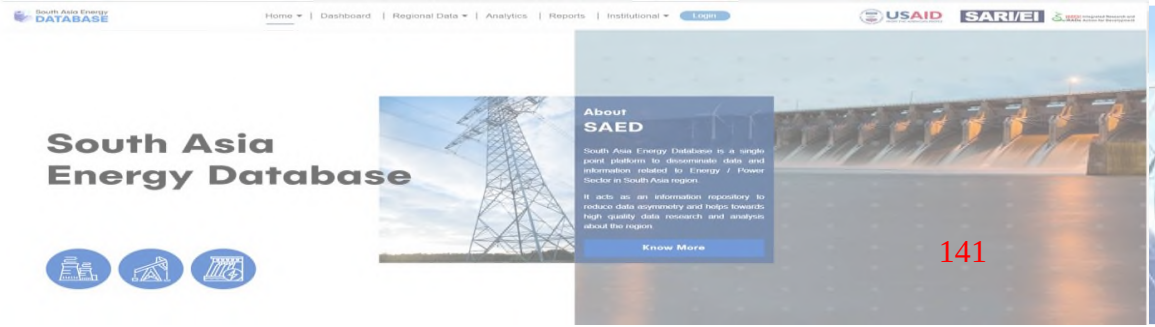
01.3 SAFIR Regulatory Newsletter (SRNL)

- ❑ Addition of CBET through PX data to be added in BBIN Transaction.
- ❑ Maintain continuity through Timely Release of the news letter for each quarter.
- ❑ Coordination through SAFIR Secretariat to finalise the Newsletter.

Any Idea and Scope for Improvement



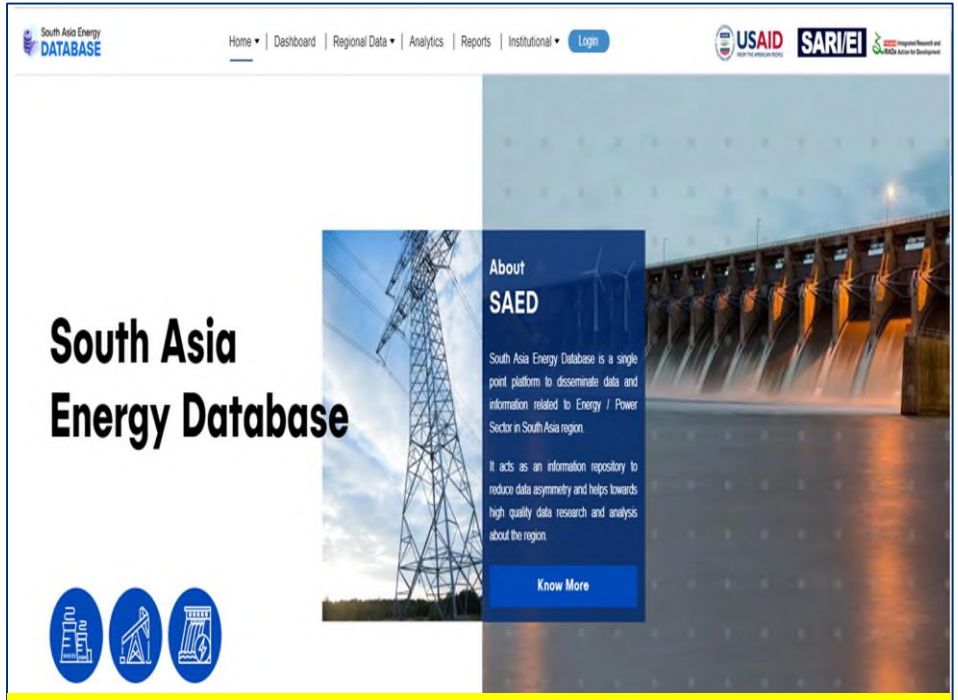
South Asia Energy DATABASE



01.4 South Asia Energy Database (SAED)

Objectives:

- ❑ To create a single point, user-friendly data source;
- ❑ To promote data transparency and help high quality data research and analysis;
- ❑ To disseminate data/information on the key indicators of power/energy sector for all the South Asian countries;
- ❑ To Act as information repository for the power/energy sector of South Asian countries;



https://www.southasiaenergydatabase.org/home

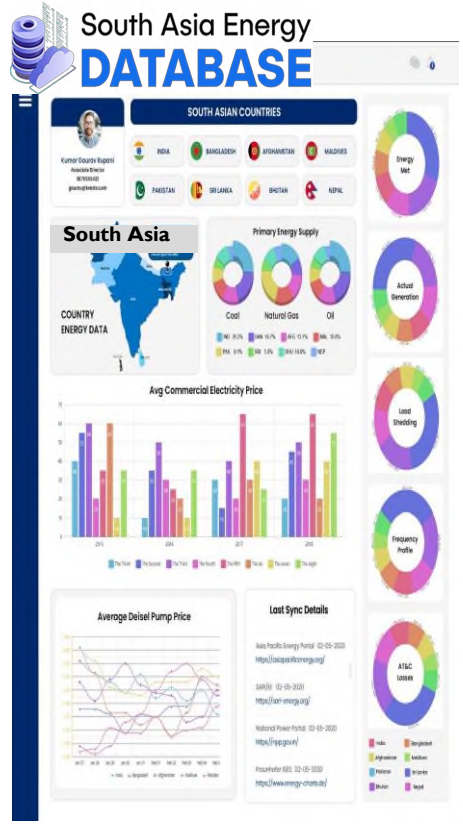
A First of its Kind in South Asia, web portal along with Mobile application provides easy data access and portability

01.4 South Asia Energy Database (SAED)

A Comprehensive Energy/Electricity Sector Data Base

{Online, user friendly, data Analytic, Indicative Graphs, pie charts and Figures, Info graphics, Annual Data Book }

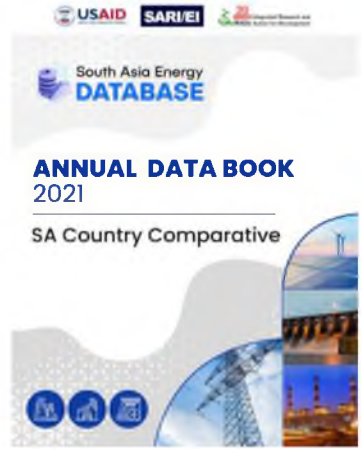
- ✓Power Related Time Series Data
- ✓Energy Met, Actual Generation , Energy & peak deficits, Rate & volume transaction of PXs
- ✓Cross Border (MU & MW), Frequency Profile, Diversity Factor, T & D losses
- ✓Electricity Generation Capacity and Transmission Network
- Installed capacity & Fuel Mix, Transmission sector
- ✓Regional Power Transfer Capacity, Basic Power Plant details
- Key Energy Statistics (Both Year wise and Past Trends & Forecasts, Country Wise)
- Per capita energy consumption, Energy resource potential & reserves, Primary Energy Supply & Demand
- 1.Total energy consumption & sector wise consumption, Energy Balance, Energy access
- 1.Key Policy and Regulations
- Key Energy & Power Sector Related Laws, Policy & Regulations
- National Power & Energy Sector Master Plans/Projection etc.

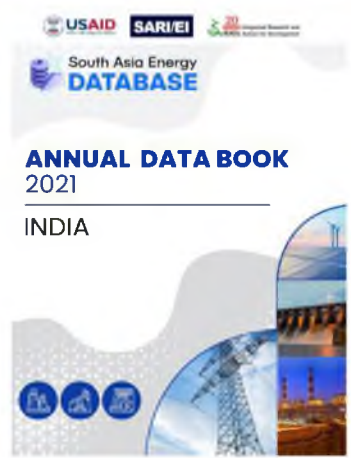


Attractive Dash board, Analytics, Automatic Report Generation, Country Comparative , Projections , Analytics

01.4 South Asia Energy Database (SAED)

- Launch of database at Delhi (India) on 22nd June 22
- High Level Demonstration and Training
  - Nepal on 18th July 2022
  - Bangladesh 31st July 2022
  - Bhutan 12th August 2022
- **Annual Data Book 2021** – Bhutan, Bangladesh, India, Nepal.
- Annual Data Book 2021 - **South Asia Country Comparative**





01.4 South Asia Energy Database (SAED) Plans : Building a data science ecosystem

A

SAED Data Acquisition Technology Modernisation:

- Moving to **Application Program Interface (API)** system for **better security and accuracy**, gradually **doing away with** web scrapping and web crawling technologies in all SAED countries.
- Some API based data sourcing by SAED has already started in India from CEA & IEX.

B

Technical Assistance to SAED countries (as per the need) to come up daily, monthly & annual reports:

- Daily, Monthly, Annual **reports on web improves data ecosystem and strengthening of SAED's data acquisition**.
- Already provided **support to NEA, Nepal** for Daily, Monthly operational reports which are **now available in NEA Website**.

C

Technical Assistance to SAED countries for **Regional (BBINS) Daily Power Supply Position Report:**

- **Develop Regional (BBINS) Daily Power Supply Position Report** wherein the important daily data related to the different countries shall be included and shall be shared with the stakeholders on daily basis.

01.4 South Asia Energy Database (SAED) Plans : Building a data science ecosystem

Strengthening of load dispatch centre/system operator's Real Time Data Acquisition System (RTDAS), Management Information System (MIS), data dissemination system and facilitating integration with SAED:

- Develop **comprehensive formats/templates** for detailed power supply position report of power system as needed.
- Detailed review of the **existing hardware and software/Information technology infrastructure** associated with RTDS, MIS, information management and data dissemination system and conduct detailed Gap analysis.
- **Comprehensive Strengthening Action Plan** for load dispatch centre/system operator's (SAPNL) covering all aspects such as :-

D

  - Including suggested **formats/templates for automatic and real-time data management** and dissemination for 15 minute wise, daily, monthly, quarterly and annual reports on a real time basis
  - The **infrastructure upgradation details** (such as hardware and software/Information technology infrastructure upgradation such as deployment/augmentation of Remote terminal units (RTUs), transducers and or any other technology for enhanced data acquisition etc.) and
  - The details required for **augmentation of the communication system.**

- **Project investment plan** and suggest procurement mechanism in consultation with load dispatch centre/system operator.
- **Support** in procurement, supply erection and commission of equipment.

01.4 South Asia Energy Database (SAED) Plans: Building a data science ecosystem

E

SAED linkages with National Databases/Portals and Improving Data Analytics:

- Linking with **National Power Portal (NPP)** of India.
- Making **SAED link/tab available in the websites** of leading power sectors institutions in each SA countries and Regional Institutions.
- Providing support to enhancing existing databases in countries (if any) as per the need .
- Integration of such database with the SAED.
- Improving **data analytics of SAED** and support to improve analytics in existing country portals as per the need.

F

SAED Research Fellowship:

- To Improve the culture and ecosystem of data science and data analytics.
- **SAED scholarship/fellowship program-** in partnership with a leading academic/research /management institution in SAED countries, to encourage young researchers/officers to prepare analytical research reports/papers on regional energy cooperation subjects by utilizing data/information from SAED and publish in reputed journal/magazines and participate in the Annual regional SAED conference and present their papers.

G

SAED Annual Regional Conference:

- To show case SAED work, exchange knowledge, information and insights.

South Asia Electricity Regulatory Compendium

01.5 South Asia Electricity Regulatory Compendium

- ✓Compendium (A first of its kind in SA) has been prepared
- ✓Compendium- Comprehensively Captures all aspects (Three Volumes)
- ✓Primary Legislation, Key Policies , Guidelines
- ✓ Regulations
- ✓Technical Standards
- Grid Code, Transmission Pricing, Open Access,
- Power Trade & Markets, Cross Border Electricity Trade
- 1.Licensing, Generation and Transmission Tariffs
- Six Monthly Updating & Yearly Edition

- ❑ Enhancing the current design of the South Asia Regulatory Compendium.
- ❑ Limited Hard Copy of Annual Edition Only.
- ❑ Six Monthly Edition to be improved with latest technologies feature for better accessibility, readability in on line format.

Combined Edition is Planned to be released in the SAFIR Conference

USAID
FROM THE AMERICAN PEOPLE

Session 4: Work Plan for FY 2023-24

15.45 -16.30 Hrs.

USAID
FROM THE AMERICAN PEOPLE

Content

02 Session 4: Work Plan for FY 2023-24- Ideas/New activities

02.1 Recap of Terms of Reference of the SAFIR working group

02.2 Ideas/new activities under SWG in the context changing/evolving scenario in SA, updating & expansion of the SWG activities

- **02.2.1** Support regulators in developing model regulation related to CBET. (in countries that currently does not have CBET regulations)
- **02.2.2** Preparation of Biennial flagship knowledge report on "South Asia Clean Energy transition & cross border energy trade Outlook-2040".
- **02.2.3** Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM).
- **02.2.4** Technical Assistance and support to Regulators on enhancing the regulatory Capacity.
- **02.2.5** Any other idea/thoughts.

02.3 Annual 3 week residential "South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and exchange of electricity in SA"

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Session 4: Work Plan for FY 2023-24

Recap of the TOR of SAFIR Working Group

02.1 Recap of TOR of the SAFIR Working Group

Key Objective of the SAFIR Working Group

❖Enhancing Regulatory Cooperation to Facilitate Knowledge sharing;

❖Addressing Cross cutting Energy/Electricity Regulatory Issues and Capacity Building in South Asia;

❖Facilitate transparent regulatory framework, promoting investment in the South Asia Region.

02.1 Recap of TOR of the SAFIR working group

- ❑To **facilitate regulatory capacity building** among member countries at both national and regional levels through information **knowledge sharing** and **skills training.**
- ❑To **facilitate** the development of **electricity/energy regulations** by identifying and addressing cross cutting energy/electricity regulatory issues for advancing Exchange of Electricity/Energy in South Asia region.
- ❑To provide **inputs on policy & regulations/regulatory opinions/regulatory guidelines & to develop model regulations**
- ❑To **undertake research** work on issues relevant to electricity /energy sector regulation through in-house/ outsourcing.
- ❑Prepare a detailed **road map** along with various **regulatory interventions** needed in South Asian countries for effective energy cooperation in the region to **prepare annual status report** and **updates on regulatory cooperation** in the SA Region.
- ❑**Create data bank/knowledge repository** on energy/electricity related issues. Prepare South Asia Energy/Electricity **Regulatory Compendium**.
- ❑To develop web portal on "**South Asia Energy/Electricity Knowledge Resource Database**". SAFIR–**Regulatory Newsletter** to enhance **regulatory knowledge sharing. Any other work assigned by SAFIR**

Any addition/updating of TOR. The current TOR was conceptualized in the year 2017

Ideas/new activities under SWG in the context of changing/evolving scenario in SA, updating & expansion of the SWG activities

Technical Assistant/Support to SAFIR Regulators in developing Model Regulation related to CBET

02.2.1 Technical Assistant/Support to SAFIR Regulators in developing Model Regulation related to CBET

- Technical Assistance and Support to SAFIR country regulators in developing **country specific model regulation related to cross border electricity trade** in countries that currently **does not have cross border electricity trade (CBET) regulations/procedures/frameworks** etc. **as needed.**

- Nature of support could be

  - **Technical Resource/Expert Support in drafting/developing model regulation** related to cross border electricity trade.

  - Technical Activities/Support for **Implementing the recommendations of the SAFIR Working Group Study** on South Asia electricity/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in SA.

  - **Knowledge and experience sharing of best practices** in the above context of **developing CBET regulations** both from inside the region and outside of the region.

Preparation of Biennial flagship knowledge report on "**South Asia Clean Energy transition & cross border energy trade Outlook-2040**"

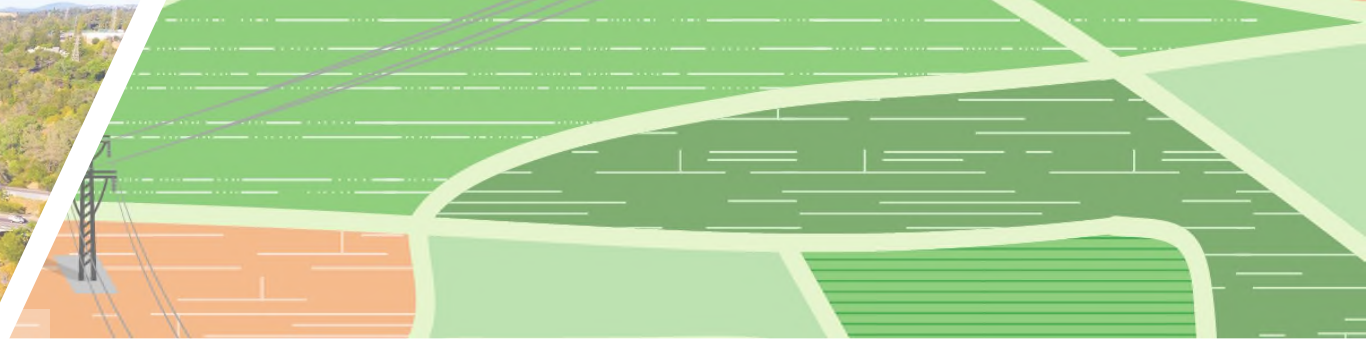
02.2.2 Flagship knowledge report on "South Asia Clean Energy transition & cross border energy trade Outlook-2040"

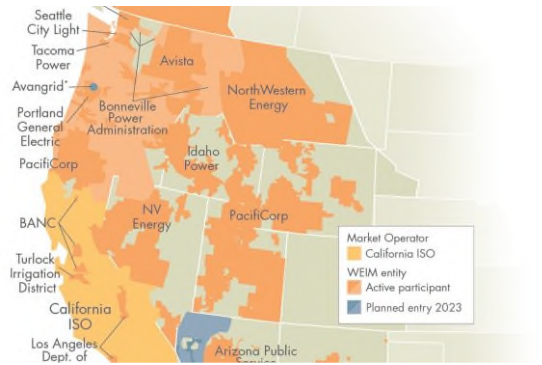
- **Rapidly transforming energy and power system** in south Asia due to **clean energy transitions**.
- Enhanced Opportunities for cross border energy trade and regional energy market
- Need for **sustained knowledge exchange** in this area.
- **Inform regulators and policy makers** on clean energy transition & energy trade priorities/outlook of South Asian countries.

- Preparation of **Biennial flagship knowledge report on "South Asia Clean Energy transition & cross border energy trade Outlook-2040** will be useful in this regard.

- Clean energy transition ambitions/plans of each country and a regional outlook.
- Cross border energy trade outlook of each country and a regional outlook.
- Present a high level regional outlook for 2040.
- Inform South Asia and other regional and global stakeholders on SA's Clean Energy and CBET ambitions.
- Regulatory instrument for advancing Clean Energy transition & cross border energy trade.
- Showcase the increasingly leadership role of South Asia in Clean Energy and CBET in the comity of nations/
- Inform investor community about the opportunities and outlook in Clean Energy and CBET.

The report aims to be a credible and flagship source of knowledge information on outlook on Clean Energy transition & cross border energy trade.



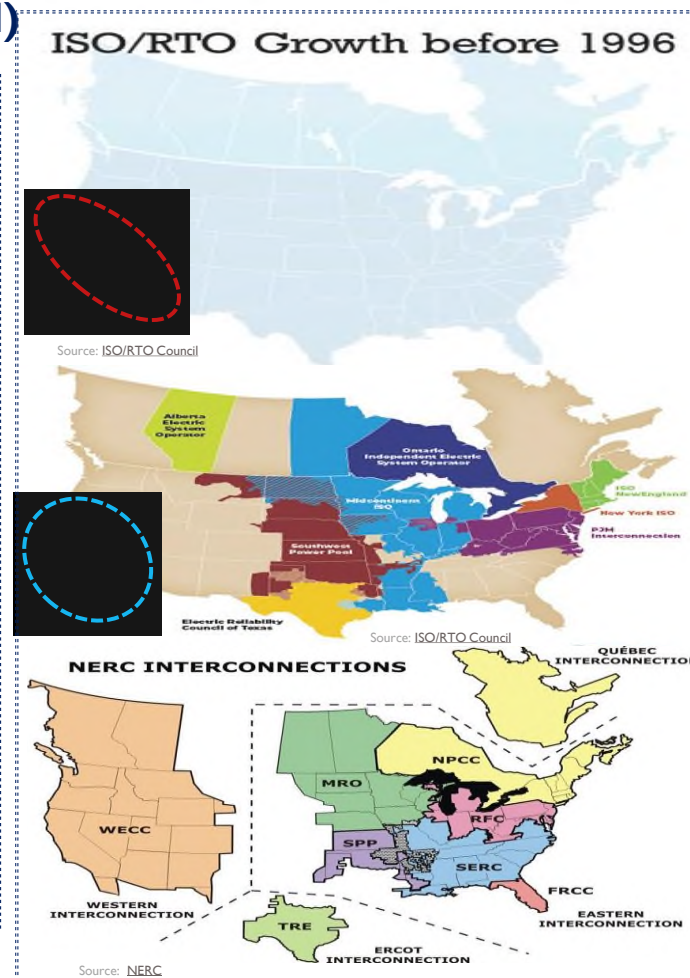


Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM)

02.2.3. Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM)

Background Information

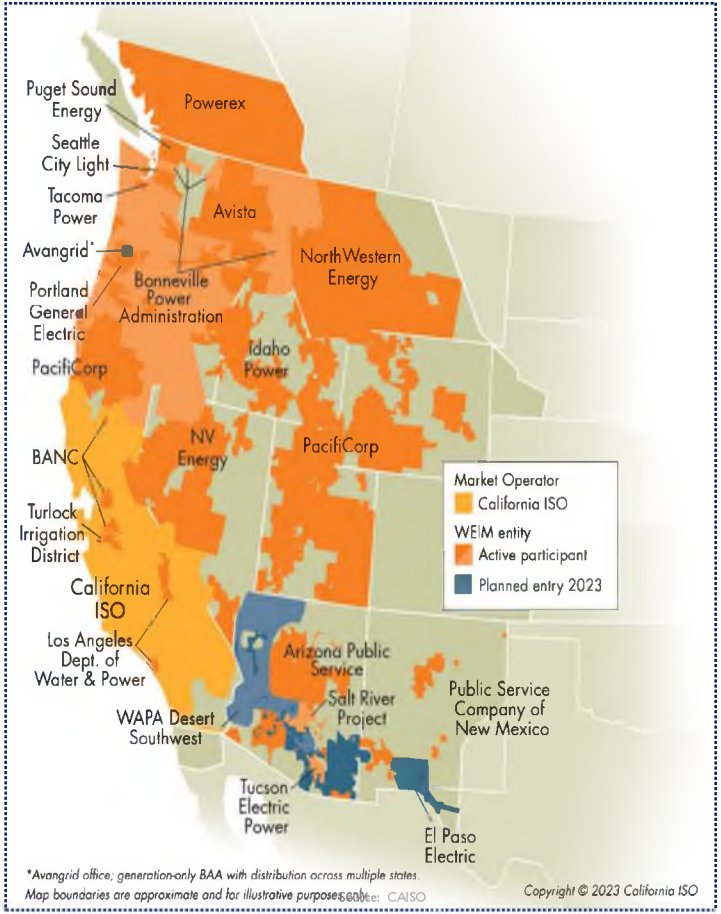
- California ISO (**CISO**) is the only **independent grid operator in the western U.S.**
- The CISO **grants equal access** to nearly 26,000 circuit miles of transmission lines & coordinates competing & diverse energy resources into the grid where it is distributed to consumers. Maximum **Peak MW demand 52 GW**
- **California ISO** also **operates a competitive wholesale power market** designed to promote a broad range of resources at lower prices and manages the **reliability of its transmission grid**.
- CAISOs markets include **energy (day-ahead and real-time), ancillary services, and congestion revenue rights.**
- **Western Energy Imbalance Market (WEIM), A real Time Market, An initiative led by California ISO since 2014.**
- **CAISO operates the WEIM**, a voluntary market, which currently includes **CAISO and other balancing authority areas** in the western United States.



02.2.3. Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM)- What is unique about it ?

- The concept behind the **EIM is nothing new**. All Independent System Operator (ISOs) and Regional Transmission Organizations (RTOs) run **integrated day-ahead markets and real-time markets**, which include 15-minute and five-minute markets.
- **But what is different about WEIM is that CAISO has made its markets available to entities outside of its ISO territory.**
- The WEIM serves parts of **Arizona, Oregon, Nevada, State of Washington, California, Utah, Wyoming and Idaho.**
- **Powerex Corp, based in Vancouver, British Columbia, Canada also participates in the WEIM.**
- The result has been enhanced grid reliability and cost savings for participants in the hundreds of millions of dollars.
- Besides its economic advantages, the EIM improves the **integration of renewable energy, which leads to a cleaner, greener grid.**
- **April 3,2022, CAISO** hits all-time peak of more than 97% renewables

Source: CAISO, EIM, POWERMAG, CAISO



02.2.3. Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM)- Expanding

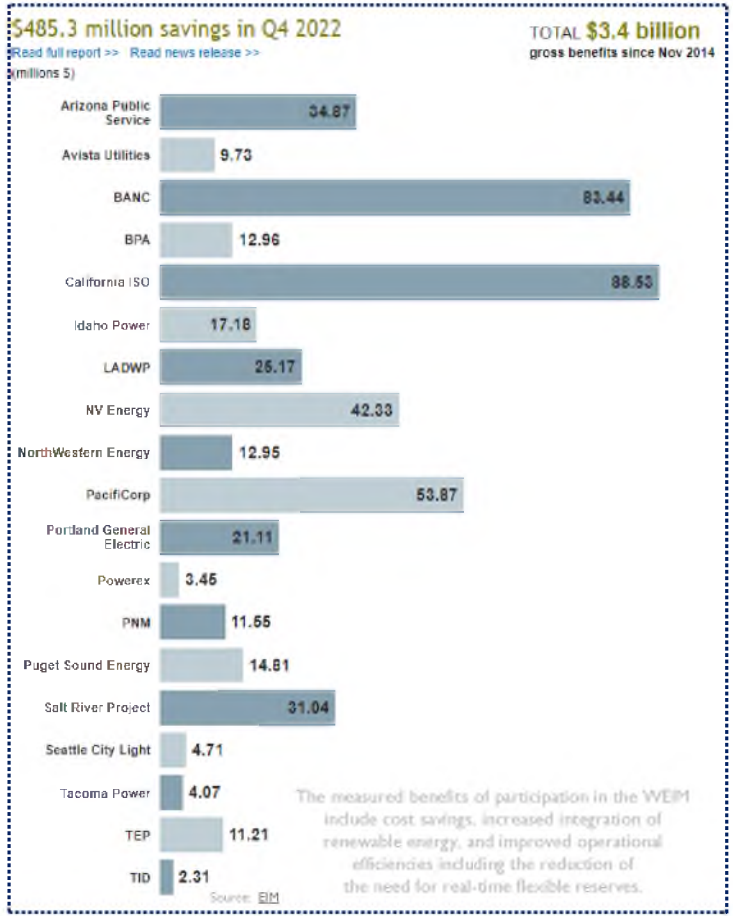
- **Transparency: Q4 2022 resulted $ 485.3 Million Benefit. So far EIM has made benefits of $ 3.4 Billion since 2014.**
- Based on the **success and learning of WEIM on February 2, 2023**, Western day-ahead market enhancements approved.
- **Approved by** ISO Board of Governors and the Western Energy Imbalance Market (WEIM) Governing Body.
- It will allow WEIM entities who currently buy and sell energy in the real-time market to participate in an **extended day-ahead market (EDAM).**

CAISO EDAM Benefits Study (1.19 Billion saving)

Area	Operational Savings ($M/year)	Capacity Savings ($M/year)	Total Savings ($M/year)
California	$214	$95	**$309**
Other Western States	$329	$557	**$886**
Total	$543	$652	**$1,195**

Source: CAISO. CAISO

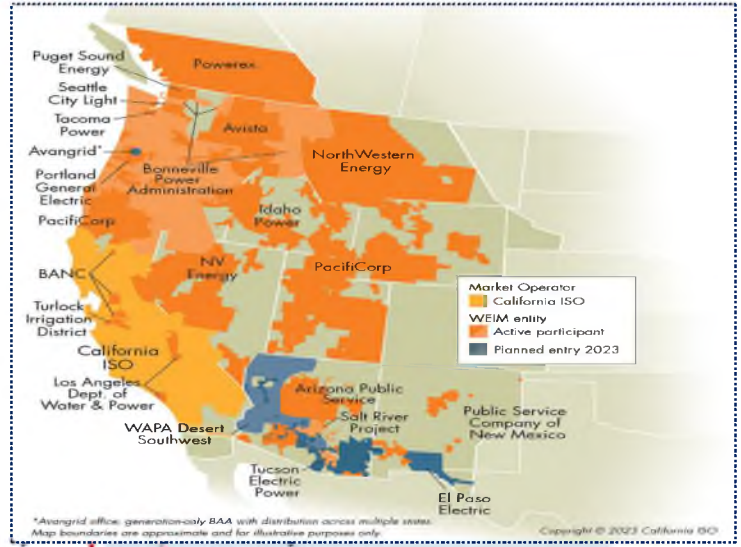
- **Feb 8, 2023,** A key California lawmaker introduced a bill to **allow CAISO to become a Western RTO** by expanding its governance to include representatives from other states. (Bill 538 (AB 538)

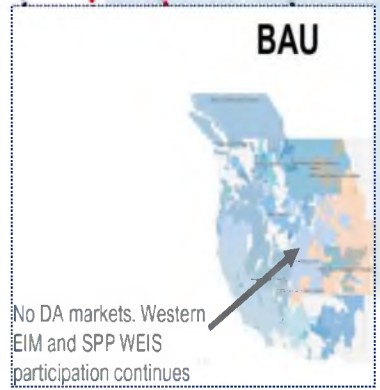


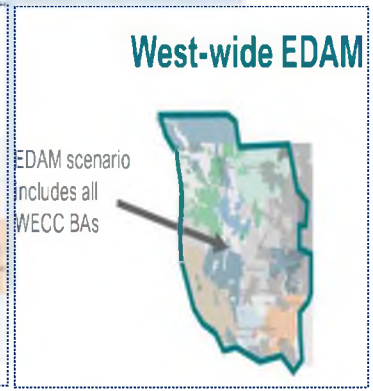
02.2.3. Regulatory Exchange visit/International study Tour to Western Energy Imbalance Market (WEIM)- Learning from CAISO, WEIM

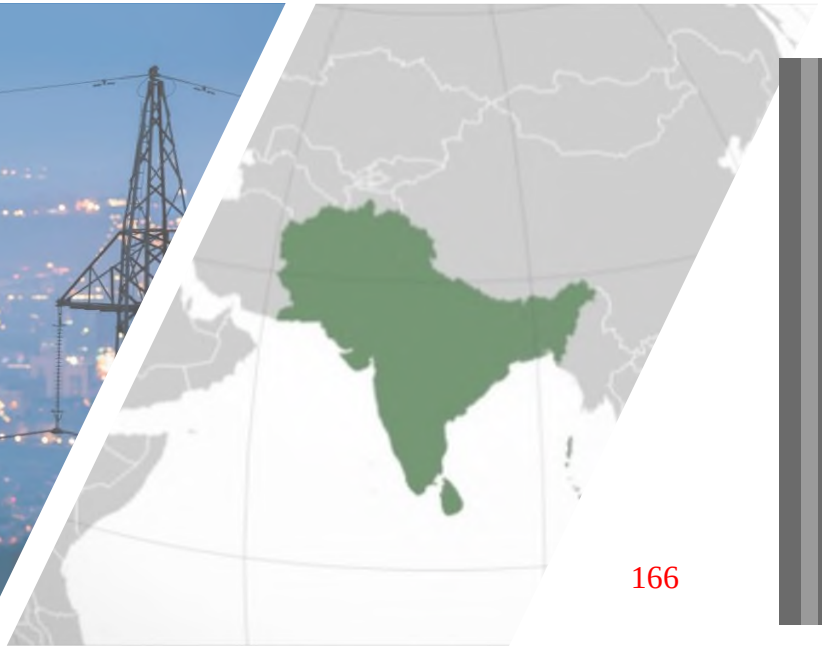
Through the Study Tour, It will be interesting to learn:

- How CAISO allowed other parties to participate outside of his territories ?
- What was the motivation ?
- What is the process followed for Joining the WEIM ?
- What kind of agreement were needed for WEIM ?.
- What is the governance structure ?
- What are the minimum technical, legal, regulatory and commercial requirement to Join the EIM.
- How Powerex of Canada joined WEIM ?
- What is the overall regulatory framework governing WEIM ?
- What is the dispute settlement method ?
- How the Regional Conesus built for WEIM ?
- How WEIM Charter drafted and adopted ?
- What is the Extended day-ahead market (EDAM) design, implementation action ahead.
- How is consensus-built on EDAM ?
- How were the Political, regulatory and territorial issues managed ?
- How the competition among states are managed/tapped ?







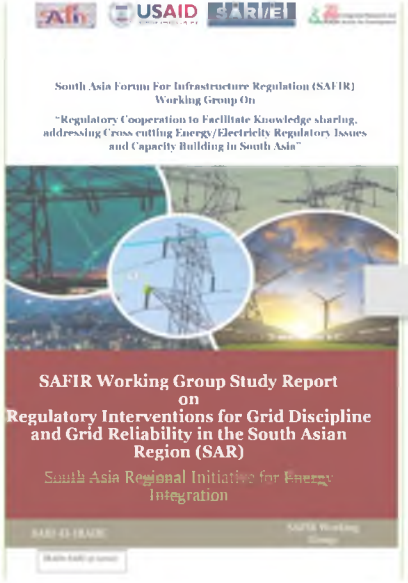


Technical Assistance and support to Regulators on enhancing the Institutional Regulatory Capacity

02.2.4. Technical Assistance and support to Regulators on enhancing the Institutional Regulatory Capacity

- **What** are the **specific area of Technical Assistance and support** to Regulators on enhancing the institutional regulatory Capacity considering the priority of SAFIR regulators ?

- Key capacity buildings areas identified from the perspective of **Regulatory Interventions for Grid Discipline and Grid Reliability (GDR)** in the South Asian Region (***Chapter 7 - Suggested specific technical capacity building measures)***



- **Power system simulation exercise.**
- Formulation of **incentive/penalty provisions for promoting grid discipline.**
- Training program on **international best practices in transmission system planning.**
- Strengthening standards for **system safety and grid connection.**
- **System protection - best practices** and **enforcement regulations.**

- **Balancing the grid - ancillary services.**
- Strengthening of **outage management.**
- **Information and communications technology – best practices** and implementation.
- Capacity building on **regulatory framework for cyber Security.**
- Capacity building on assessment of **investments in GDR, for disclosure of GDR** related information to general public/

Any other idea/need for Technical Assistance and support to Regulators on enhancing the institutional regulatory Capacity

Any other Ideas/Thoughts /Need

02.2.5

Any other Ideas/Thoughts/Need

- Emerging Needs
- Short term and long term priorities
- Country Specific Special Requirements
- ……
- ……..

Annual 3 week residential "South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and Exchange of Electricity in SA "

02.3

Annual 3 week residential "South Asia Energy Sector Training and Capacity Building program on Energy Regulation for Energy Cooperation and Exchange of Electricity in SA "

Certificate Master Class on "Electricity Market" for Electricity Regulators

Power Market Basic

- Evolution of Electricity Markets in developing and developed economies
- Fundamentals of Electricity Markets
- ❑Competition in Power Sector and Economics of Regulation.
- ❑Political, economic, social and reform consideration for power market development.
- ❑Building policy/political Conesus for power market and regulatory reform.

Power Market Model, Design and Other Considerations

- Models of Regional market development and Market integration.
- Long term supply and demand balance in electricity markets.
- Market Failure and Natural Monopoly, Pricing and Regulation of Natural Monopoly
- ❑Designing wholesale electricity markets- Characteristics and structures of electricity markets, key factors, ingredients etc.
- ❑The role of system operators, new challenges for system and market operation with high shares of clean energy.

Power Market Economics, Regulation and Operation

- Power Market Economics and Operation- Power Market Regulation, Operation of Power Exchanges, Market Monitoring, Open Access
- Power Procurement Planning, Ancillary Services, Congestion Management, Imbalance settlement-DSM regulations
- PoC charges and Transmission loss regulations, Metering Regulations, Energy accounts and Settlement of bills.
- ❑Strategy and rationale for different Power market Products design (all products). Future of Electricity Markets

02.3 Annual 3 week residential "South Asia Energy Sector Training and Capacity Building Program on Energy Regulation for Energy Cooperation and Exchange of Electricity in SA "

SAREP exploring Plans to organise South Asia Three-week residential Certificate Master Class on "Electricity Market" for Electricity Regulators of South Asian Countries in partnership **with reputed training/research organisation.**

- Florence School of Regulation, European University Institute
- Indian Institute of Management (IIM- Ahmedabad)
- Administrative Staff College of India
- IISC Bangalore
- IIT-Kanpur
- ISB

Certificate Course

Sustainability of Training/Master

Institutionalisation of Training/Master Class

Aims to make Certificate Master Class on "Electricity Market" as flagship and credible program in the region

Thank You

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