

Presentation on Updates on the TOR of the SAFIR Working group: Plan for Implementation of Key Activities

by

Mr. Pankaj Batra, Project Director, SARI/EI IRADe & Mr. Rajiv Ratna Panda, Technical-Head, SARI/EI IRADe

*Second 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”*

4th Dec, 2019, Hotel Radisson, Dhaka, Bangladesh

Content

- *About SARI/EI Program (Extended Phase 2018-2022)*
- *Brief about the SAFIR Working Group and It's TOR*
- *Key Activities of the Working Group*

Overview South Asia Regional Initiative for Energy Integration (SARI/EI) Program (Extended Phase 2018-2022)

Overview South Asia Regional Initiative for Energy Integration (SARI/EI) Program

SARI/E is a long standing program of USAID started in the year 2000.

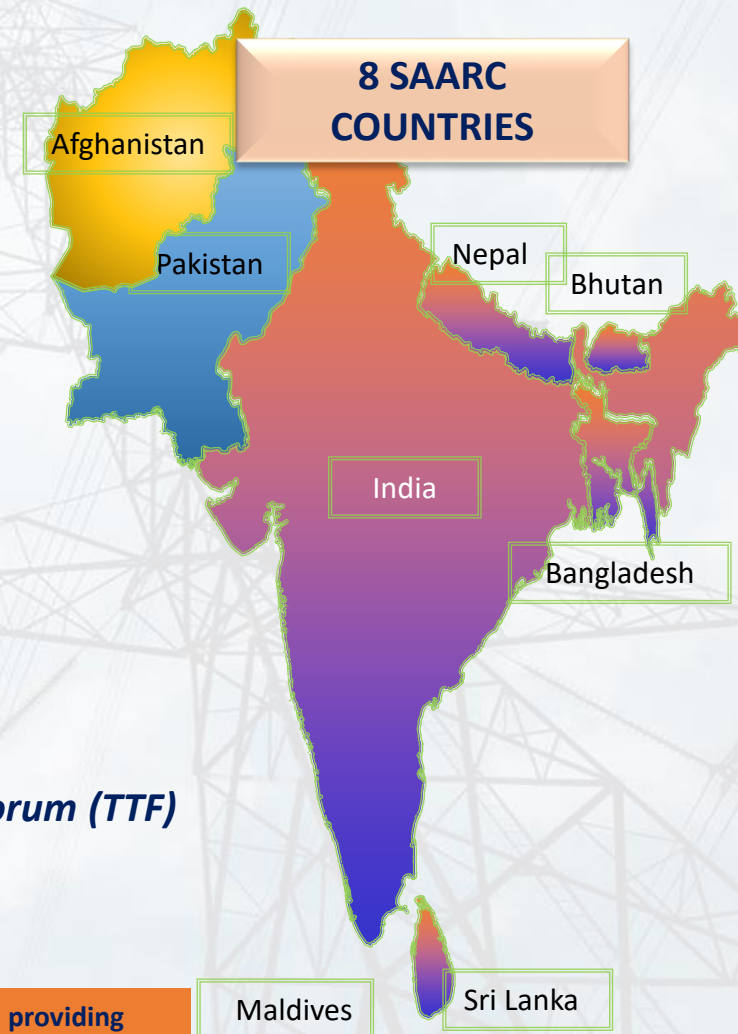
Program has consistently strived to address energy security in South Asia by focusing

- 1) Cross Border Energy Trade
- 2) Energy Market Formation and
- 3) Regional Clean Energy Development.

Phase IV (Extended Phase 2018-2022): Key Activities: Expected Development Outcomes:

- *Harmonize Policy, Legal and Regulatory Issues (Task Force-1)*
- *Advance transmission interconnections (Task Force-2)*
- *Establish South Asia Regional Electricity Markets (Task Force-3)*
- *Transfer clean energy innovations to the region*
- *Expand SARI/EI technical studies to South East Asia (BIMSTEC region)*
- *Socialize power trade benefits to create public consensus and support through Think Tank Forum (TTF)*
- *Analytical study to assess the potential of gas for regional energy cooperation.*
- *Develop Skilled Workforce to support regional projects*

The focus of the Extended phase will be on establishing and strengthening institutional mechanisms to carry forward the legacy of SARI/EI and providing secretariat functions to transfer knowledge/learning from USAID/India's bilateral projects to rest of the region.



Objective of the SAFIR Working Group

Objective of the SAFIR Working Group

The SAFIR Working Group works on



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.



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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 and to develop model regulations.

To undertake research work on issues relevant to electricity /energy sector regulation through in-house/ outsourcing.



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TOR of the SAFIR Working Group

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 South Asia 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 Monthly Newsletter to enhance regulatory knowledge sharing.

Any other work assigned by SAFIR.

Key Activities of the SAFIR Working Group

Key Activities of the SAFIR Working Group

- ❖ Study /Research on South Asia energy/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in South Asia.
- ❖ Organizing “South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and exchange of electricity in South Asia “
- ❖ South Asia Energy/Electricity Regulatory Compendium.
- ❖ SAFIR-Regulatory newsletter and web portal “South Asia Energy/Electricity Knowledge Resource Database”
- ❖ Organizing two/three meetings of SAFIR Working Group.



Study /Research on South Asia energy/electricity regulations under SAFIR Working Group



Study /Research on South Asia energy/electricity regulations

Two studies are proposed to be conducted by the SAFIR Working Group

- ☐ **Regulatory interventions for Grid discipline and Grid reliability in the South Asian region and**
- ☐ **Study Cross Border Trade of Electricity.**
- ☐ **Study /Research on South Asia electricity/electricity regulations to develop regulatory pathway/Road Map for Electricity/Energy exchange and Energy Cooperation (EC) in SA**



Study/Research on Regulatory interventions for Grid discipline and Grid reliability in the South Asian region

Objective:

- ☐ To review and analyse all the existing relevant electricity regulations, mechanisms and technical frameworks with respects to Grid discipline and Grid reliability of each South Asian Countries both from the perspective of integration/unification of regional grids of domestic power system of a country as well as cross border power grid integration.

Deliverable :

- ☐ Detailed set of Regulatory measures/Intervention and Mechanism needed for enhancing Grid discipline & Grid reliability in SA region along with detailed explanatory memorandum.
- ☐ Roadmap (regional and country wise) and action plan for implementation of above suggested Regulatory measures /Intervention.

Time Period : 6 Months from the date of award. will be awarded by December 2019 through a competitive bidding process.

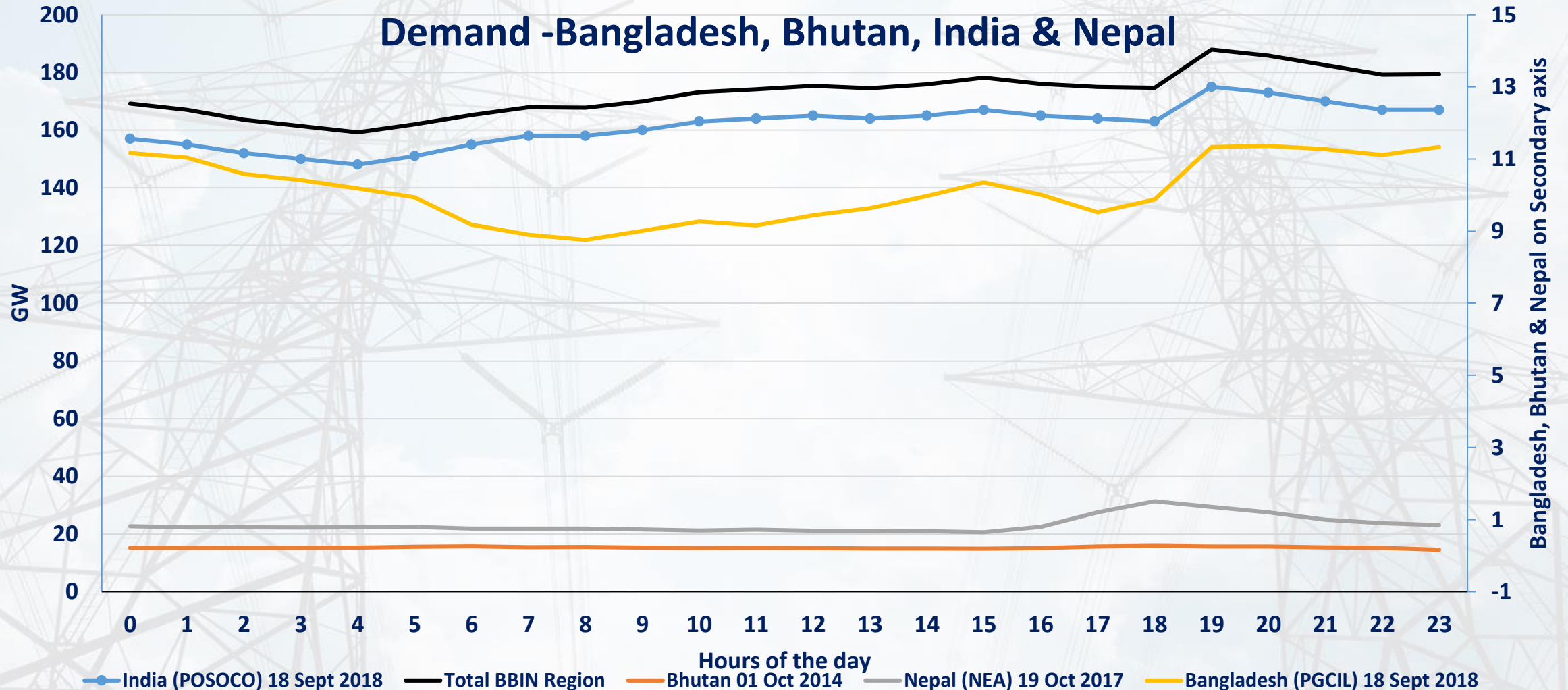
Study on Cross Border Trade of Electricity

Objective:

- ☐ To review and analyze the load and generation patterns in all neighboring countries and study the season-wise trade/barter of power between the countries to ensure 24x7 supply to all countries and optimum utilization of generation assets, including quantification of benefits for all countries.
- ☐ This may also cover planning of generation resources and anticipated import/export for 10 years ahead.
- ☐ Work out the savings in generation reserves for all countries, with the objective of providing 24x7 supply to all consumers.
- ☐ Calculate the reduction in cost of supply for each country.

Time Period : 3-4 Months from the date of award. Study is expected to start by Jan/Feb 2020

Demand Diversity: Load Profile of Bangladesh, Bhutan, India & Nepal



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

Objective:

- ☐ To review, study and analyze 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 analyze 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 Energy Cooperation (EC) in South Asia.

Time Period : 6 Months from the date of award. ToR Drafted by SARI/EI, Study is expected to start by March 2020



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South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and exchange of electricity in South Asia



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South Asia Energy Sector Training and Capacity Building program on energy regulation for Energy Cooperation and exchange of electricity in South Asia

Key Topics to be Covered (Regulatory Aspects of Energy Cooperation and exchange of electricity)

- ✓ **Transmission Planning**
- ✓ **Coordinated System Operation**
- ✓ **Licensing Regimes**
- ✓ **Tariff Frameworks**
- ✓ **Grid Codes**
- ✓ **Open access**
- ✓ **Transmission Pricing**
- ✓ **Imbalance Settlements**
- ✓ **Power Trading and Power Exchange Mechanism.**
- ✓ **Power Market Regulations**
- ✓ **International Experiences**

- ✓ **4-5 days Training Programme**
- ✓ **Working Groups Members and Regulators of South Asian Countries**
- ✓ **Site Visit to Load Dispatch Centers/Power Utilities etc.**
- ✓ **One Training Program in a Year**

Proposed to be held in the Month of March/April 2020



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**SAFIR-Regulatory newsletter
and
web portal “South Asia Energy/Electricity Knowledge
Resource Database”**

SAFIR-Regulatory newsletter

SAFIR-Regulatory newsletter

- ✓ **Aims to Increase Regulator Knowledge exchange in the SA region**
- ✓ **Track and Compile various Energy Regulatory and Policy Developments in the Region .**
- ✓ **Analysis on the Energy Regulatory and Policy Developments in the Region.**
- ✓ **It includes power, oil and gas sector.**
- ✓ **Will be circulated among the Regulatory Commission/policy makers of SA counters in electronic format. (to be Issued Monthly/Quartely)**



Proposed to Start by March, 2020

Web portal “South Asia Energy/Electricity Knowledge Resource Database”

Web portal on “South Asia Energy/Electricity Knowledge Resource Database”

Aims to Create a Energy/Electricity Sector Data Base/ Dashboards

Track and Compile various Energy/Electricity Sector Data of the Region such as (but not limited to) :

- ✓ *Energy/Power Demand, supply*
- ✓ *Energy Balance*
- ✓ *Installed capacity (total and fuel wise)*
- ✓ *energy and peak deficits, load sheading*
- ✓ *CBET in MW/MW hr, Energy Losses*
- ✓ *Per Capita Energy Consumption*
- ✓ *Generation and Transmission Projects Planned*
- ✓ *Power Market Data*
- ✓ *Renewable Energy Related Data*
- ✓ *Key Policy and Regulations*

- ✓ **Web portal with data Analytic, Indicative Graphs, pie charts and Figures, Info graphics etc .**
- ✓ **Data to provided by the Working Group Members .**
- ✓ **Will be available in Public Domain**

Proposed to Start by March 2020

South Asia Energy/Electricity Regulatory Compendium

South Asia Energy/Electricity Regulatory Compendium

- ☐ **Compilation has been done.**
- ☐ ***Currently is under review and designing***
- ☐ ***Documents has been sourced from respective regulatory commission websites.***

For ease of reference, the regulations are classified under the following categories for each of the countries:

1. Primary legislation, key policies, rules and guidelines
2. Cross Border Electricity exchange/Trade
3. Technical Standards
4. Grid Code and System Operation
5. Transmission Investments and Pricing
6. Open Access
7. Power Trade, Exchanges and Markets
8. Licensing
9. Generation and Transmission Tariffs

* Even though the compendium focuses on regulations that enable, or have the potential to enable energy exchange/trade, it also tries to include relevant primary legislations, relevant policies and regulations that are not necessarily linked to CBET.

*In case of some of the documents, official / non-official English translations were not available, due to which only the available native language version of such documents are included

** The Compendium serves merely as a collection/compilation of already published/notified electricity regulations for ease of reference with an aim enhance have better understanding/knowledge sharing about the electricity regulations of SAARC/SAFIR member countries.

SAFIR Working Group Meetings

SAFIR Working Group Meetings

We have planned to organized three meetings for the year

- ✓ **2nd Meeting of SAFIR Working Group in Dec,2019**
- ✓ **3rd Meeting of SAFIR Working Group in March ,2020**
- ✓ **4th Meeting of SAFIR Working Group in September,2020**

Continuous Interaction

Regular meetings are essential for ensuing a Consultative and participatory process



*** 1st Meeting of SAFIR Working Group held on 15th & 16th May'2018, Hotel Taj Samudra, Colombo, Sri-Lanka**

Thank You

South Asia Regional Initiative for Energy Integration(SARI/EI)

Common Minimum Grid Code for SouthAsia

Mr. Pankaj Batra and Mr. Rajiv Ratna Panda,IRADe

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Common Minimum Grid Code for South Asia

- The Common Minimum Grid Code for South Asia lays down the rules, guidelines and standards to be followed by various South Asia country participants in the system for cross border trading in electricity, while operating the power system, in the most secure, reliable, economic and efficient manner.

Applicability and Organizational Framework

- Applicable to all countries of South Asia, who get connected to the South Asia grid through a *synchronous* or *a-synchronous* (i.e. HVDC) connection.
- Each country will initially be represented by a **single point of contact** for the initiation of implementation of the Common Minimum Grid Code.
- Single point of contact will be supported by the **relevant Ministry** dealing with power, the **Regulator** of the respective country, the **transmission agency** of the respective country, the **system operator** of the respective country and the **accounts settlement/market operator** of the respective country.

Organizational Framework

- Later, to formalize the process of implementation, Regional coordination bodies need to be formed for South Asia, i.e. **South Asia Forum** at the Government level, at the **Regulator** level, at the **planning body** level, **transmission utility** level, at the **system operator** level and at the **accounts settlement/market operator** level.
- A South Asia Power Portal would be made for information of all South Asian countries. This would be maintained by the South Asia Forum at the planning level.

Objective

- Facilitation of cross border trading of power, while ensuring secure, reliable, economic and efficient operation of the grid.
- Facilitation of the coordinated optimal operation of the South Asian Grid.
- Facilitation of coordinated and optimal maintenance planning of generation and transmission facilities in the South Asian grid.

Structure of the Common Minimum Grid Code for South Asia

- Connection Code,
- Operating Code,
- Scheduling and Despatch Code and
- Administration of the Grid Code.

Connection Code

- a) To ensure the safe operation, integrity and reliability of the connected South Asia grid.
- b) Any new country getting connected to the South Asia grid shall neither suffer unacceptable effects due to its connectivity nor impose unacceptable effects on the South Asia grid.
- c) Any new country seeking connection to the South Asia grid is required to be aware, in advance, of the requirements for connectivity to the South Asian grid and also the standards and conditions its system has to meet for being integrated into the grid.

Connection Code

- Require to apply for Connectivity to SAFTU.
- SAFTU will carry out system studies and state whether any augmentation in the transmission system is required.
- Must have provision to implement generation and/or load control mechanisms to be able to control cross border power flows.
- Must abide by the Regional under frequency load shedding schemes to ensure commensurate load shedding
- Must abide by the Regional islanding schemes and system protection schemes, which would be decided by the South Asian Forum of Planning bodies, which are involved in operation planning.

Connection Code

- Must ensure installation of Data Acquisition System, disturbance recorders and sequence-of-events recorder at the interconnection points and other significant points
- Must ensure robust, redundant and reliable communication between countries, so that voice and data communication takes place instantly and seamlessly across countries. This would be mutually decided by the points of contacts of the South Asian countries.
- Every connection of a country's system to the South Asian grid shall be covered by a Connection Agreement between the SAFTU and the national transmission utility of the country seeking connection.

Operating Code

- Frequency Band - 49.9 - 50.05 Hz
- Voltage Band for 400 kV at interconnection point - 380-420 kV
- System Security - Protection Coordination & periodic Protection testing
- Operation liaison.
- Restoration Plans including Black Start.
- Periodic Reports - Daily, Monthly Reports.
- Outage Planning.

Scheduling and Despatch Code

- Each country to regulate their generation and/or consumers' load so as to maintain their actual drawal from the South Asia grid close to the above schedule.
- Penalty for violations in accordance with a Deviation Settlement mechanism.
- Reactive power drawals to be controlled at inter-country connection points.
- Scheduling and Despatch Procedure.

Administration of the Grid Code

- Committee for Review of the Grid Code.
- Ultimately, the Forum of South Asia Regulators would do that.



SARI/EI



Thank You!

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Contents

- ☐ Evolution of Energy Cooperation, CBET- Key Policy & Regulatory Development
- ☐ Changes Occurred
- ☐ Future Outlook
- ☐ Way forward





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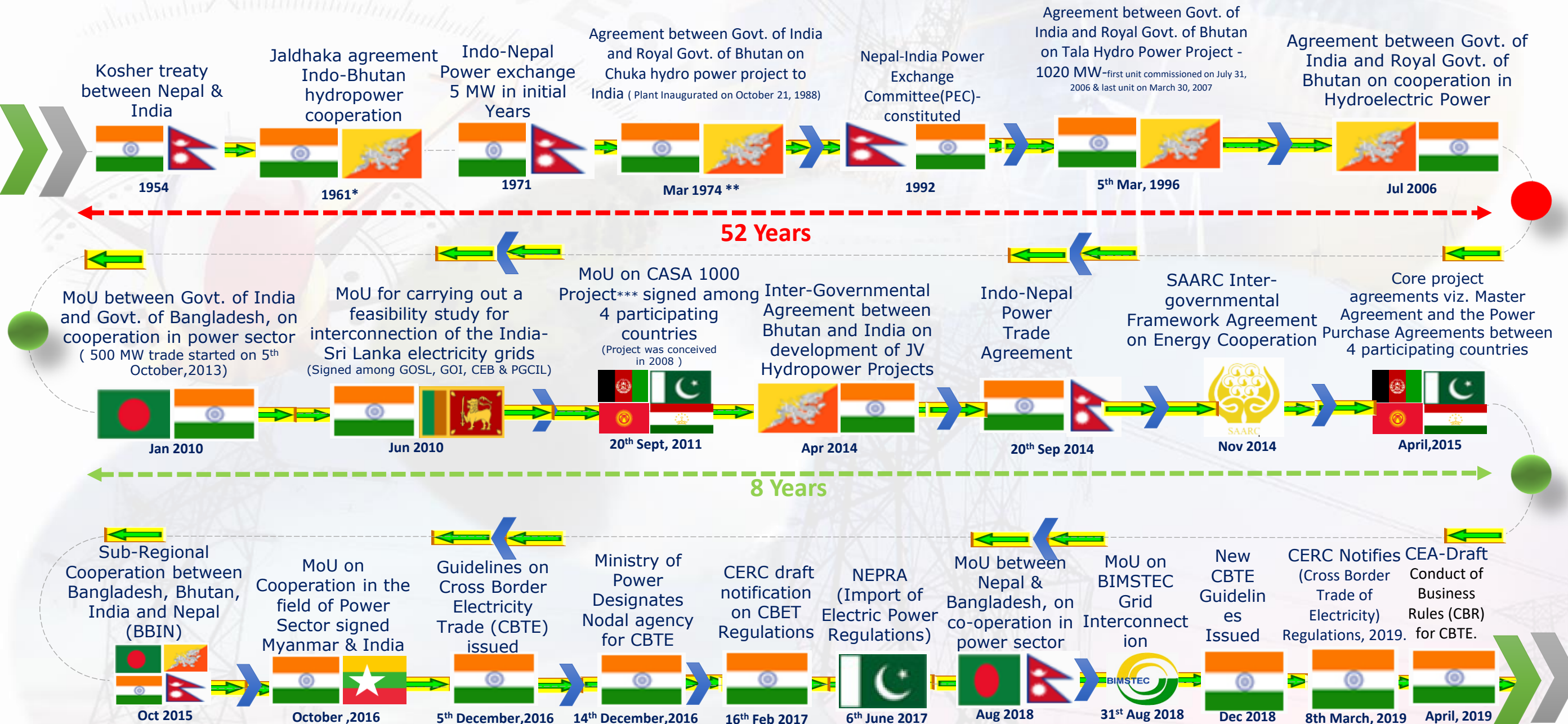


Integrated Research and
IRADE Action for Development

Evolution of Energy Cooperation, CBET- Key Policy & Regulatory Development



History of evolution of Energy Cooperation, CBET- Key Policy & Regulatory Development

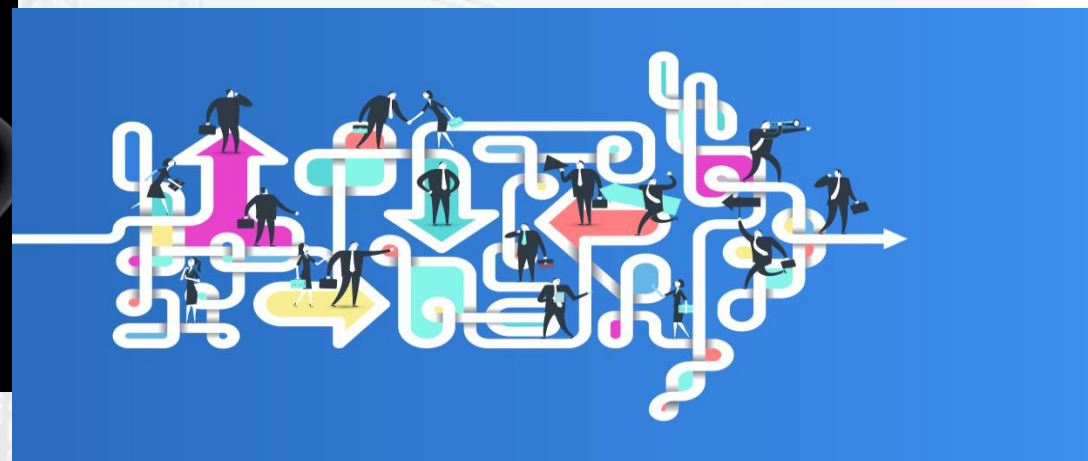


* http://www.mfa.gov.bt/rbedelhi/?page_id=28

***When complete, the full CASA-1000 transmission lines will move electricity at high voltages between the Kyrgyz Republic and Tajikistan (the first 477 kms) and from Tajikistan to Afghanistan and Pakistan (the next 750 kms). [http://www.casa-1000.org/4.%20Bishkek%20MoU%20ENG%20\(Signed%20Sep%2020,%202011\).pdf](http://www.casa-1000.org/4.%20Bishkek%20MoU%20ENG%20(Signed%20Sep%2020,%202011).pdf) , CASA-1000 Power Project Inaugurated In Tajikistan on 12th May, 2016 - <https://www.rferl.org/a/tajikistan-afghanistan-kyrgyzstan-pakistan-casa-power-project-inaugurated/27729921.html>

** <http://www.mea.gov.in/bilateral-documents.htm?dtl/6349/agreement>

Changing Mindset



Earlier -Promoting Cross Border Electricity Trade (CBET)

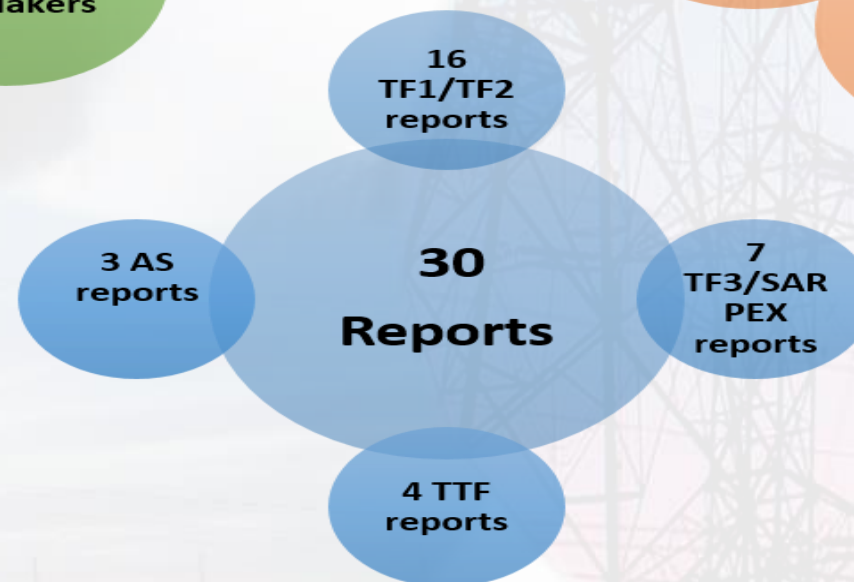
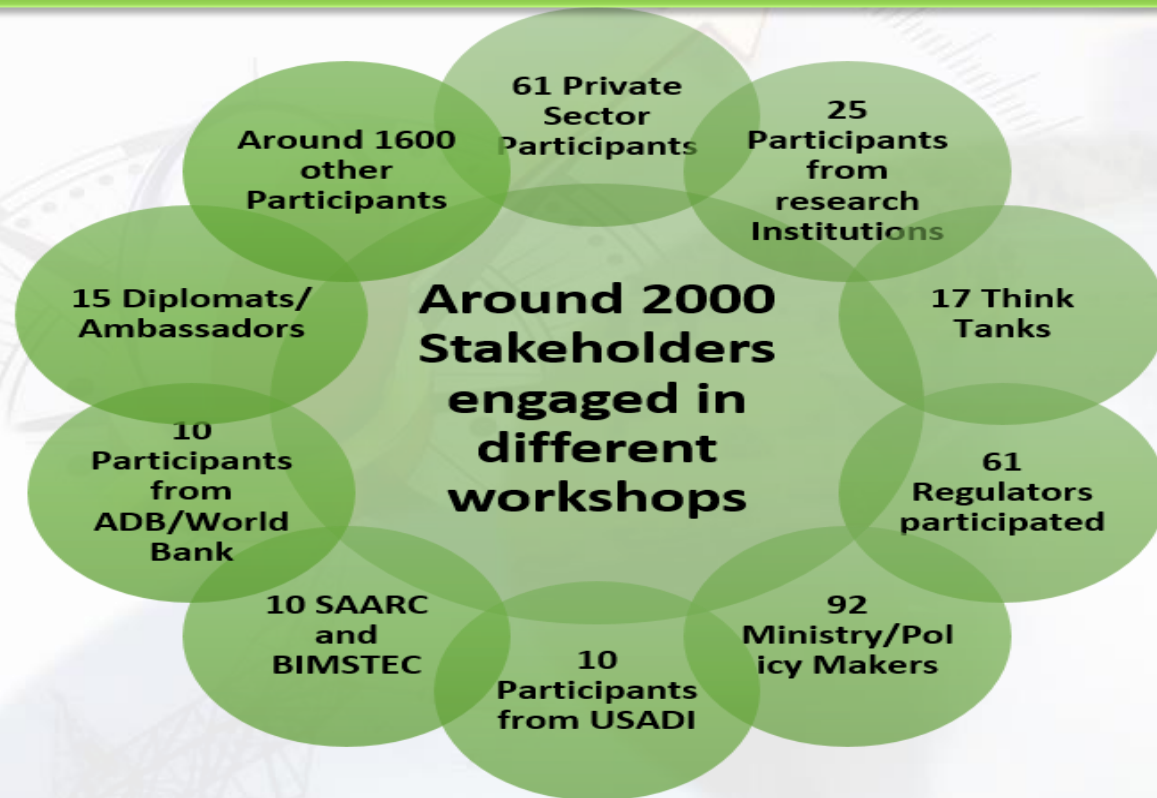
Preconceived
Notions &
Dominant
Thoughts



Preconceived Notions and Dominant Thoughts

- ☐ *CBET only when country in Surplus*
- ☐ *No need of Comprehensive Regulatory framework or regional institutions , Ad hoc measures are fine*
- ☐ *Restrict electricity imports for Energy security*
- ☐ *No need of Regional Approach and Planning*
- ☐ *Notion of Not getting the benefits of Export -Won't get a fair deal*
- ☐ *Geo-Politics rather than Economics the Driver*
- ☐ *No Consensus on Trilateral Approach*
- ☐ *Limited Market Approach*

Dialogue, Engagements and developing Understanding



Now- Evolution : Promoting Cross Border Electricity Trade (CBET)

Changed/Changing Thoughts

- ☐ *CBET can Happen by Exploiting Diversity , absolute Surplus not a pre-conditions*
- ☐ *Clear need of Comprehensive Regulatory framework or regional institutions , Ad hoc measures are not fine, It negatively impacts Investment*
- ☐ *Energy security continue to be a concern, but energy interdependence is a better approach*
- ☐ *Clear need of Regional Approach and Planning*
- ☐ *Can get a fair deal, Learning the art of deal making.*
- ☐ *Mix of Geo-Politics and Economics the Driver*
- ☐ *Consensus on Trilateral Approach*
- ☐ *More Market Approach , Renewable Energy Trade*

Changed/Changing Thoughts :





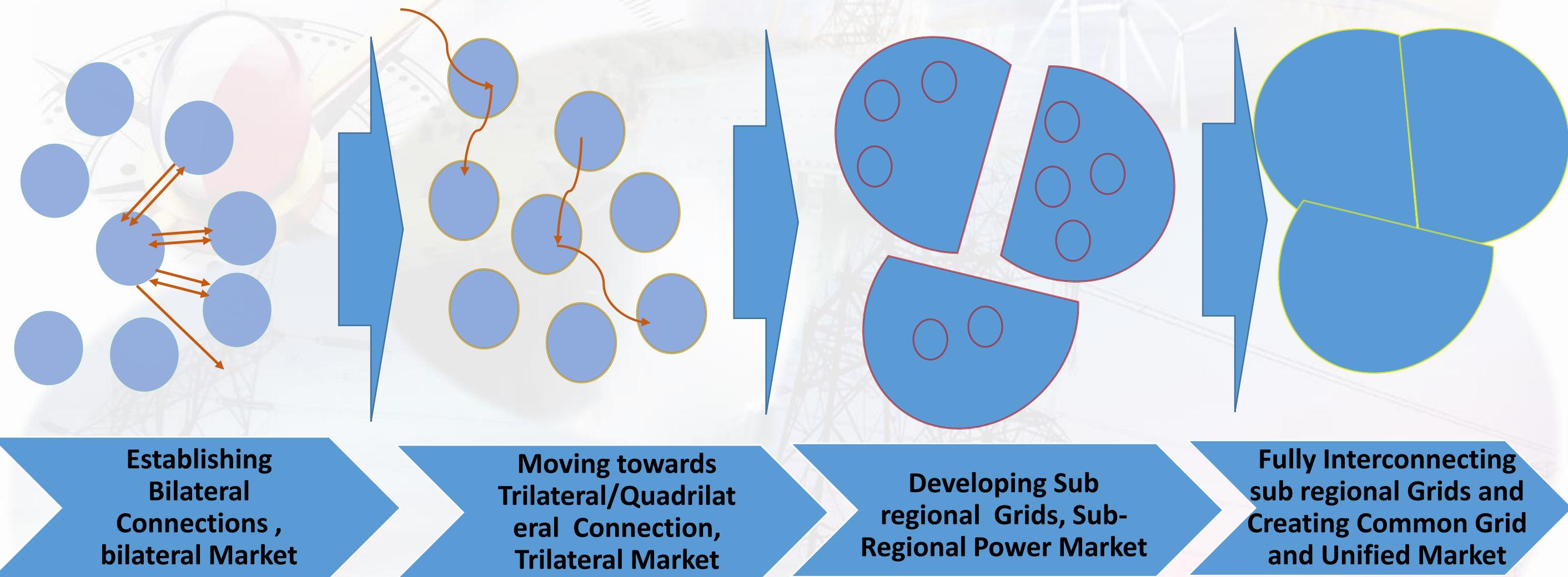


Cross Border Electricity Trade in South Asia: Future Outlook- Key Trends

Future Outlook- Trend-1



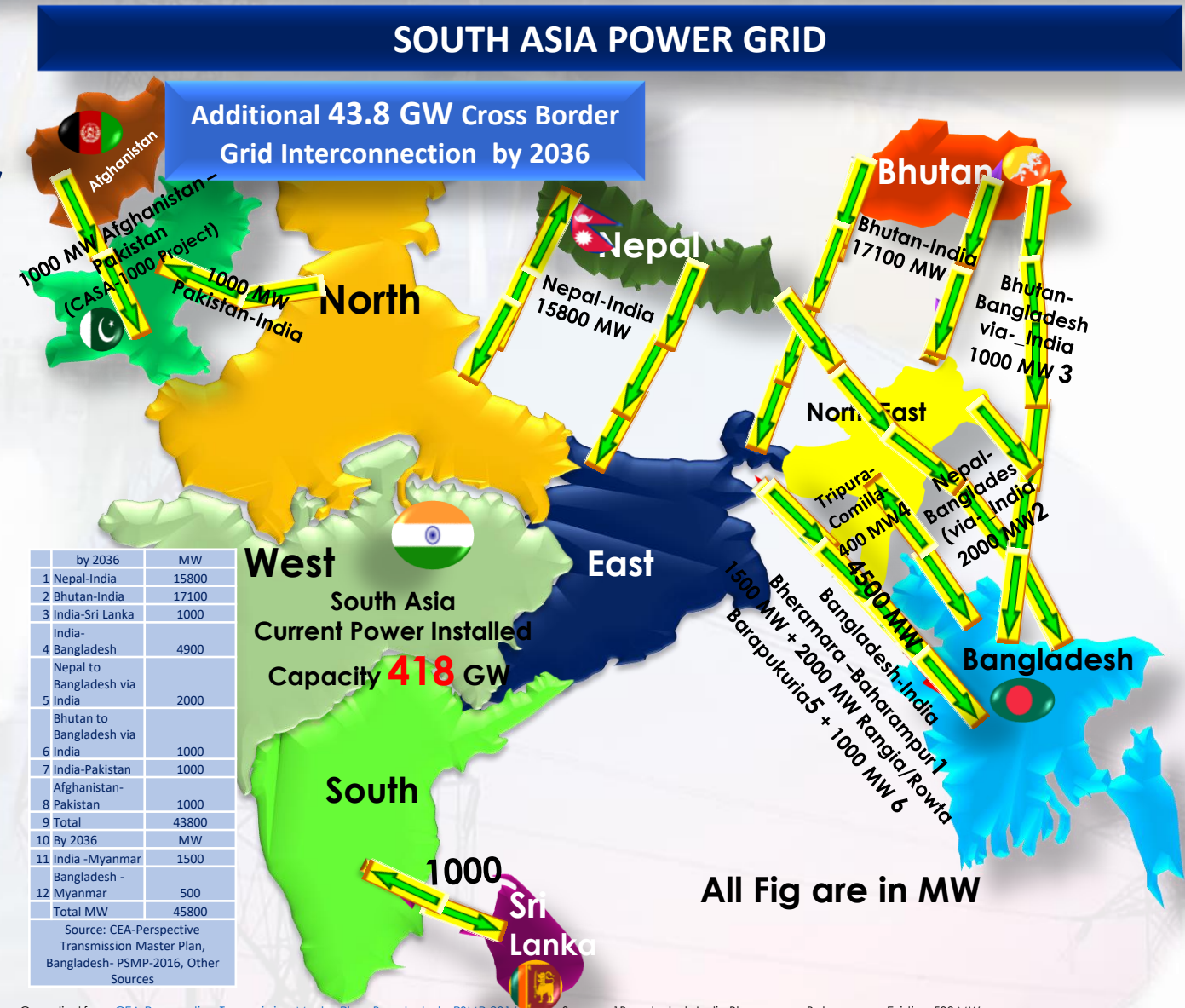
Power system and Market Integration evolution across the Globe



SA CBET Future Outlook-Trend-1:-Moving from Bilateral to Tri/Multilateral and Market Integration

Future Outlook- South Asia Power Grid: Transmission Capacity- 2036/2040

- ❑ SA- **418 GW** power system. One of the Largest.
- ❑ India **3rd Largest Producer & Consumer** of Electricity in the World.
- ❑ SA Power Trade is on an upward Trajectory, doubled since 2012. (3500 MW currently)
- ❑ In addition to bilateral , **trilateral power trade** are also being envisaged.
- ❑ **Bangladesh Master Plan***- envisaged to **import from Bhutan and Nepal** through India.
- ❑ Power import from Bhutan, 500 by 2032, 500 by 2034 (Bongaigaon/Rangia –Jamarpur)
- ❑ Power import from Nepal, 500 MW 2031, 500 by 2035 and 500 MW by 2038.

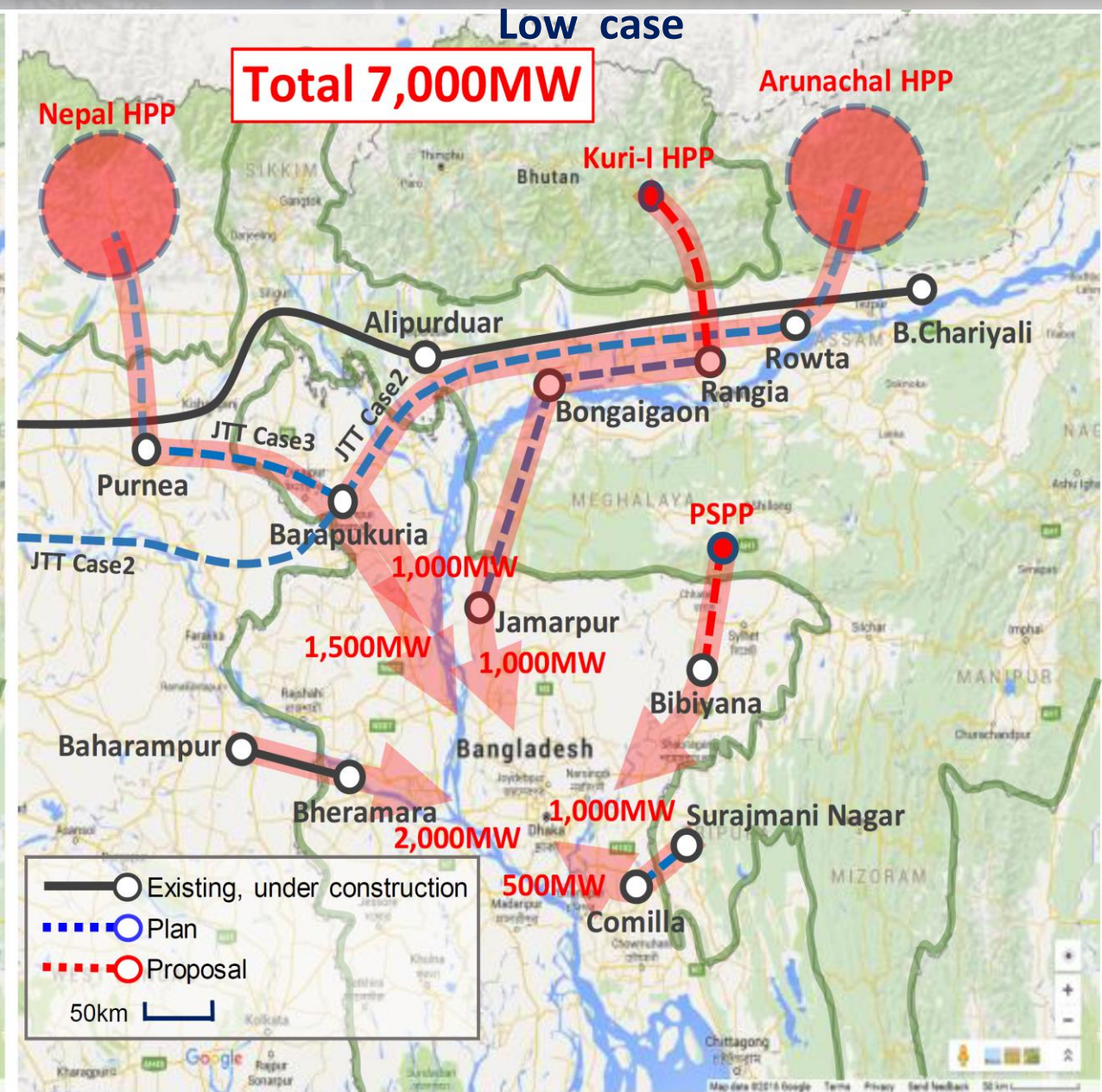
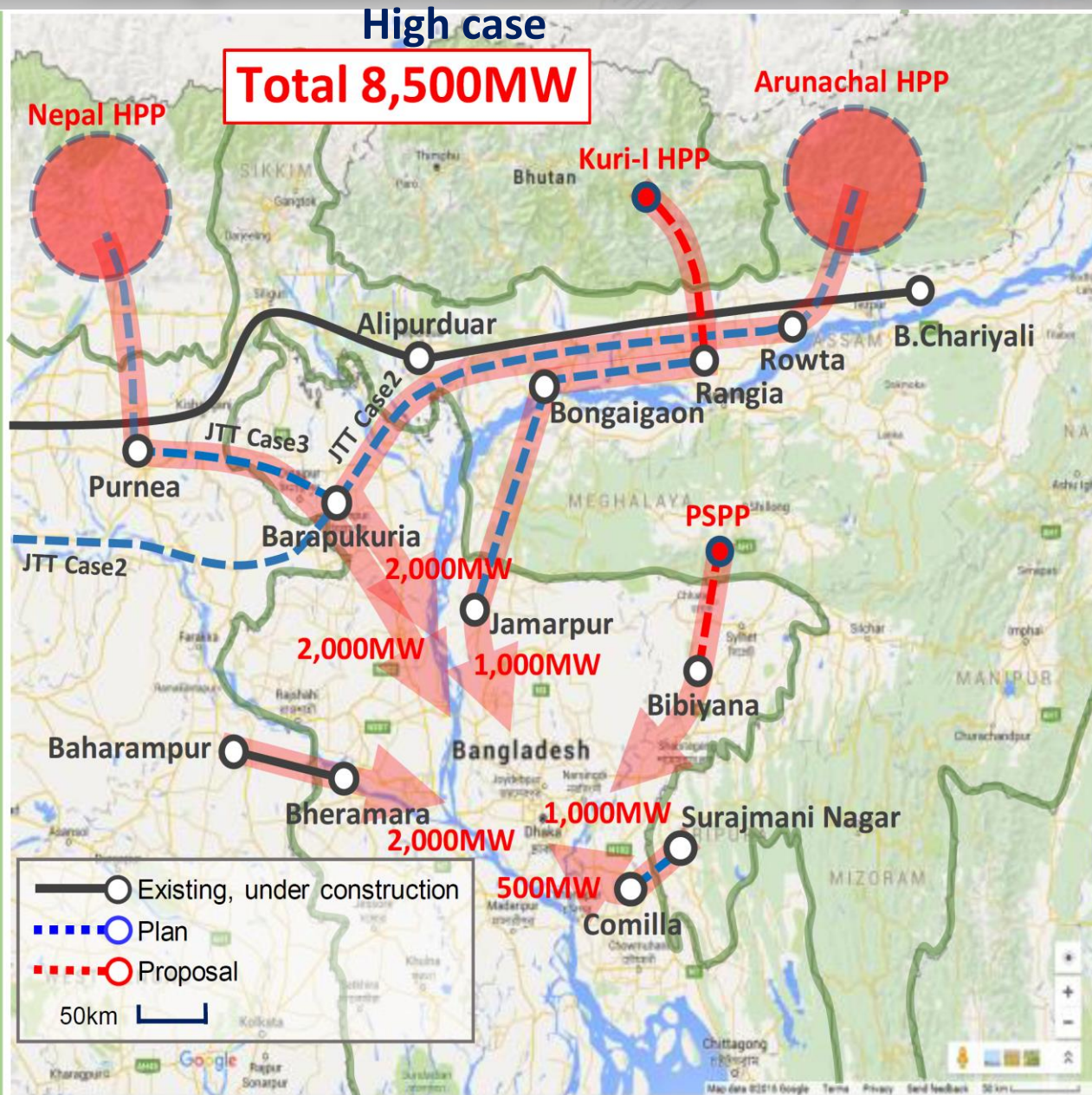


Compiled from [CEA-Perspective Transmission Master Plan, Bangladesh- PSMP-2016](#), Other Sources 1 Bangladesh-India Bheramara –Baharampur-Existing 500 MW

2 From Nepal 1,000 by 2030 Power import by using Case 3 T/L (upgrade to 765kV AC) and From Nepal (Purnea –Barapukuria), 1,000 by 2025, Power import by using Case 3 T/L (initially 400kV AC) 3 Bhutan-Bangladesh via-India 1000 MW-Bongaigaon/Rangia –Jamarpur 1,000 by 2030-Power import from Bhutan 4 400 MW by 2020 (100 MW existing) Construction of HVDC (500MW) in Comilla Construction of HVDC (500MW) in Comilla S/S. Some load (100 MW) in Comilla (N) S/S will be disconnected from Indian System 5 1000 MW by 2023 and 1000 MW by 2025 (Power Import Using Case 2 T/L (± 800KV HVDC) 6 1000 MW by 2030 Bibiyana-Meghalaya (PSPF) 7 At the Proposal Stage , detailed planning to be done.

Bangladesh Power Import as per Master Plan -2016 from SA countries

FY2035



Power System and Market Integration Models-International Experiences

Limited Bilateral
Power System
and Market
Integration

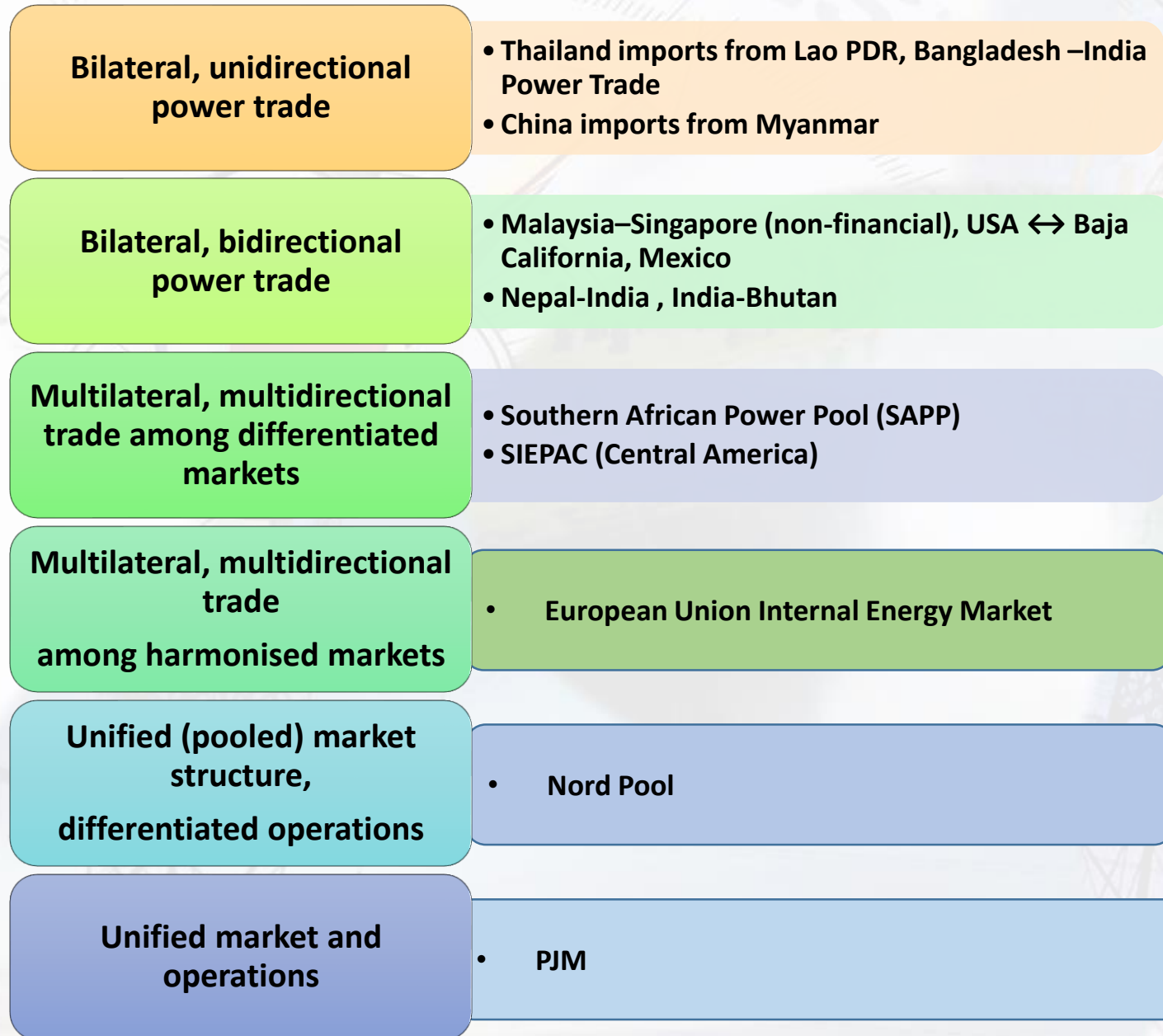
Moderate
Integration-
Trilateral/Quadrilat
eral
Interconnection (
Transitional Stage)

Multilateral

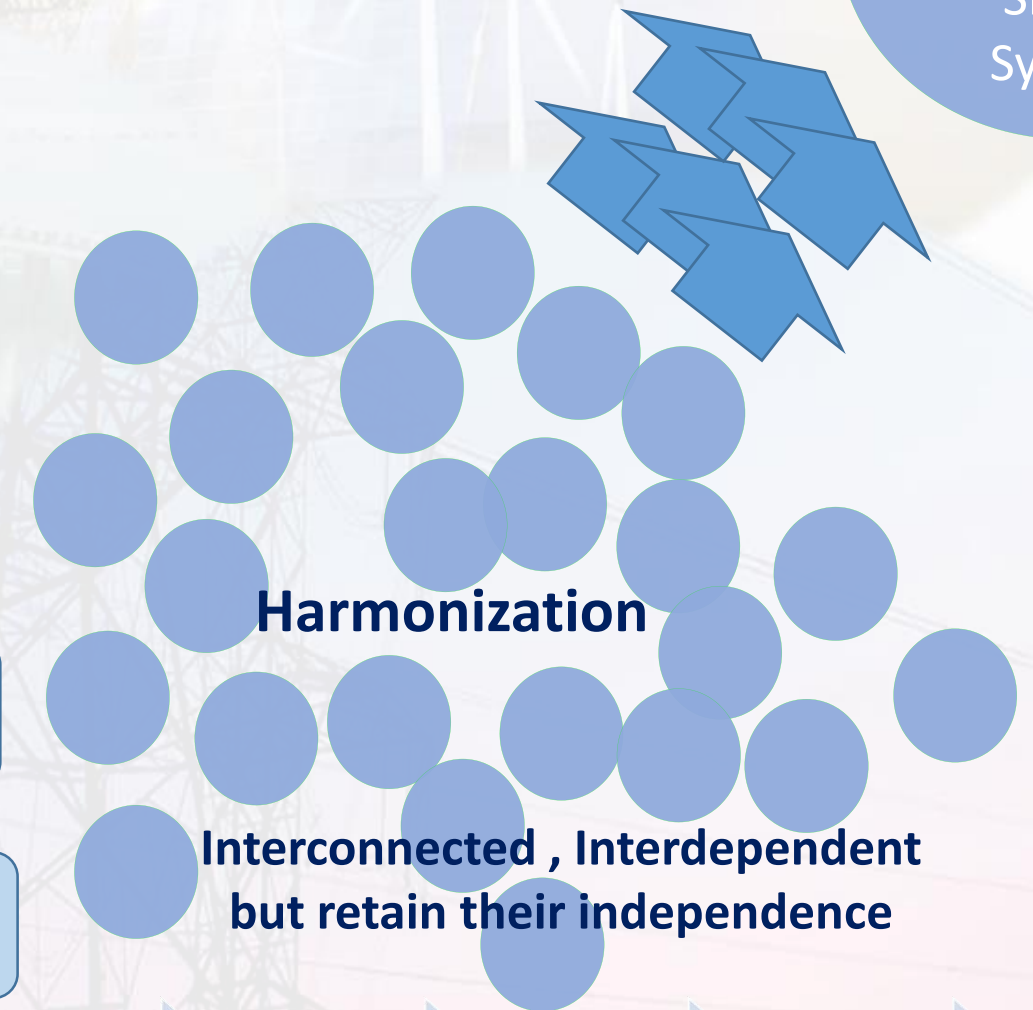
Deep Integration
– Multilateral
Power Trading
Unified Regional
Power Market

- *USA-PJM -**unified power market and system operations-** responsible for organising electricity markets and **for co-ordinating dispatch across all generators** within its service territory.*
- *Regional market and system operators and harmonisation of **market rules, grid codes, and transmission tariffs.***

Power System and Market Integration Models-International Experiences



Complete Integration, Uniform and Single System



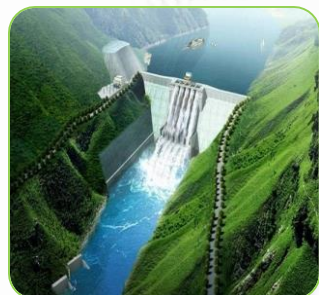
Reference - IEA (2019), "Integrating Power Systems across Borders ", IEA, Paris, www.iea.org/publications/reports/integratingpowersystemsacrossborders/
 IEA (2019), "Establishing multilateral power trade in ASEAN", IEA, Paris, www.iea.org/publications/reports/EstablishingmultilateralpowertradeinASEAN/.



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 **IRADE** Integrated Research and
Action for Development



Future Outlook- Trend-2

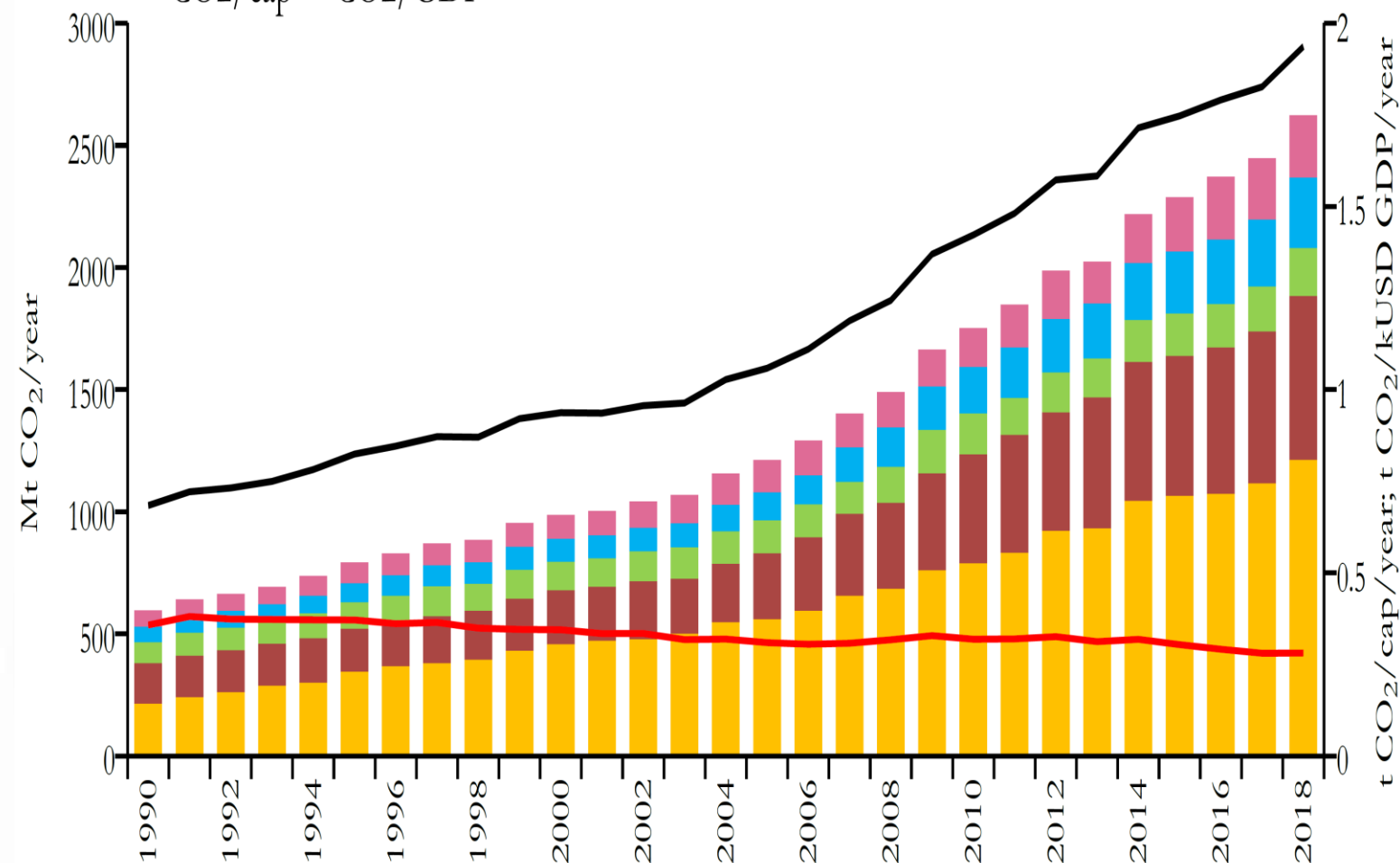


Significant Climate Change Challenge-India

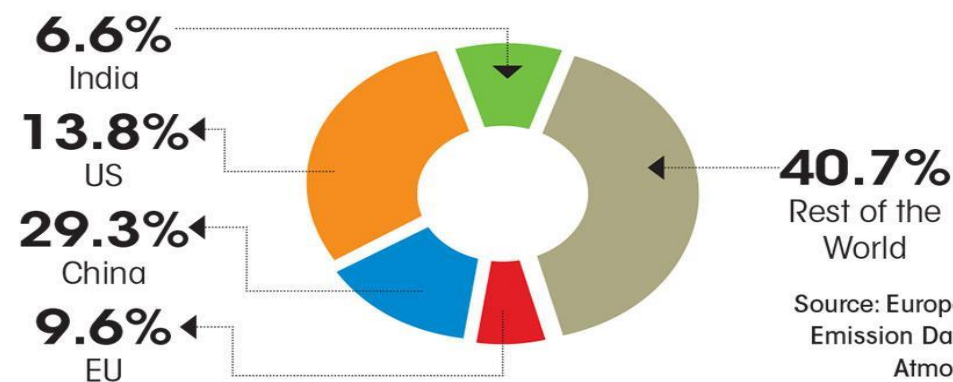
Fossil CO₂ emissions by sector

Power Industry Other industrial combustion Buildings Transport Other sectors

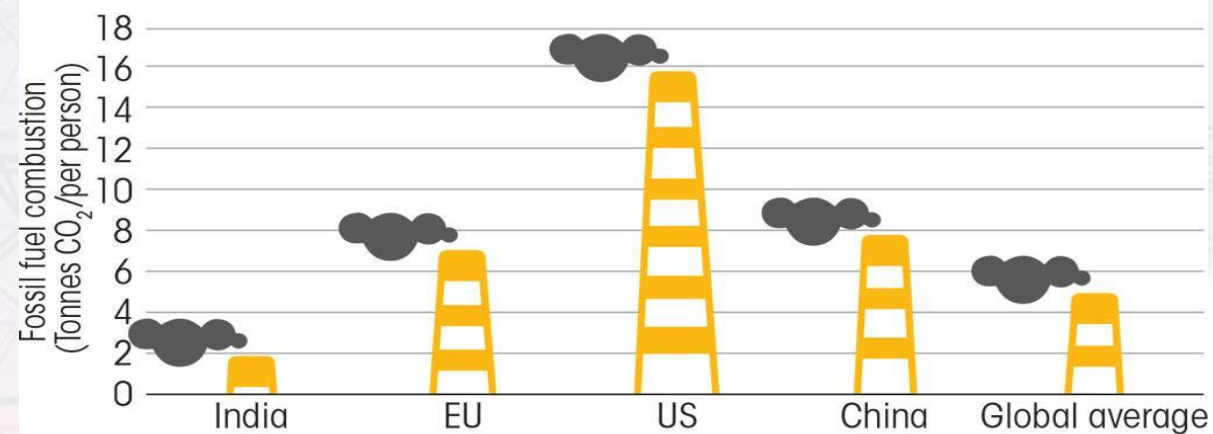
CO₂/cap CO₂/GDP



Four Nations -60% of Global Co₂ Emission from Fossil Fuel (2017) Combustion

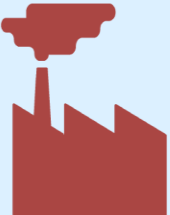
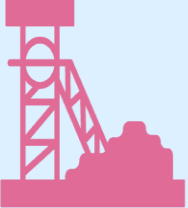


Though Per Capita it is less



Source: European Commission, Emission Database for Global Atmospheric Research

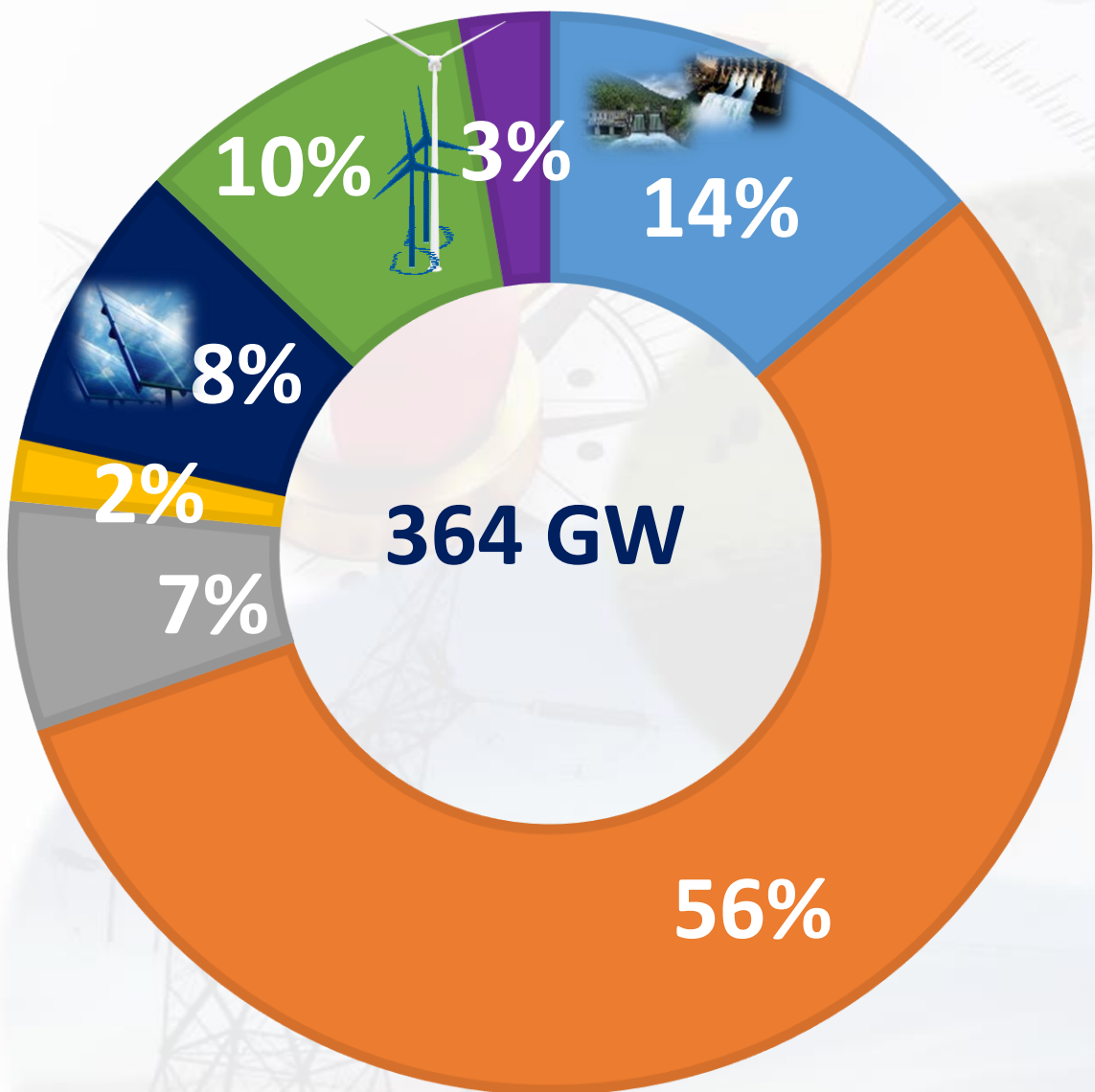
Significant Climate Change Challenge-India

		2018 vs 1990 (CO2)	2015 vs 1990 (GHG)	2015 vs 2005 (GHG)
	Power Industry	 +462%	 +396%	 +90%
	Other industrial combustion	 +309%	 +246%	 +111%
	Buildings	 +127%	 +81%	 +26%
	Transport	 +348%	 +293%	 +122%
	Other sectors	 +293%	 +53%	 +22%

source: Fossil CO2 and GHG emissions of all world countries 2019 Report-JRC SCIENCE FOR POLICY REPORT -https://edgar.jrc.ec.europa.eu/booklet2019/Fossil_CO2andGHG_emissions_of_all_world_countries_booklet_2019report.pdf



INDIA POWER INSTALLED CAPACITY (MW) IN OCT. 2019



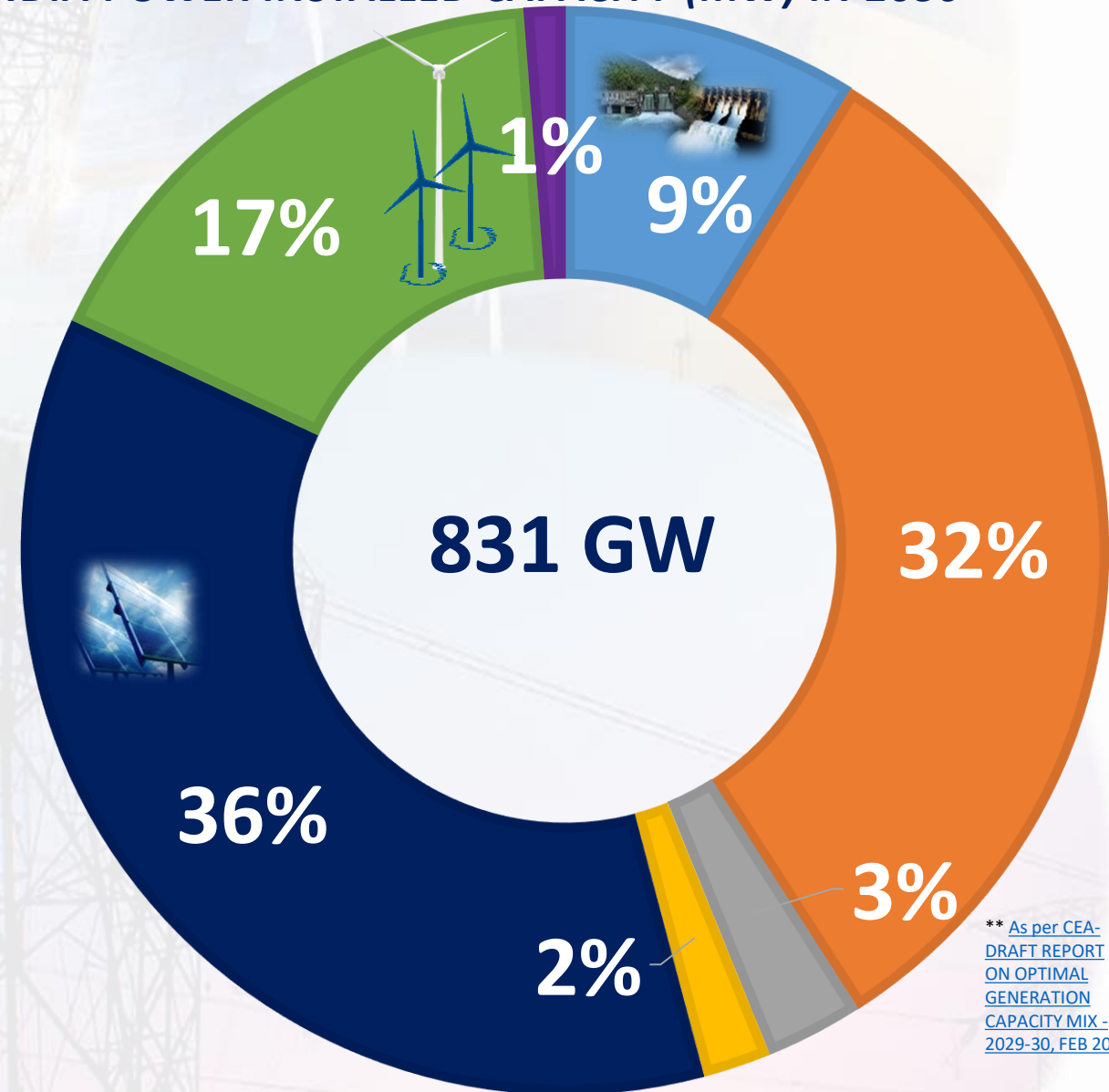
364 GW

■ Hydro * ■ Coal + Lignite ■ Gas ■ Nuclear
■ Solar ■ Wind ■ Biomass

RES (Hydro+ Solar+ Wind)= 118 GW (32%) RES (Solar+ Wind)=68 GW (18%)

* including small hydro

INDIA POWER INSTALLED CAPACITY (MW) IN 2030 **



831 GW

■ Hydro * ■ Coal + Lignite ■ Gas ■ Nuclear
■ Solar ■ Wind ■ Biomass

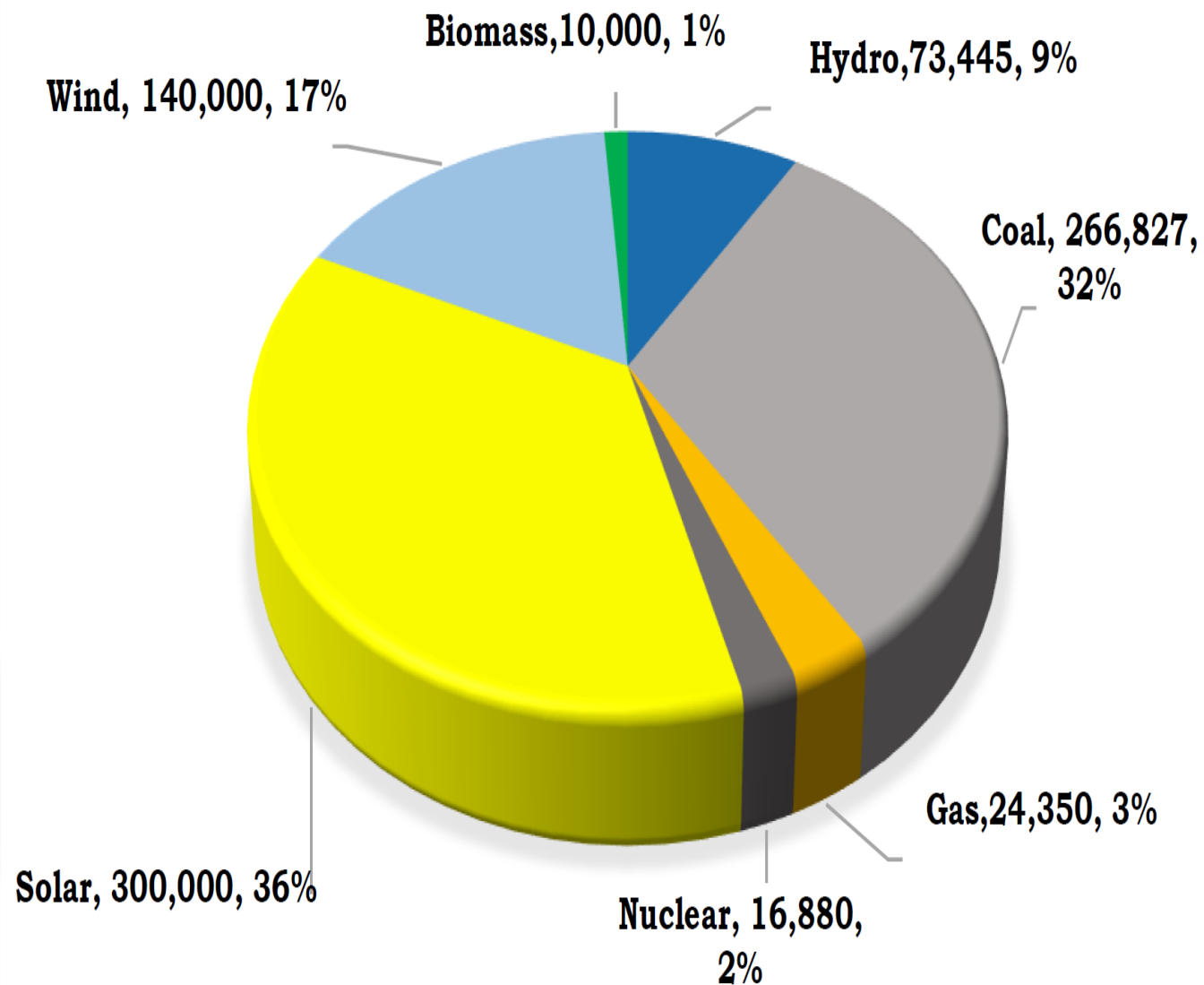
RES (Hydro+ Solar+ Wind)= 513 GW (62%) RES (Solar+ Wind)=440 GW (53%)

** As per CEA-
DRAFT REPORT
ON OPTIMAL
GENERATION
CAPACITY MIX -
2029-30, FEB 2019

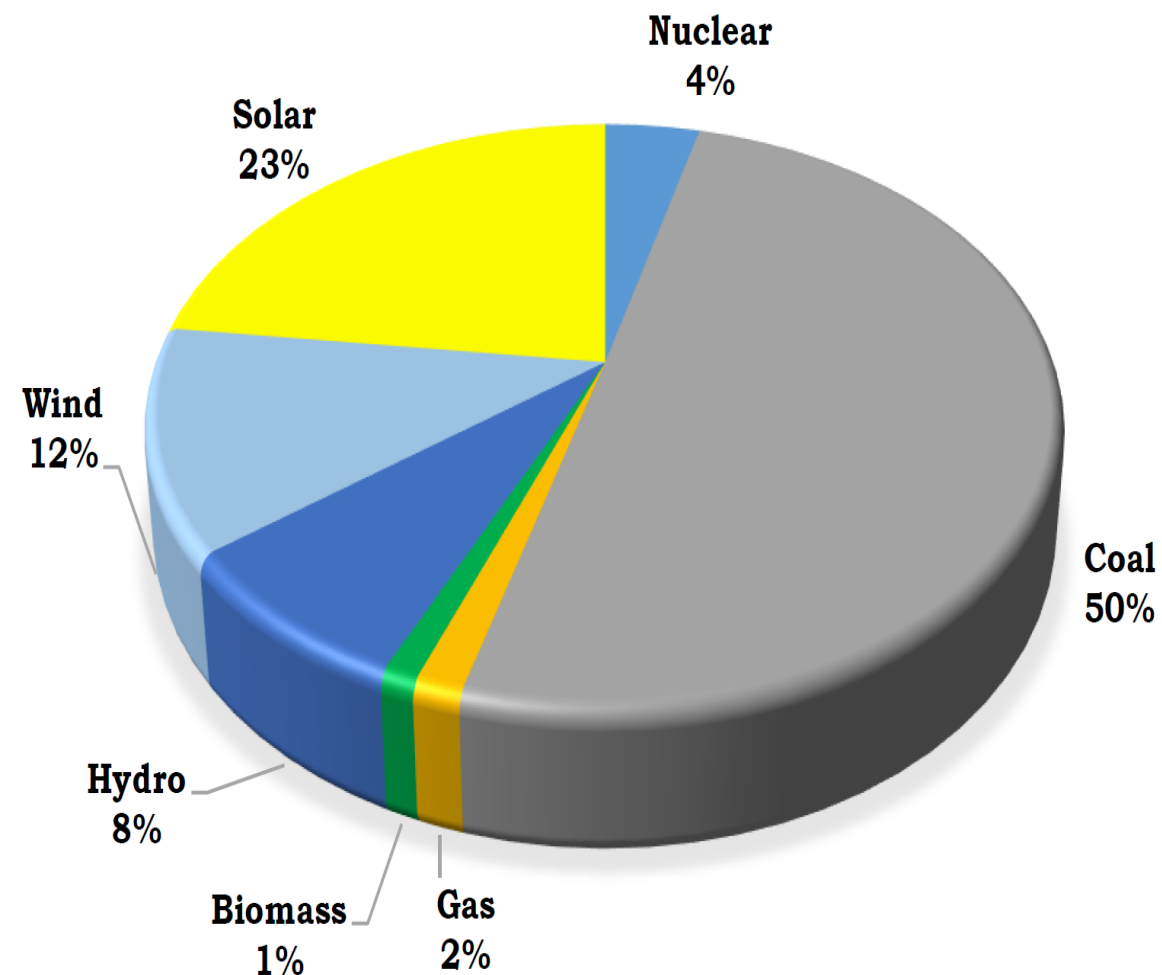
* including small
hydro of 5000 MW
and hydro imports
of 4356 MW

Likely Installed capacity by the end of 2029-30

LIKELY INSTALLED CAPACITY (MW) IN 2029-30



LIKELY GROSS GENERATION (MU) IN 2029-30



Regional Hydro Power can help in Renewable Integration and Grid Balancing

● Role of Cross Border Hydro in Renewable Integration and Grid Balancing.

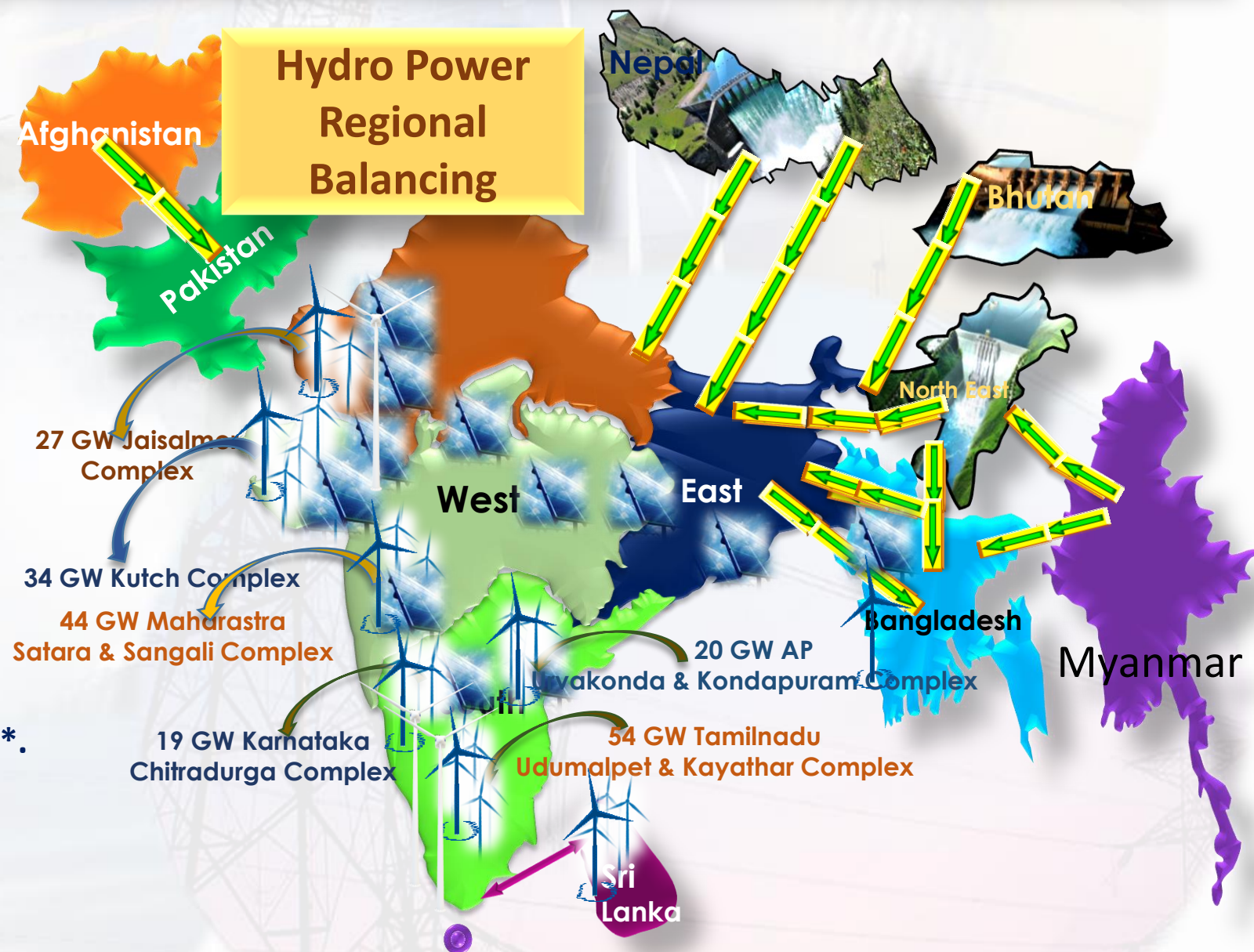
● India RE Target -175 GW by 2022

● Prime Minister Modi announced, “we will increase our renewable energy capacity to much beyond 175 GW & we are committed to take it further to 450 GW. *”

● Hydro share in India has been declining over the years (45% in 1970 to Apprx 12 % in 2019)

● National Electricity policy (GoI), spinning reserves at 5%**.

● Developing Regional Ancillary Market- India has started ancillary market



Five Year Vision Document for Power Sector

Action Plan Framework



Power Markets

Very Significant Reforms for Power Market has been Proposed in the above Draft Document – Indian Power Market 2.0



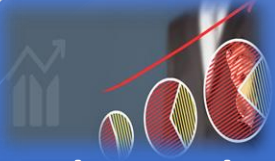
सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF POWER

Five Year Vision Document for Power Sector

28 June 2019

Five Year Vision Document for Power Sector- Goals- Power Markets



**1. Enhance share
of market traded
electricity**



**2. Make markets
efficient and
transparent**



**3. Deepen
products in
market to
enhance clean
energy**



**4. Enhance cross
border trade
through market
products**





Five Year Vision Document for Power Sector- Power Markets

Goal 04	Implementation Roadmap
Goal	Potential Interventions/ Actions
Enhance cross border trade through market products	• Introduce standardized products in Day-Ahead Markets, Intra-day, Term-Ahead market for cross-border electricity trading – physical delivery • Introduce products in Balancing market for trading of balancing services from fast response plants such as Hydro • Introduction of financial products – futures & derivatives
Goal 03	Implementation Roadmap
Goal	Potential Interventions/ Actions
Deepen products in markets to enhance clean energy	Introduction of Real Time Market (RTM) for improved reliability and control and better absorption of RE
	Move from regulated to market based mechanism for Ancillary Services
	Inclusion and scale up of innovative models for Decentralised Renewable Energy (DRE) based access



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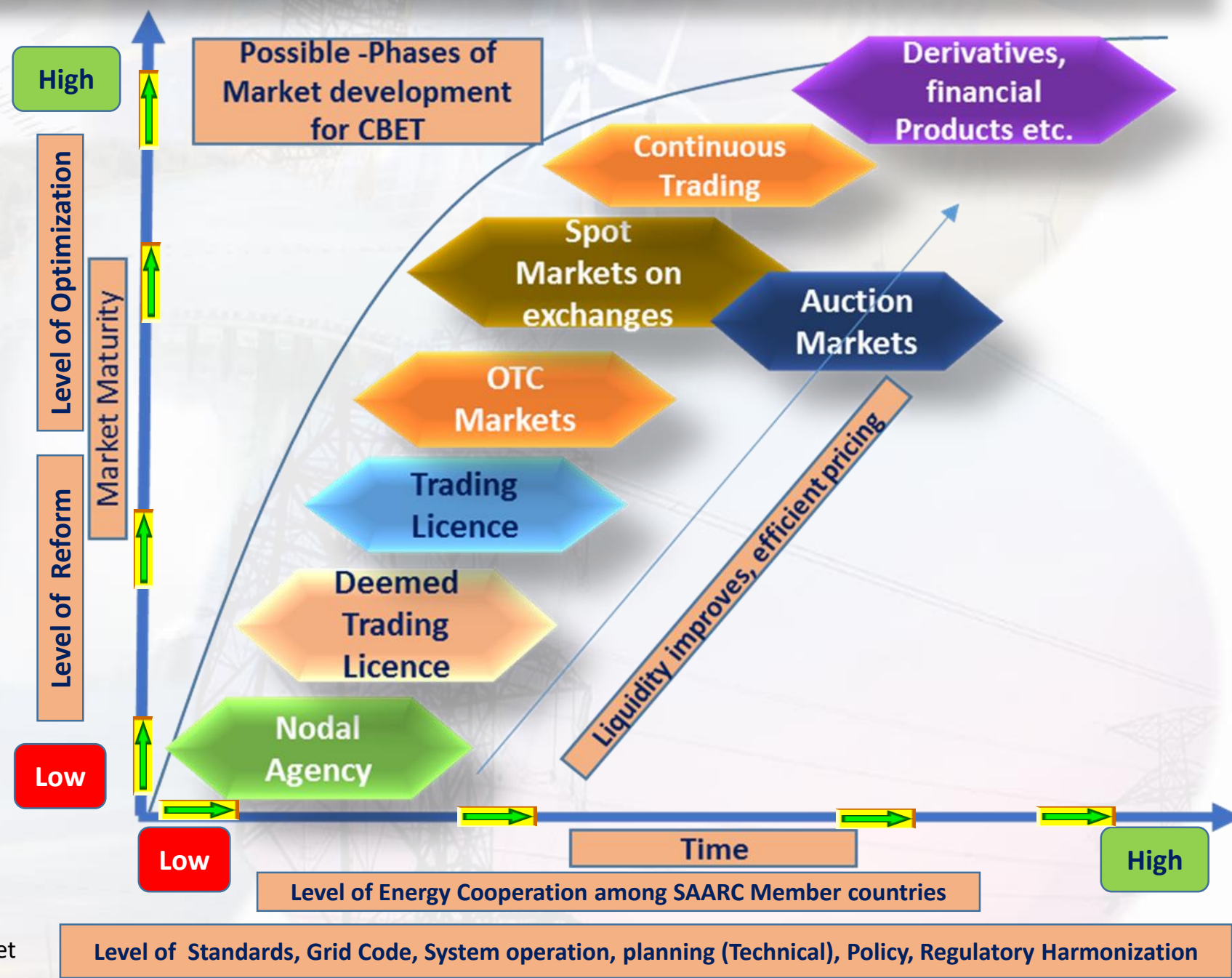
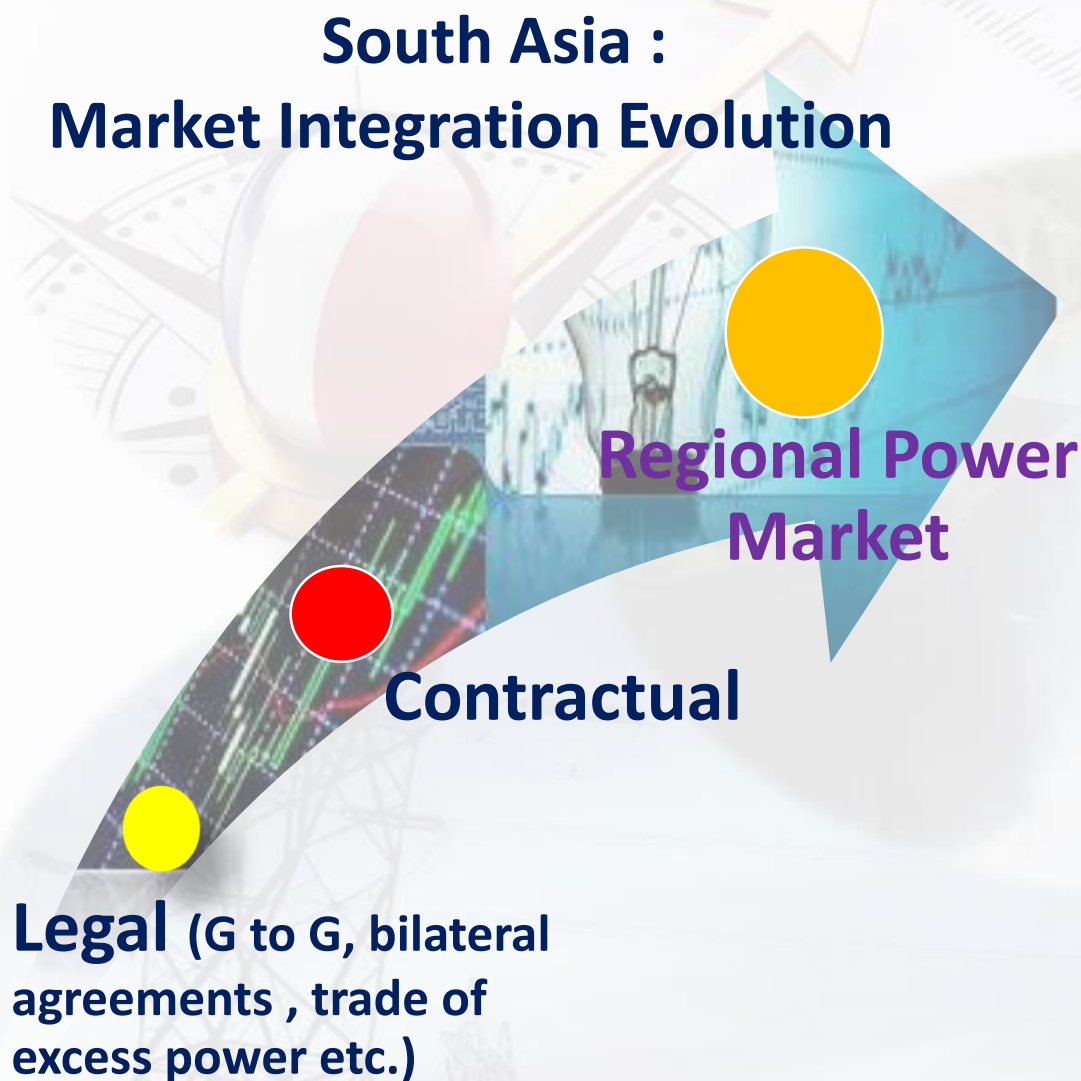
 **IRADE** Integrated Research and
Action for Development



Future Outlook- Trend-3



Moving Towards Market form of Trade



An mix of Long Term, Medium Term, Short term and PX based Trade will be desirable one for A Journey towards the Vision of a Competitive Power Market



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 **IRADE** Integrated Research and
Action for Development

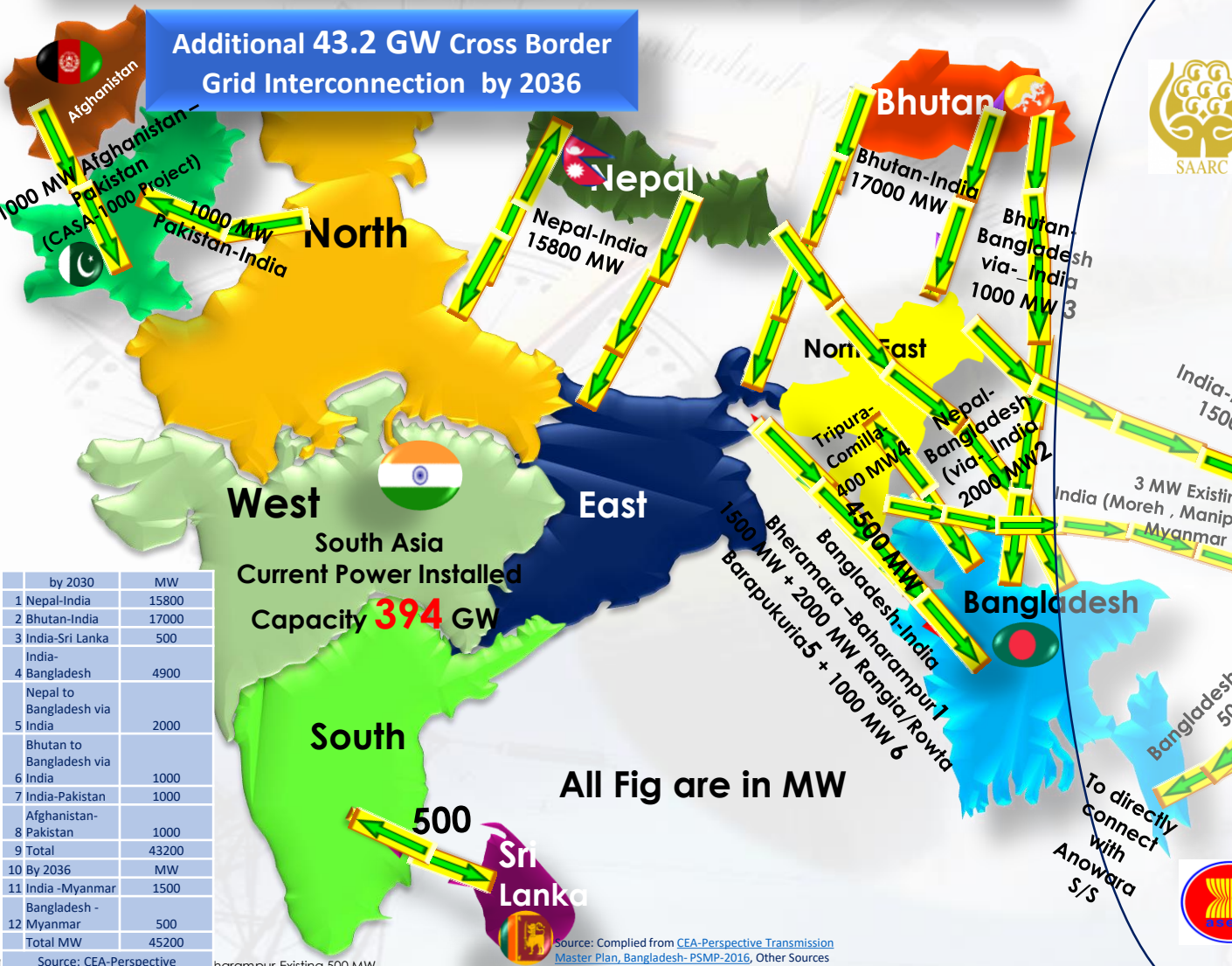


Future Outlook- Trend-4



SOUTH ASIA POWER GRID

Additional 43.2 GW Cross Border
Grid Interconnection by 2036



ASEAN POWER GRID

Existing-5,212 MW* , On-going (Up to 2021)-3,199-3,269 MW,
(Future-2021)-2,074-23,224 MW , Total -28.48 GW -31GW



ASEAN+ South Asia Power Grid -Will be one of the world's Largest Integrated Trans-Regional Power System by 2040 = 1996 GW (1367* GW + 629** GW)

Disclaimer: By making any reference to a particular geographic area or by using the term "country" and Map in this document, IRADE/USAID does not intend to make any judgement as to the legal or other status of any area/Map. The map used is without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries, and to the name of any territory, city or area.

Future Outlook-Way Forward

- ☐ Moving from Bilateral to Tri/Multilateral and Market Integration
- ☐ Regional Hydro Power can help in Renewable Integration and Grid Balancing
- ☐ Moving Towards Market form of Cross Border Power Trade
- ☐ Trans-Regional Energy Integration –South Asia and South-East Asia



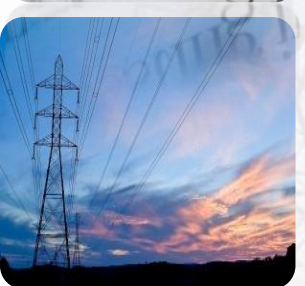
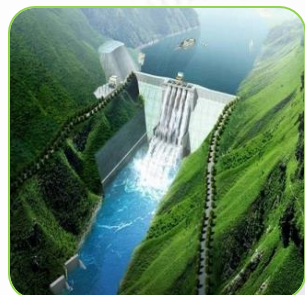


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Thank You

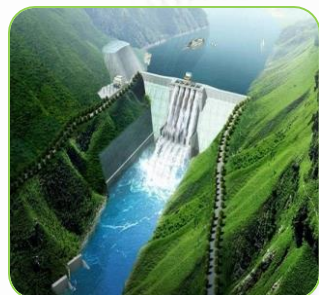




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Future Outlook- Trend-5



Five Year Vision Document for Power Sector

Action Plan Framework



Power Markets

Very Significant Reforms for Power Market has been Proposed in the above Draft Document – Indian Power Market 2.0



सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF POWER

Five Year Vision Document for Power Sector

28 June 2019

Five Year Vision Document for Power Sector- Goals- Power Markets



Five Year Vision Document for Power
Sector

28 June 2019

**1. Enhance share
of market traded
electricity**

**2. Make markets
efficient and
transparent**

**3. Deepen
products in
market to
enhance clean
energy**

**4. Enhance cross
border trade
through market
products**



Five Year Vision Document for Power Sector- Power Markets

Goal 01

Implementation Roadmap

Goal

Potential Interventions/ Actions

Enhance share of market traded electricity (
Current Short Term Trade-- ~12% of total generation, ~88% is still long term)

Improving the liquidity short term (ST) by enabling increased participation of Discoms and Gencos-

- Stronger regulations and stringent penalties for discouraging use of DSM to meet energy requirement
- Review of gate closure norms and 'Right to Recall'

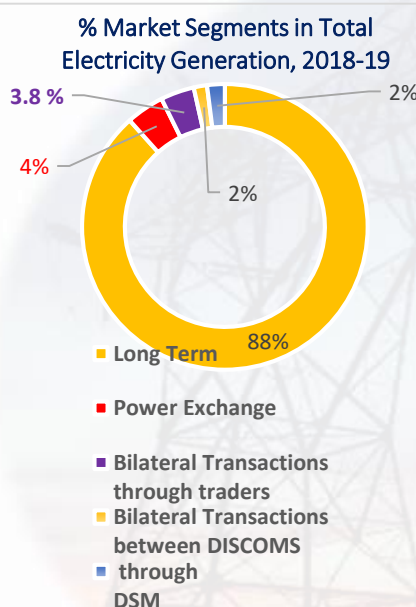
Alternative mechanisms to flexibilise existing long term contracts - Long Term PPAs can act as forward contracts, while physical transactions can take place ST Market. Financial products such as Contracts for Differences (CfD) can be enablers.

Introduction of Real Time Market ([basis CERC's discussion paper](#))

- To help improve market liquidity

The intent is to provide the market players an organized platform for energy trade closer to real time.

Move to shorter term and more flexible PPAs





Five Year Vision Document for Power Sector- Power Markets

Goal 02

Implementation Roadmap

Goal

Potential Interventions/ Actions

**Make
markets
efficient and
transparent**

Strengthening of data disclosure regime -

- Regulations to mandate disclosure scope and set accountability
- Standardisation of data disclosure

Better demand forecasting and power procurement optimization approaches

Move towards a **“new form of market”** based on Centralised Despatch with CfD’s – least cost provision of power

Robust planning regime at national and state level

- Multiple scenarios based approach for energy system development in near to long term
- Plans to send clear market signals for capacity addition

Resource adequacy (capacity) mechanisms

- Revive the long term capacity investments (beyond RE)
- Dedicated auction platforms (like DEEP) for long term contracting

Introduce financial products such as derivatives for hedging risks and improving liquidity. ³⁶



Five Year Vision Document for Power Sector- Power Markets

Goal 03

Implementation Roadmap

Goal

Potential Interventions/ Actions

Deepen products in markets to enhance clean energy

Introduction of Real Time Market (RTM) for improved reliability and control and better absorption of RE

- Aim is to manage the differences in day ahead forecasts and actual conditions closer to real time
- This becomes critical in view of increasing RE share.

Move from regulated to market based mechanism for Ancillary Services

- Introduce new technologies such as battery storage to respond quickly (primary response) to grid fluctuations
- Introduce innovative models such as Demand Response
- Will help signal new investments (storage, flexible thermal etc.)

Inclusion and scale up of innovative models for Decentralised Renewable Energy (DRE) based access

- Utility driven models for solar rooftop installation
- Other products and services for cooking, heating, lighting etc.



Five Year Vision Document for Power Sector- Power Markets

Goal 04	Implementation Roadmap
Goal	Potential Interventions/ Actions
Enhance cross border trade through market products	• Introduce standardized products in Day-Ahead Markets, Intra-day, Term-Ahead market for cross-border electricity trading – physical delivery • Introduce products in Balancing market for trading of balancing services from fast response plants such as Hydro • Introduction of financial products – futures and derivatives

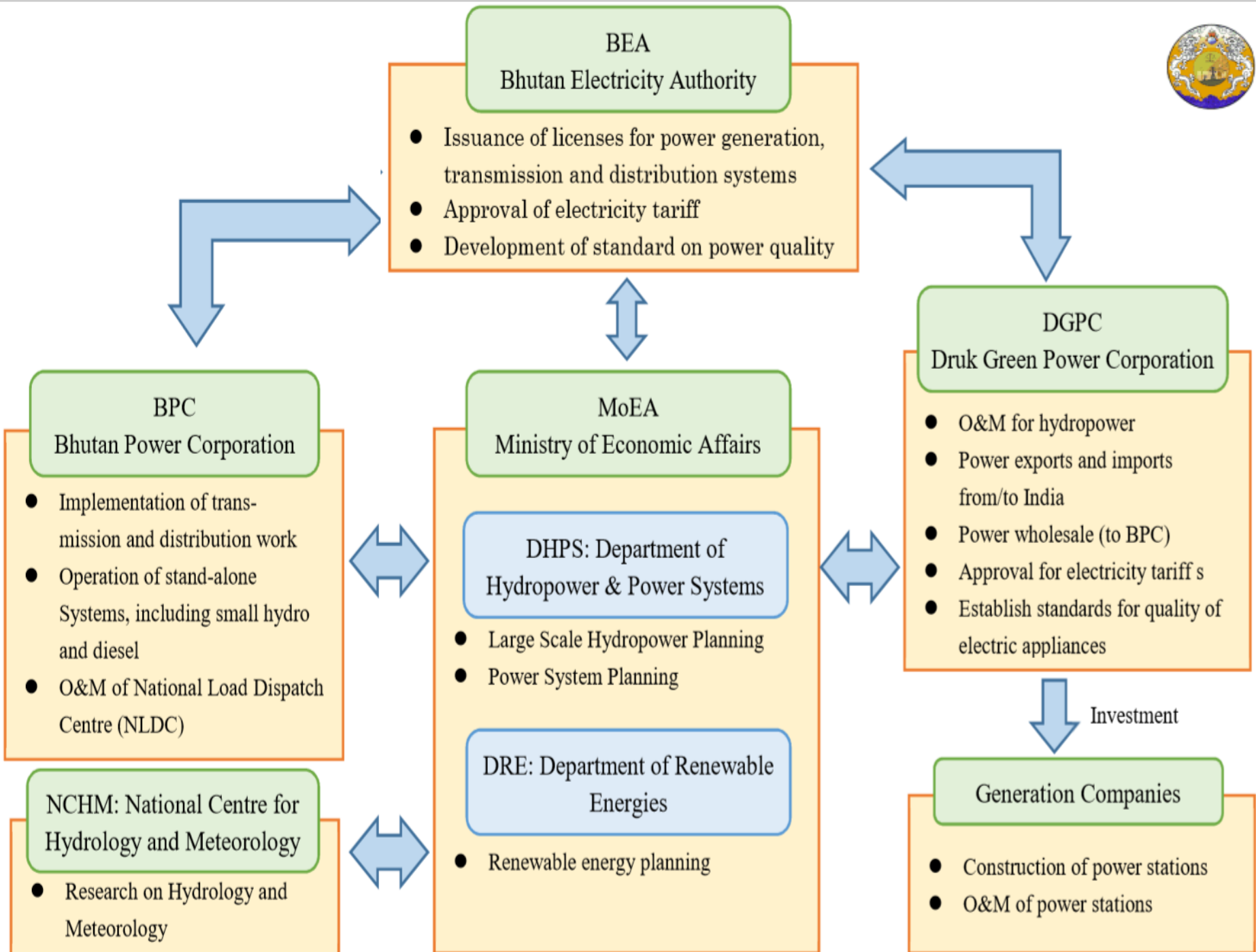


BHUTAN

Dorji

4th DECEMBER 2019

DHAKA, BANGLADESH



Existing Planned

400kV (Quad) 2cct

400kV 1cct

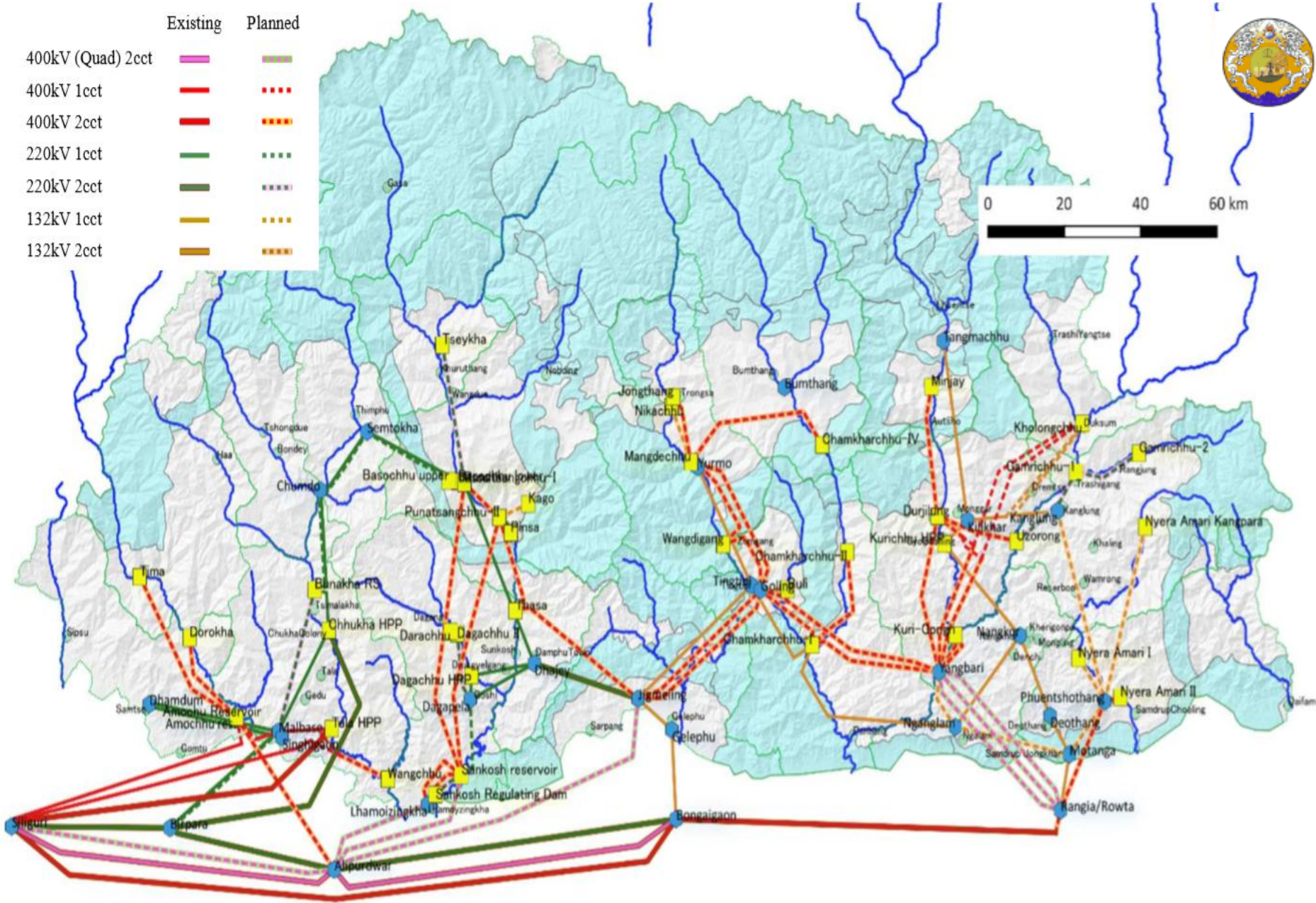
400kV 2cct

220kV 1cct

220kV 2cct

132kV 1cct

132kV 2cct



(Source: JICA Survey Team)



Power generating capacity

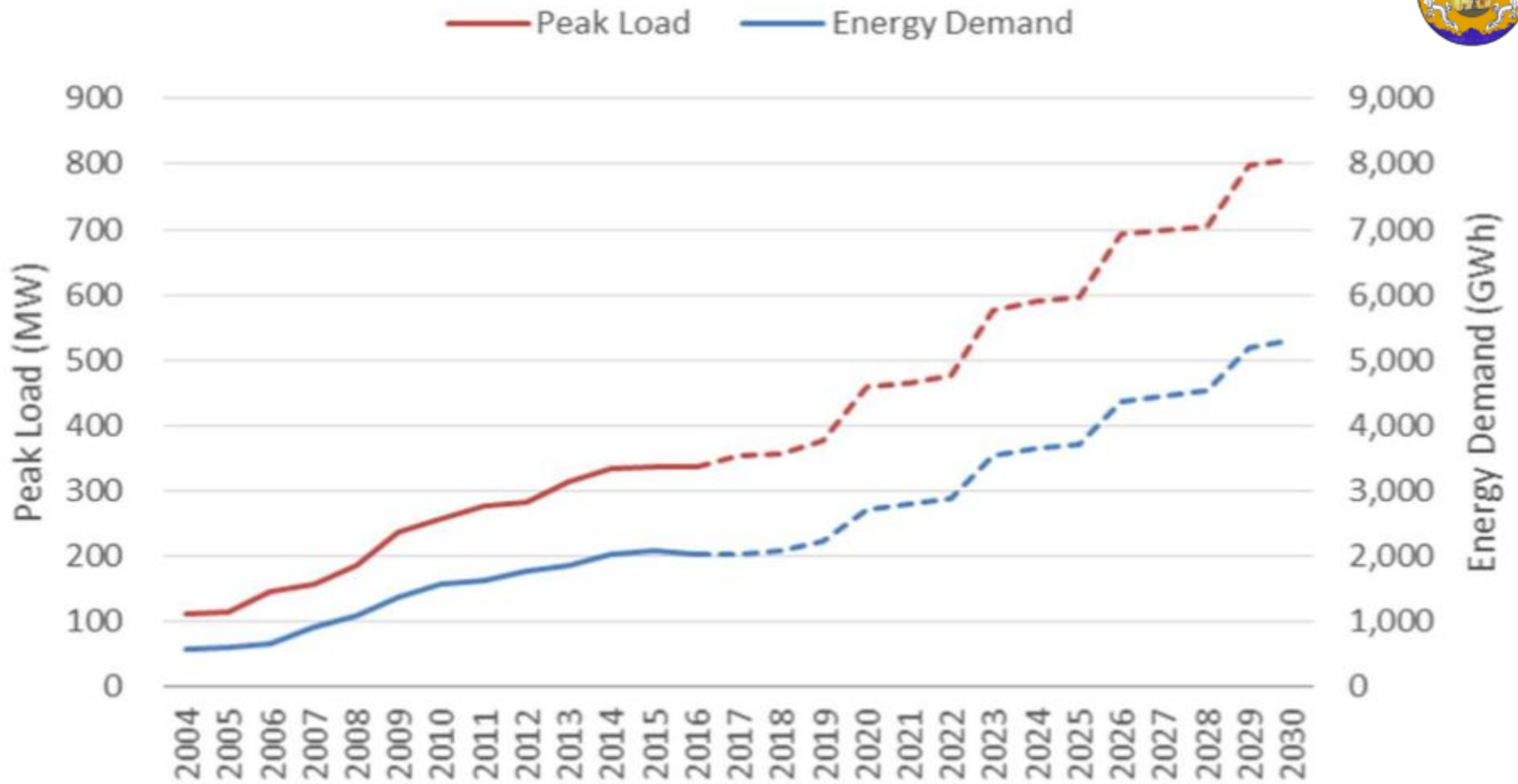
SI No.	Plant Name	Capacity (MW)
1	DGPC (CHP, THP, BHP, KHP)	1480
2	MHPA	720
3	BPC (mini, micro hydel and wind power -600kW)	6.2
	Total	2206

Power Development Plan



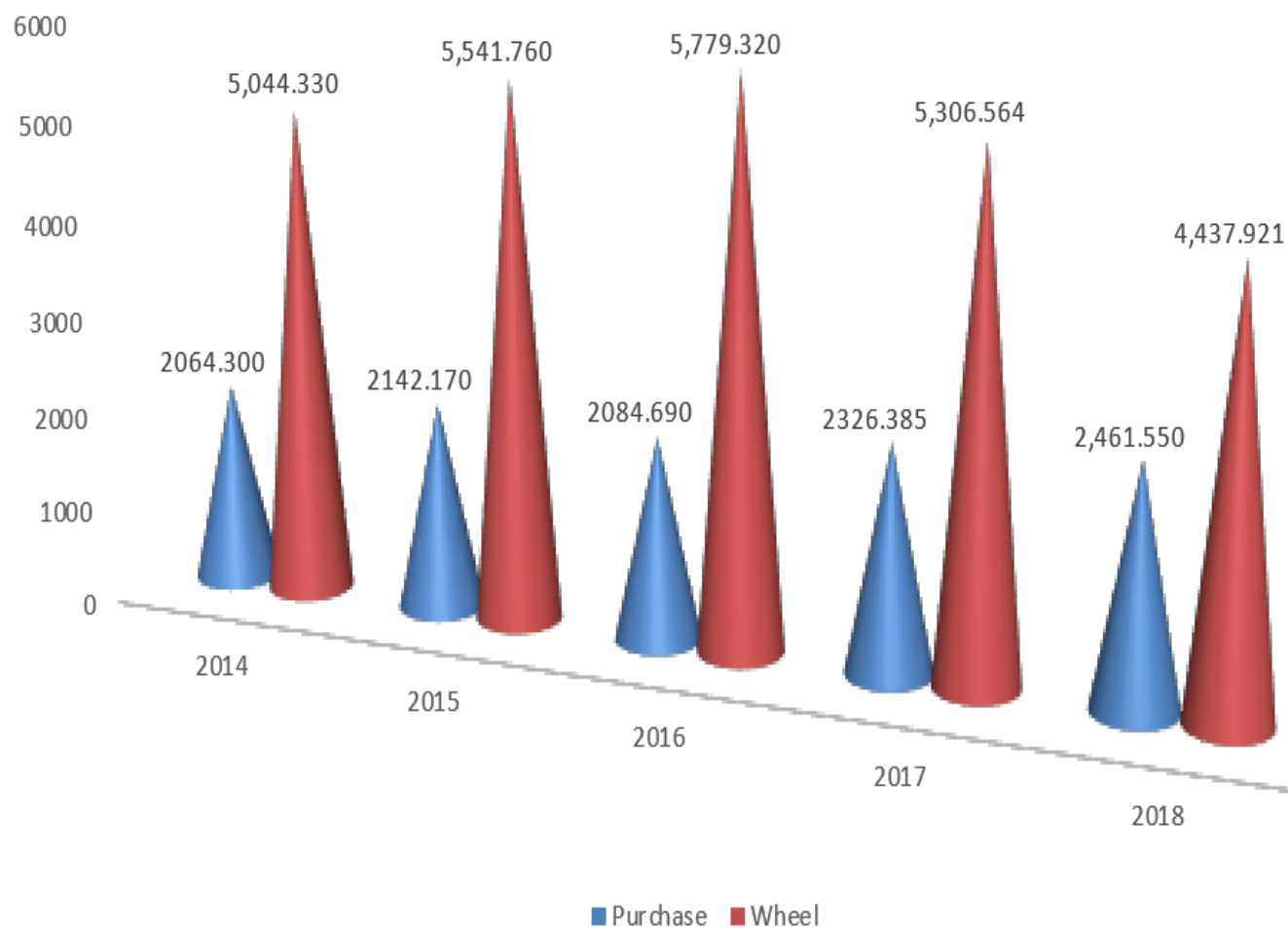
	Project	Capacity (MW)
2018 - 2020 Total: 1,858MW	Punatsangchhu II	1,020
	Mangdechhu	720
	Nikachhu	118
2021 - 2025 Total: 1,800MW	Punatsangchhu I	1,200
	Kholongchhu	600
2026 - 2030 Total: 4,114MW	Dorjilung	1,125
	Sankosh Reservoir	2,500
	Sankosh RD	85
	Nyera Amari I	112
	Nyera Amari II	292
2031 - 2035 Total: 4,160MW	Kuri-Gongri	2,640
	Chamkharchhu I	770
	Wangchhu	570
	Bunakha	180

(Source: NTGMP 2018)

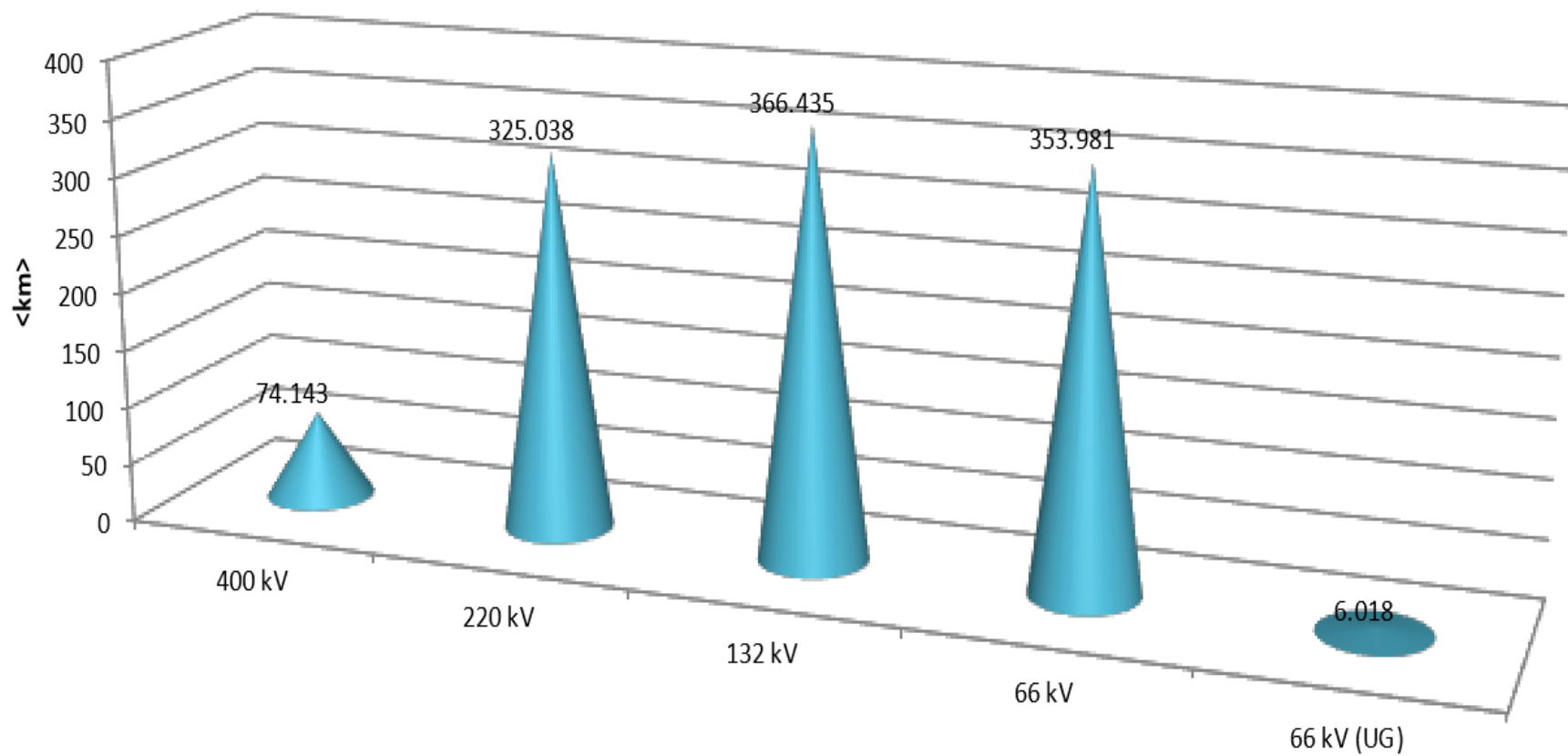


(Power Data 2017, DHPS)

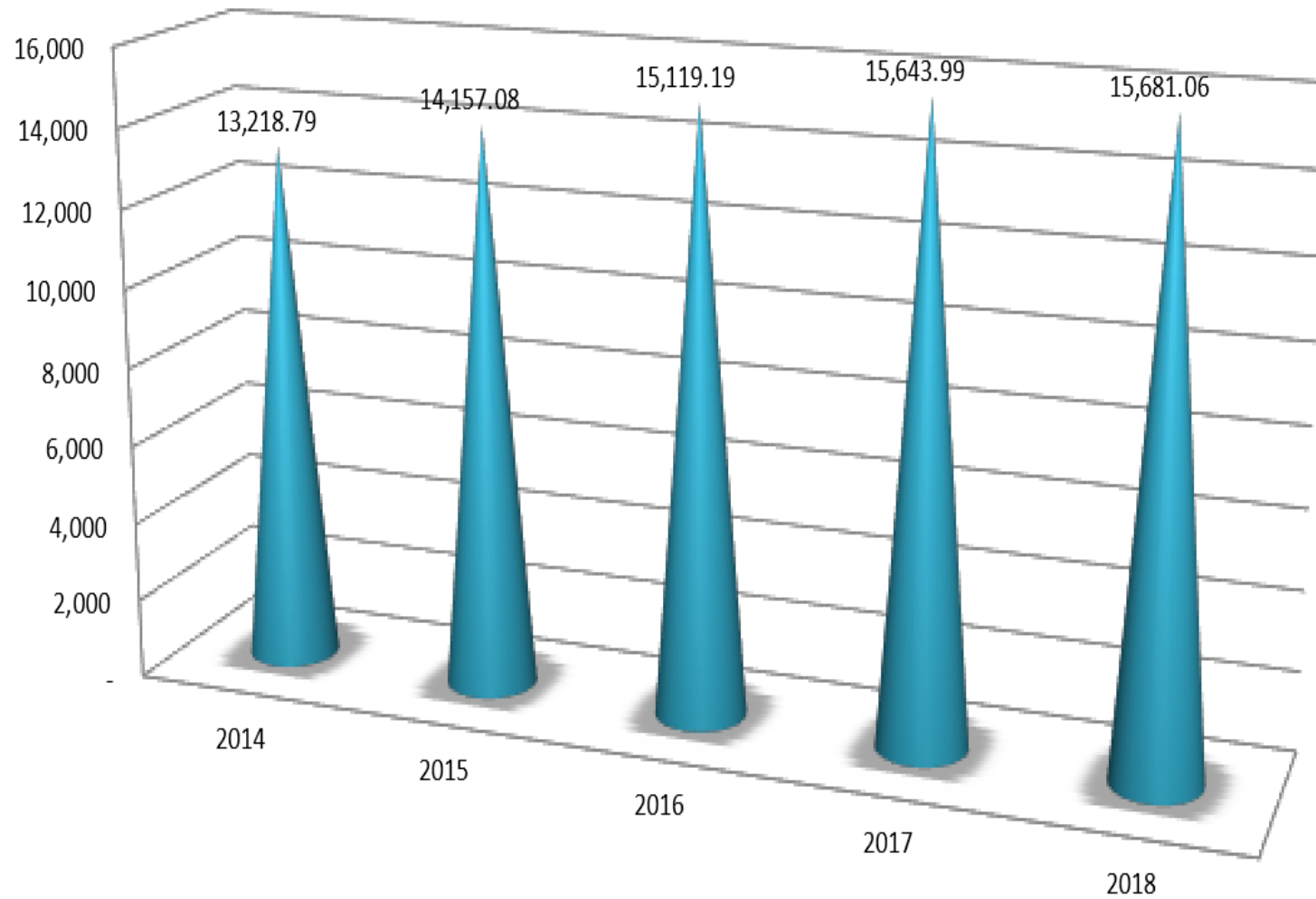
Domestic Power Demand Forecasts



Transmission line length for different voltages (km)



Distribution Network (km)





History of BEA

- Electricity Act - enacted on **26 July 2001** during **79th** National Assembly
- Act enforcement:- 1 July 2005 (Minister's Notification - section 4)
- June – August 2006: BEA Commission Appointed
- 1st January 2010: Fully independent - BEA Secretariat delinked from civil service



Purpose of the Act

Section 2

1. Restructure electricity supply industry;
2. Establish BEA;
3. Technical Regulation of electricity supply industry;
4. Private sector participation in electricity supply industry;
5. Empower Government in formation of any company to fulfill purpose of this Act



Objective of the Act

1. Safe & reliable electricity supply;
2. Revenue generation through export;
3. Socio-economic welfare development;
4. Economic self-reliance - financially viable electricity industry;
5. Renewable energy development;
6. Efficiency management and service delivery;
7. Environmental consideration in electricity supply projects.

Power and Functions of Minister



Section 17:

- 1) Set general policies, targets & strategies of electricity industry operation;
- 2) Approve power system expansions plans;
- 3) Set general policies on tariff determination & service provisions;
- 4) Provide policy on customer service standard & licensee standard;



Power and Functions of Minister

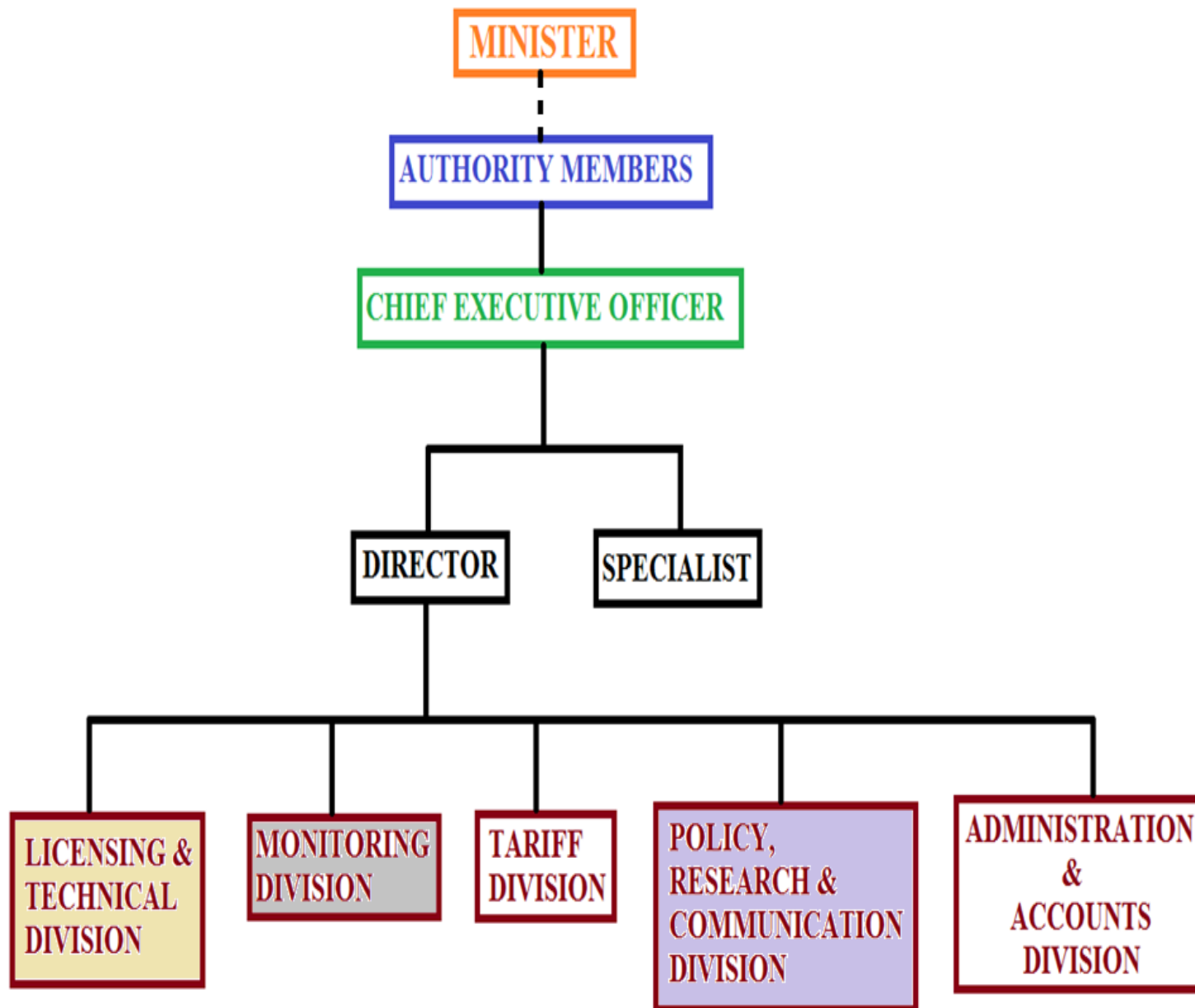
(continue..)

- 5) Set policy encouraging energy service for underprivileged;
- 6) Approve licence fee and fee for the licensee;
- 7) Approve operational plan and budget of BEA;
- 8) Provide policy on protection against & solution to energy shortage;
- 9) Provide policy for private participation.

Authority Members - BEA



1. Chairman
2. Four (4) Members
3. Member Secretary – CEO





BEA Functions

► **Section 11:**

1. Develop regulations & rules:
 - a) Performance standards & technical safety;
 - b) Tariff setting;
2. Issue Licenses;
3. Monitor Licensee's compliance;
4. Determine Tariffs;
5. Prescribe and collect Fees;
6. Impose Sanctions & Fines for violations;
7. Settle Dispute.



BEA's Responsibility

- ▶ As per section 11.2:
 - 1) Ensure power reliability, quality, security & efficiency;
 - 2) Encourage competition;
 - 3) Ensure non-discriminatory access to power system;
 - 4) Ensure fair balance of stakeholders;
 - 5) Facilitate electricity supply development;
 - 6) Ensure natural resources, environments & public interest protection



BEA - Financing

➤ **Section 13**

- 1) From levies, fees & other charges payable in performance of its functions; and
- 2) Budgetary support from the Royal Government.

BEA Regulations



1. Tariff Determination 2016;
2. Accounting & Reporting 2006;
3. Regulatory Fees Regulation 2006;
4. Grid Code 2008
5. Distribution Code 2008
6. Safety
7. Internal House Wiring Regulation 2016

Tariffs



Sl No.	Category	Tariff (Nu/kWh)
1	Generation	1.50
2	Distribution	
	HV	2.26
	MV	5.15
	LV	5.01
3	Export (wheeling)	0.270



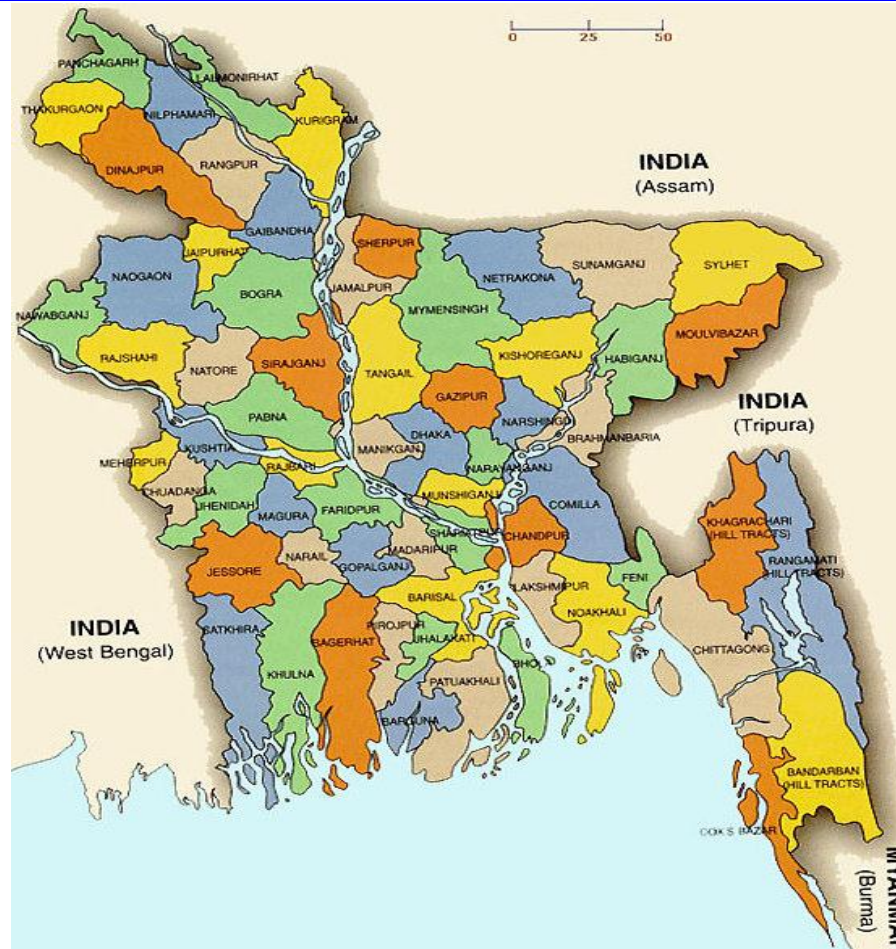
THANK YOU

**Regulatory Cooperation to
Facilitate Knowledge sharing,
Addressing Cross Cutting Energy/Electricity
Regulatory Issues**

Md. Firoz Zaman
Deputy Director
Bangladesh Energy Regulatory Commission (BERC)

Bangladesh Country Profile

- **Latitude :** 20°34' & 26°38'N **Longitude:** 92°41'E
- **Total Area:** 147,570 km²
- **Population :**160.8 Million
- **Per Capita Income:**
\$ 1909
- **GDP Growth Rate:**
8.3 %



Sundarban :World's Largest
Mangrove Forest



Cox's Bazar : World's Largest Sandy
Sea Beach



VISION

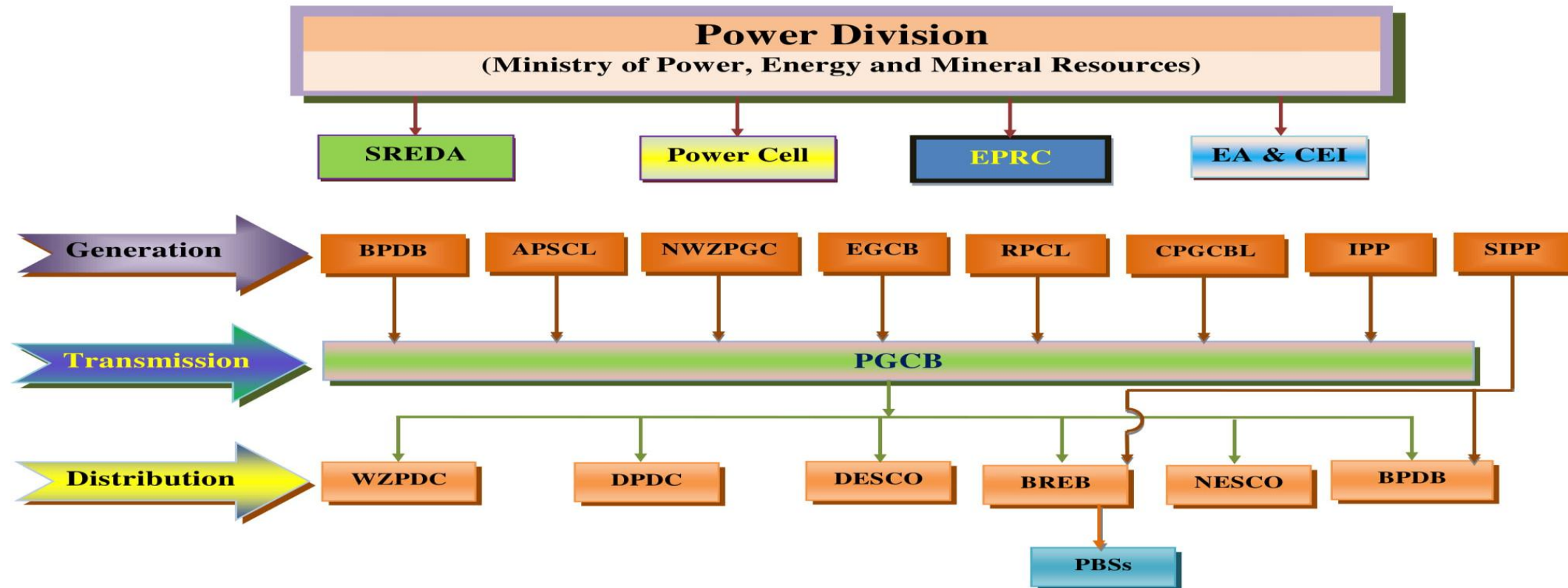
Vision 2021-

- To be a Middle-Income Country

Vision for Power Sector:

- To provide quality electricity to all at affordable price

Bangladesh Power Sector : Structure



BERC ACT 2003

Bangladesh Energy Regulatory Commission Act, 2003

Enacted on 13 March, 2003

And

came into effect on 24 April, 2004

Vision

**To establish
Bangladesh Energy Regulatory Commission
as a world class organization
to ensure justice and good governance
in Energy Sector by 2030.**

Mission

- **To promote equal opportunities for public and private investment**
- **To ensure justice through dispute settlement**
- **To protect consumers' interest in energy sector**
- **To ensure good governance in energy sector**
- **To fix up reasonable tariff in energy sector**
- **To issue licenses among the government and private agencies dealing with energy business**
- **To ensure efficiencies in energy sector**
- **To develop competitive market for energy sector**

Major Functions of BERC

- **Licensing:**
 - **Electricity Generation incl. captive, Transmission and Distribution**
 - **Natural Gas Transmission and Distribution;**
 - **Petroleum Storage, Distribution, Marketing**
- **Tariff Setting:**
 - **Electricity- Bulk and Retail**
 - **Gas**
- **Dispute Settlement: Between Licensees; Licensee and Consumers**
- **Consumers' Complain Handling**

Bangladesh Power Sector : Overview

- **Generation Capacity** : 22,051 MW
- **Total Consumers** : 34.3 Million
- **Transmission Line** : 11,650 Ckt. km
- **Distribution Line** : 5,02,000 km
- **Distribution System Loss:** 9.35 %
- **Per Capita Generation** : 510 kWh
- **Access to Electricity** : 94%

Generation Plan: 2021-2041

Year	2021	2030	2041
Grid Capacity (MW)	24,000	40,000	60,000

Primary Fuel Options: Indigenous Resources

- **Gas:** Only 12 tcf proven reserve; No significant gas discovery in recent years; Depleting gas reserve restricts gas based generation expansion; R/P ration is only about 12 years.
- **Hydro:** Present capacity 230 MW and average energy generation- 800 GWh; No further significant potential
- **Coal:** Total 3.2 billion ton reserve in 5 mines; Near term option;
- **Renewable:** Present capacity of Solar is only 300 MW; still high cost

Bangladesh in Regional Power Cooperation

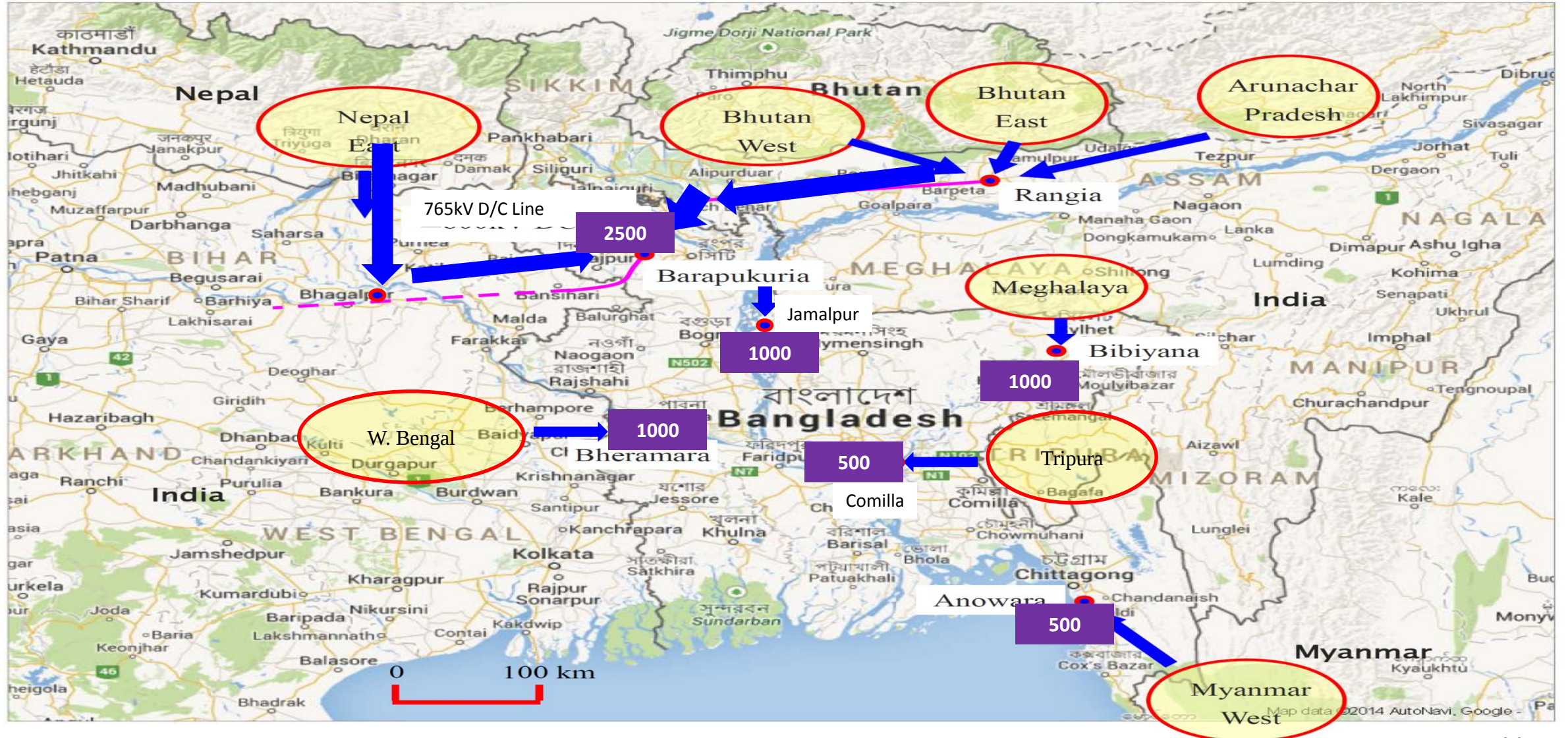
Regional Cooperation: Opportunities

**BBIN- Bangladesh-
Bhutan-India-Nepal**

**Bangladesh-Myanmar-
China**



Proposed Cross border Links with Neighboring Countries by 2035 (PSMP-2016)



Current Status:

- Now Bangladesh is importing **1160** MW from India
 - **1000** MW (400 KV HVDC) through Bheramara (Bangladesh) – Baharampur (India) interconnection From National Thermal Power Company (NTPC), India
 - **160** MW (132 KV Aerial mode) through Tripura (India) - Comilla (Bangladesh) interconnection from same Company.
- PSMP-2016' encompasses **9000 MW by 2041**

Near future

➤ India:

400 MW, February 2020

500MW, December 2021

1600 MW, December 2022

➤ Nepal:

Total 2000MW, 500 MW very soon (by GMR)

➤ Myanmar: MoU signed for 500

➤ Bangladesh Bhutan and India (BBI) 2000 MW

Existing Frameworks

- ❑ **SAARC Framework Agreement for Energy Cooperation [Electricity]**
- ❑ **The South Asia Subregional Economic Cooperation (SASEC)**
- ❑ **BIMSTEC** [MoU was signed on 31 August '18 for the establishment of BIMSTEC grid interconnection]
- ❑ **UNSCAP [APEF]**
- ❑ **Developing-8** (The fifth D-8 Summit Declaration Bali, 2006 reaffirmed commitment to enhance co-operation in the field of energy to develop alternative & renewable energy resources)

Challenges for Power Trade in Future

- ❑ Development of hydro power projects in Nepal, Bhutan and North-eastern India at competitive price
- ❑ Development of regional transmission inter-connections with adequate capacity
- ❑ Non-discriminatory 'Open Access' power flow regulation to allow power transmission through a third country
- ❑ Removal of technical and commercial barriers for power trade- like harmonization of grid codes, standards, norms, dispute resolution etc

Way Forward

- To harmonize codes and standards for inter relationship
- To uphold officials amongst regulatory bodies
- To strengthen regulatory bodies through capacity building
- To collect, review, maintain and publish statistics and data

Thank You



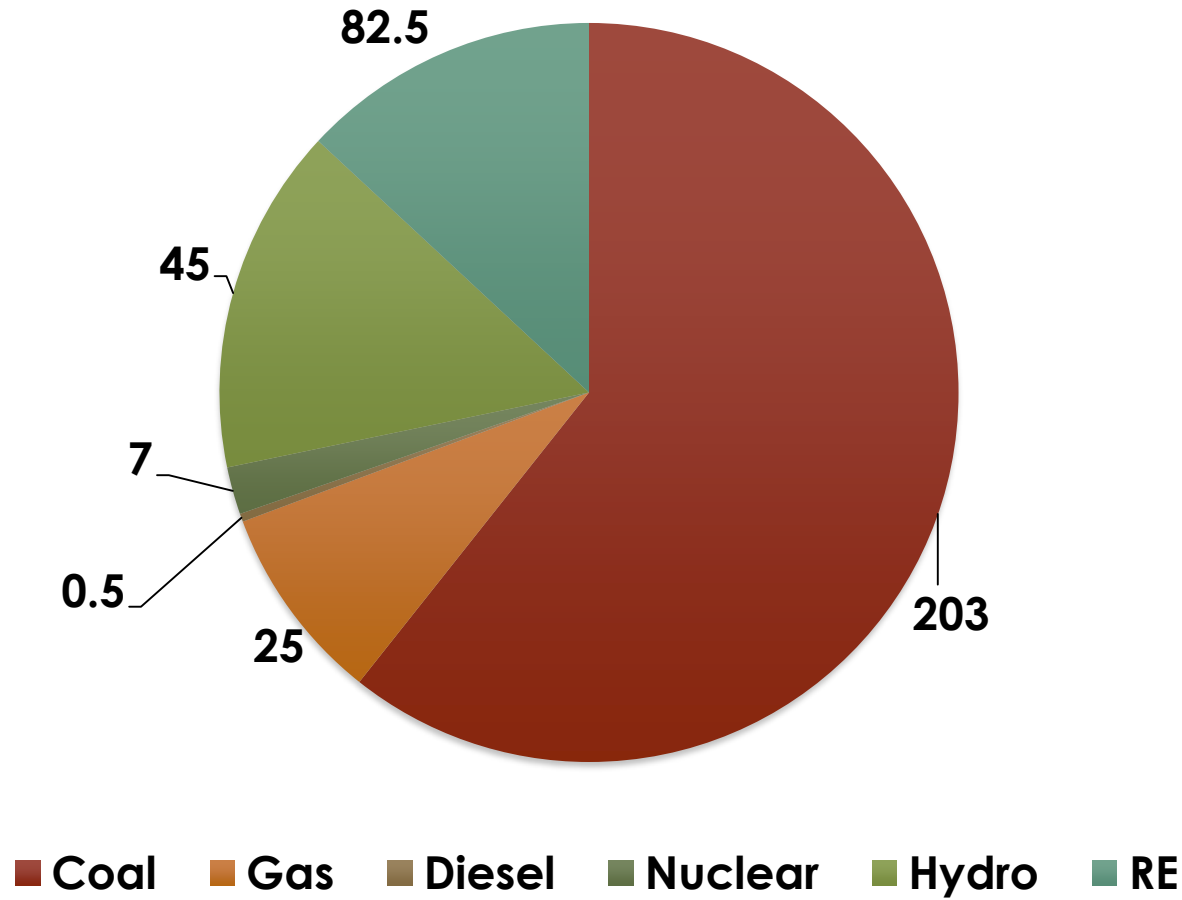
Presentation on Role and Initiatives *of* Central Electricity Regulatory Commission

By
Rashmi Somasekharan Nair
Deputy Chief (Regulatory Affairs)
Central Electricity Regulatory Commission

Power Sector Overview

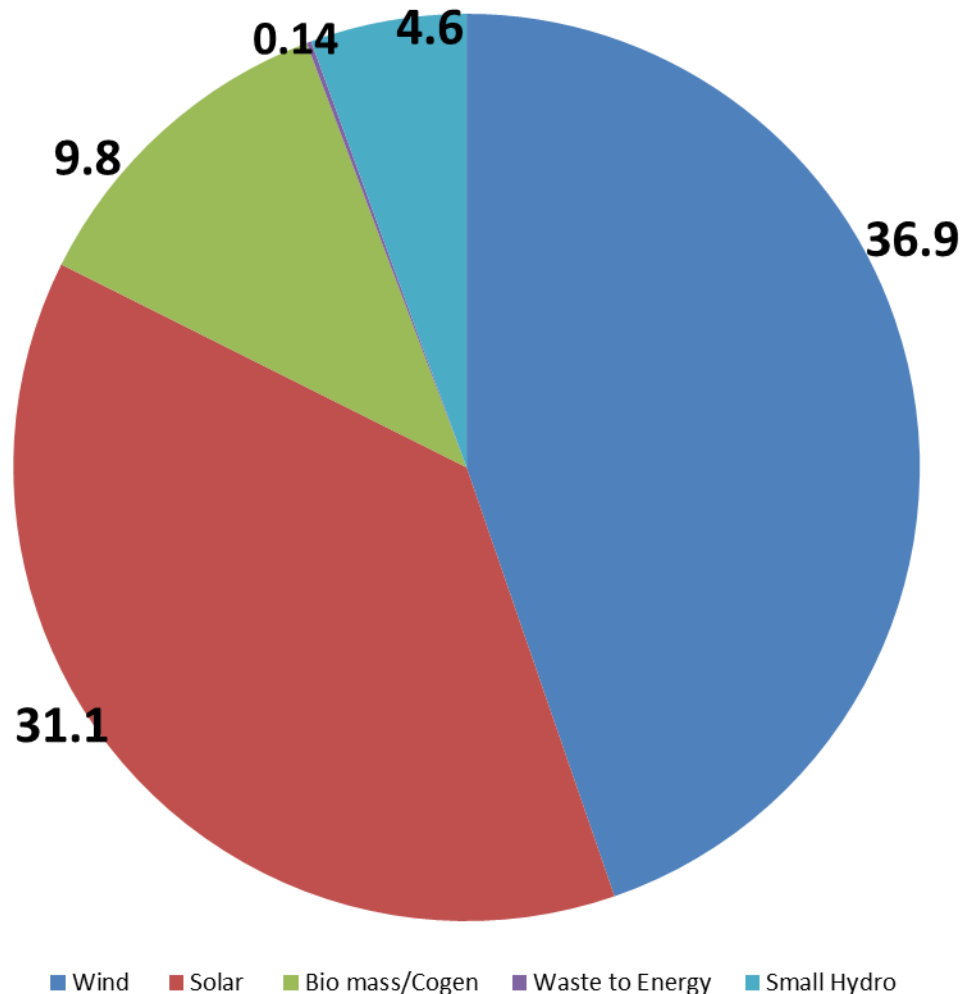
Generation Capacity in India

Installed Generation Capacity 363 GW

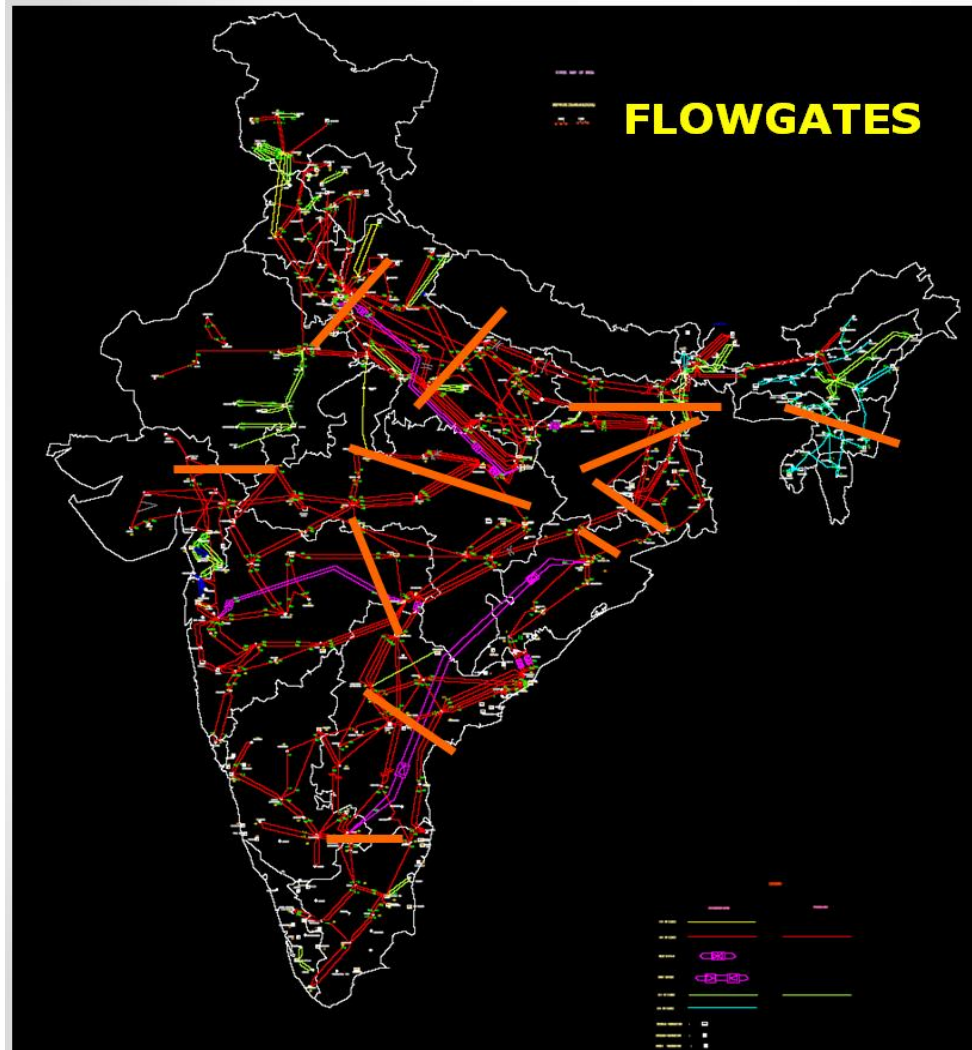


Generation Capacity in India

Generation through RE Sources 82.5 GW



Creation of Transmission Flow-gates



**Pan India Market:
All India Economy &
Efficiency**

**Optimal utilization of
resources**

Well Meshed Network

**400 kV Backbone (~100,000
ckt kms)**

**765 kV Operations
commenced**

**Bulk transfer through
HVDCs**

**High Capacity Corridors
under construction**

Generation, Transmission & Distribution Ownership



- **Generation is owned by**
 - *Central (25.18%) / State (28.35%) / Private (46.47%) Sectors*
- **Transmission - more than 90% is owned by public sector**
 - *Regulated monopoly business*
 - *New projects through competitive bidding*
- **Distribution - about 13% owned by private sector**

Regulatory Framework : Historical Background

Regulation by Government (1910 Act¹; 1948 Act²)

- **Central Government**
 - Powers to fix tariff of Central Gencos
- **State Governments**
 - Powers to grant license
- **Central Electricity Authority**
 - TEC³ of generation projects, setting technical standards
- **State Electricity Boards**
 - Main advisor and Operational arm of State Government

¹ – Indian Electricity Act, 1910

² – Electricity (Supply) Act, 1948

³ – Techno Economic Clearance

Regulatory Framework : Historical Background

- **Independent Regulatory Authorities (1998 Act⁴)**
 - CERC / SERCs / JERCs
 - Regulatory responsibility thus, divided between
 - Centre (CERC) and State (SERC/JERC)
 - There is no hierarchical relationship between CERC and SERCs
 - CERC – inter-State issues
 - SERC / JERC – intra-State (including Distribution) issues
- **Objective – Distancing of Government from Regulation**
 - Tariff Regulations were distanced
- **Expanded Role of Regulators (2003 Act⁵)**
 - Apart from Tariff,
 - other regulatory responsibilities of licensing, adjudication, market development, with Regulator

⁴ – Electricity Regulatory Commissions Act, 1998

⁵ – Electricity Act, 2003

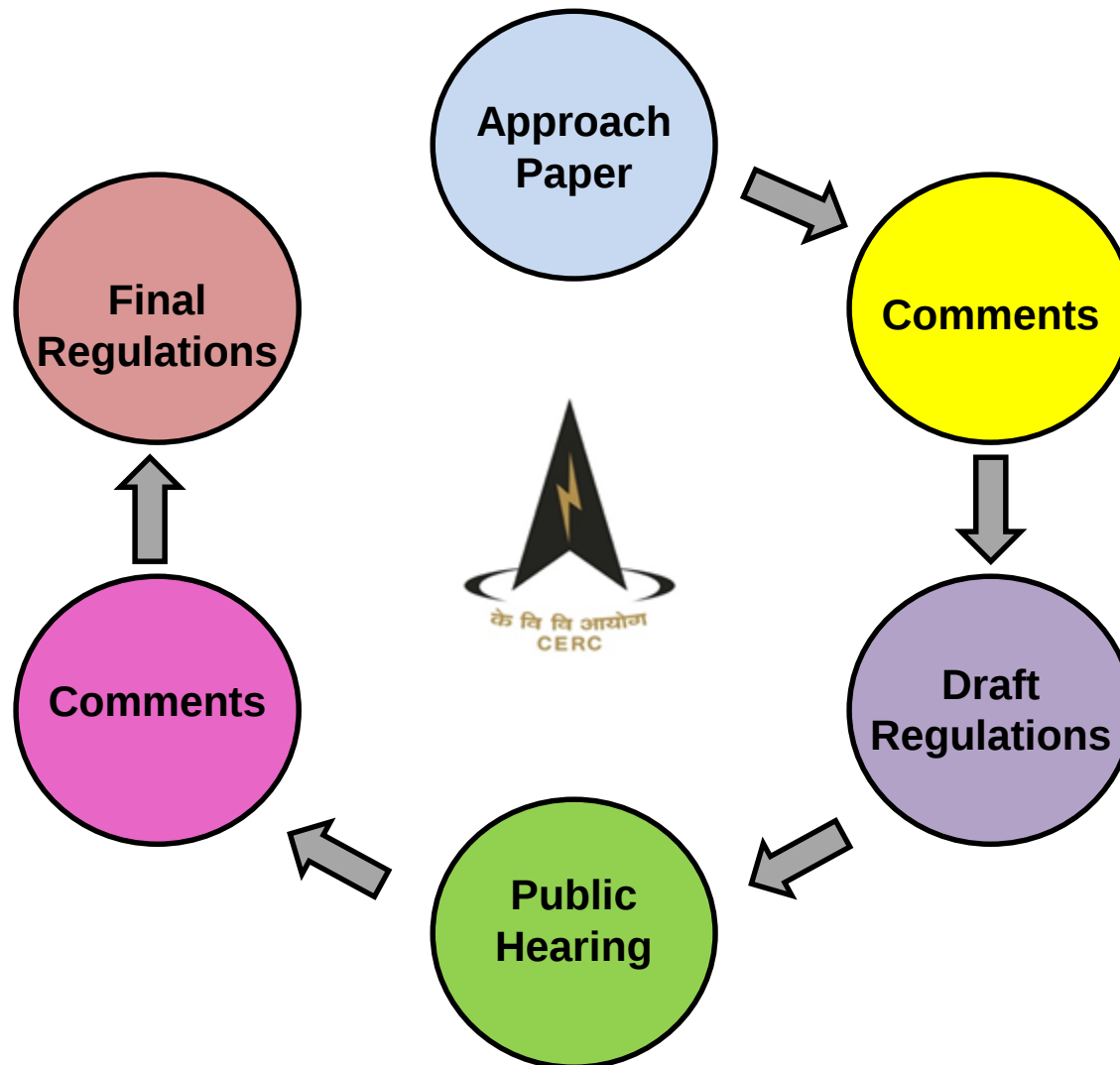
CERC Role & Initiatives

CERC Roles & Responsibilities

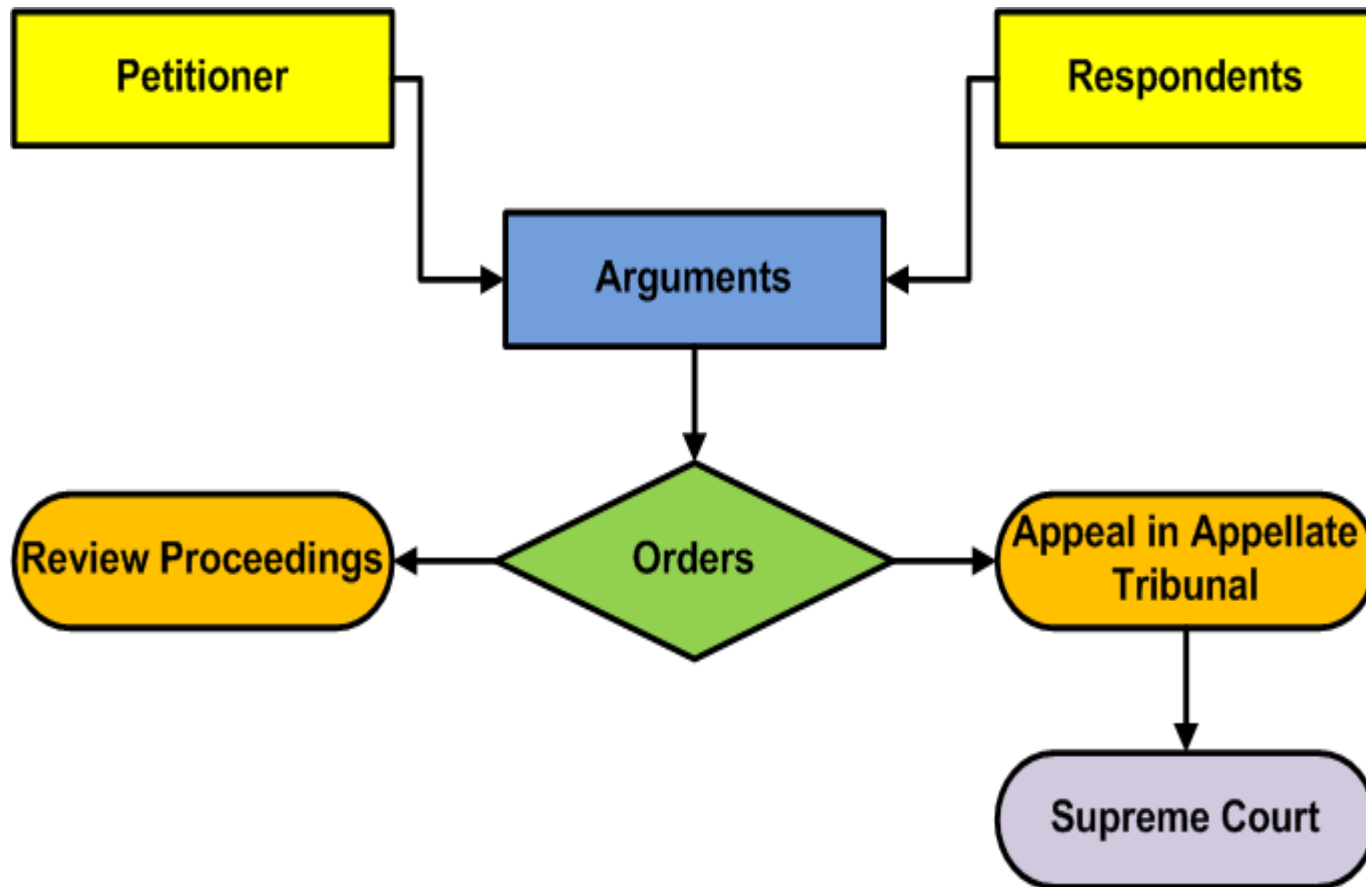


- Tariff Regulation
 - Regulated Tariff
 - Competitive Bidding
- Licensing
 - Transmission, Trading, Distribution
- Development of power market
 - Facilitating Open Access
 - Licensed traders
 - Power Exchanges
- Inclusive Growth
 - Consumer Protection
 - Promotion of Green Energy

Procedure for Regulation



Procedure for Petitions



Tariff Determination

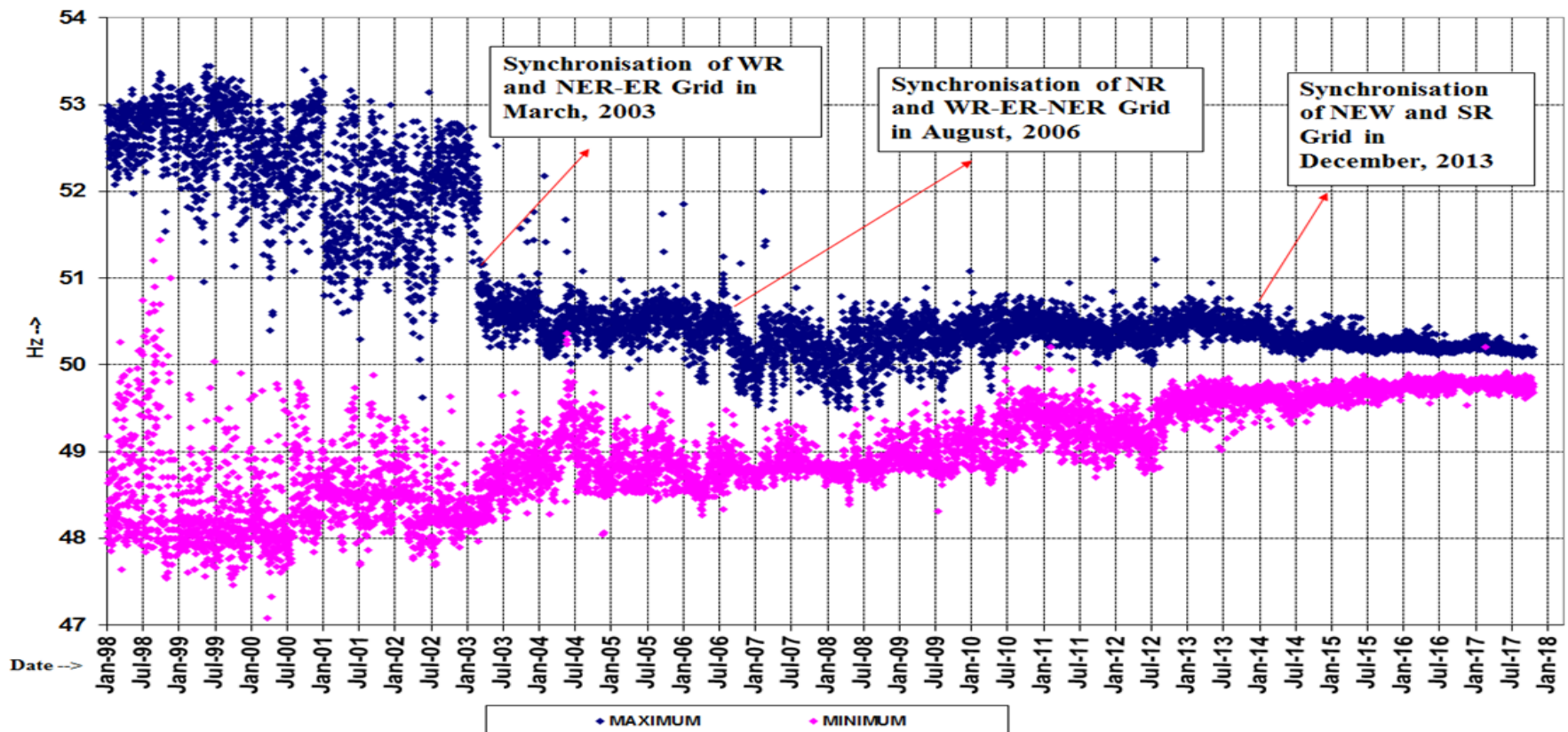
- Tariff Determination : performance based regulation (Regulated Tariff)
- Adoption of tariff determined through competitive bidding (Competitive Tariff)
- 'Point of Connection' tariff for Transmission

Licensing

- CERC grants licence for inter-state transmission and inter-state trading in electricity
- SERCs grant license for intra-state transmission and intra-state trading and distribution
- Generation is delicensed in India

Grid Discipline

- Notification of Grid Code
- Deviation Settlement Mechanism



Market Development



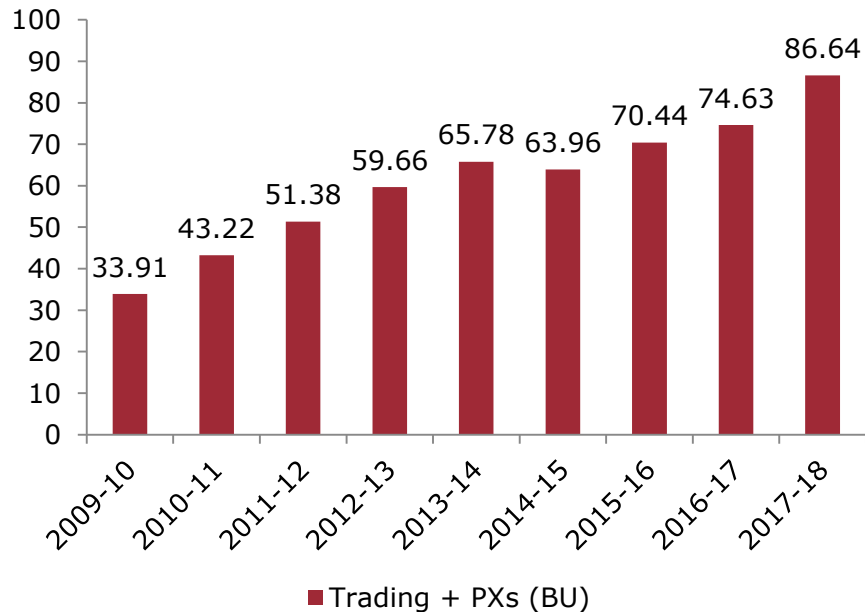
- Enabling Framework : Non-discriminatory Open Access
- Framework for National Power Market
- Power Trading
- Large Number of Licensed Traders
- Short Term markets – Multiple Buyers & Sellers

Multiplicity of Players

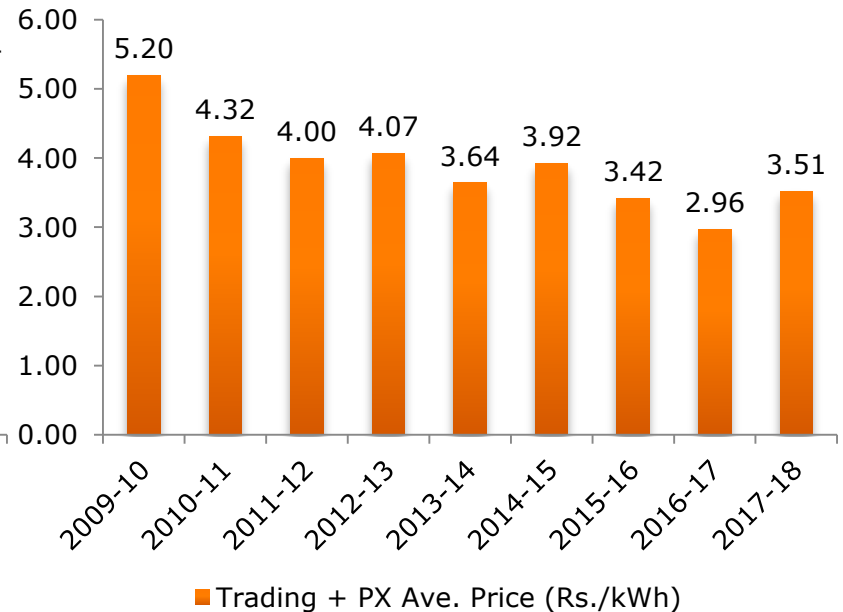
- 600+ generators
- 30+ Transmission licensees
- 70+ Distribution Utilities
- 2 Power Exchanges
- 40 Trading Licensees
- 1 NLDC, 5 RLDCs, All State SLDCs (system operators)

Vibrant Short Term Market

Trading + PXs Volume (BU)



Trading + PX Ave. Price (Rs./kWh)



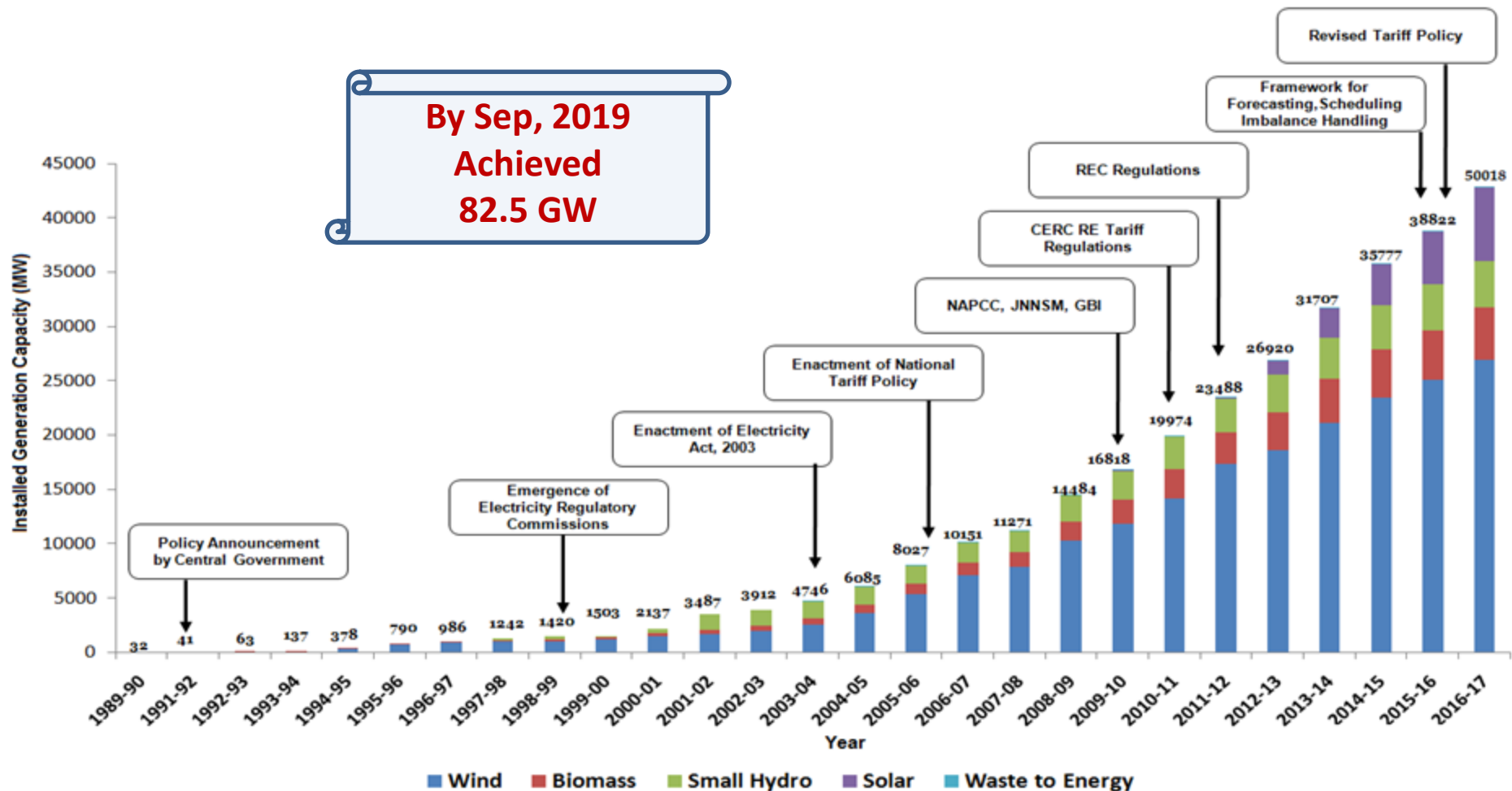
2018-19
Vol. 100.85 BU
Ave. Price Rs. 4.27/kWh

Sustainable Development

Renewable – Regulatory Intervention

- RE Tariff Regulations
- Renewable Purchase Obligation
- Renewable Energy Certificate (REC) market
- Framework for Forecasting, Scheduling and Deviation Settlement (DSM) of RE Generation
- Roadmap for Reserves
- Ancillary Services
- 24x7 Operation of Power Exchanges
- Flexing Thermal Generation

Growth of Generation using RE Sources



Spurt in growth of Renewables due to Regulatory and Policy initiatives

New Initiatives

Proposed

- Cross Border Trade of Electricity
- Real Time Energy Market Design
- Day Ahead Market re-design – Market Based Economic Dispatch
- Re-design of Ancillary Services Framework

Cross Border Trade of Electricity

INDIA'S BILATERAL CBTE IN SOUTH ASIA REGION

Max. capacity transacted till date...

Export to Bangladesh	-	1150 MW
Export to Nepal	-	700 MW
Import from Bhutan	-	2400 MW
Export to Myanmar	-	3 MW

EXPECTED BY 2036

Export to Bangladesh	-	2000 MW
Export to Sri Lanka	-	100 MW
Import from Nepal	-	5800 MW
Import from Bhutan	-	17100 MW

Institutional Framework

Designated Agency

- Coordinate with Neighbouring countries
- Facilitate in approval process and lay down procedures for cross border trade
- Plan for Cross Border Transmission Lines

Settlement and Nodal Agency

- Responsible for settling all charges pertaining to grid operations with a particular neighbouring country

National Load Dispatch Centre

- System operator for cross border trade of electricity between India and the neighbouring countries
- Responsible for granting short term open access to the participating entities

Central Transmission Utility

- Responsible for granting Connectivity, long-term access and medium-term open access with respect to cross border trade of electricity

Tariff Mechanism

- ❑ Tariff of the electricity shall be determined through:
 - Competitive Bidding, or
 - Government to Government negotiation, or
 - In case of hydro generating station, the Central Commission on a cost plus basis, or
 - Mutual agreement between the entities under the overall framework of agreement signed between India and the neighbouring countries

- ❑ Tariff for Cross Border Transmission Link from pooling station in India to the Indian border shall be determined based on either competitive bidding or by the Central Commission or Government to Government negotiations

Participation in Power Exchanges

Participating entities from the neighbouring countries can participate in Indian Power Exchanges through Trading licensees of India.

- Participation may take place in multiple power exchanges across all the product segments
- Quantum of cross border electricity trade through power exchanges to be approved by the designated authority (Central Electricity Authority).

Other provisions

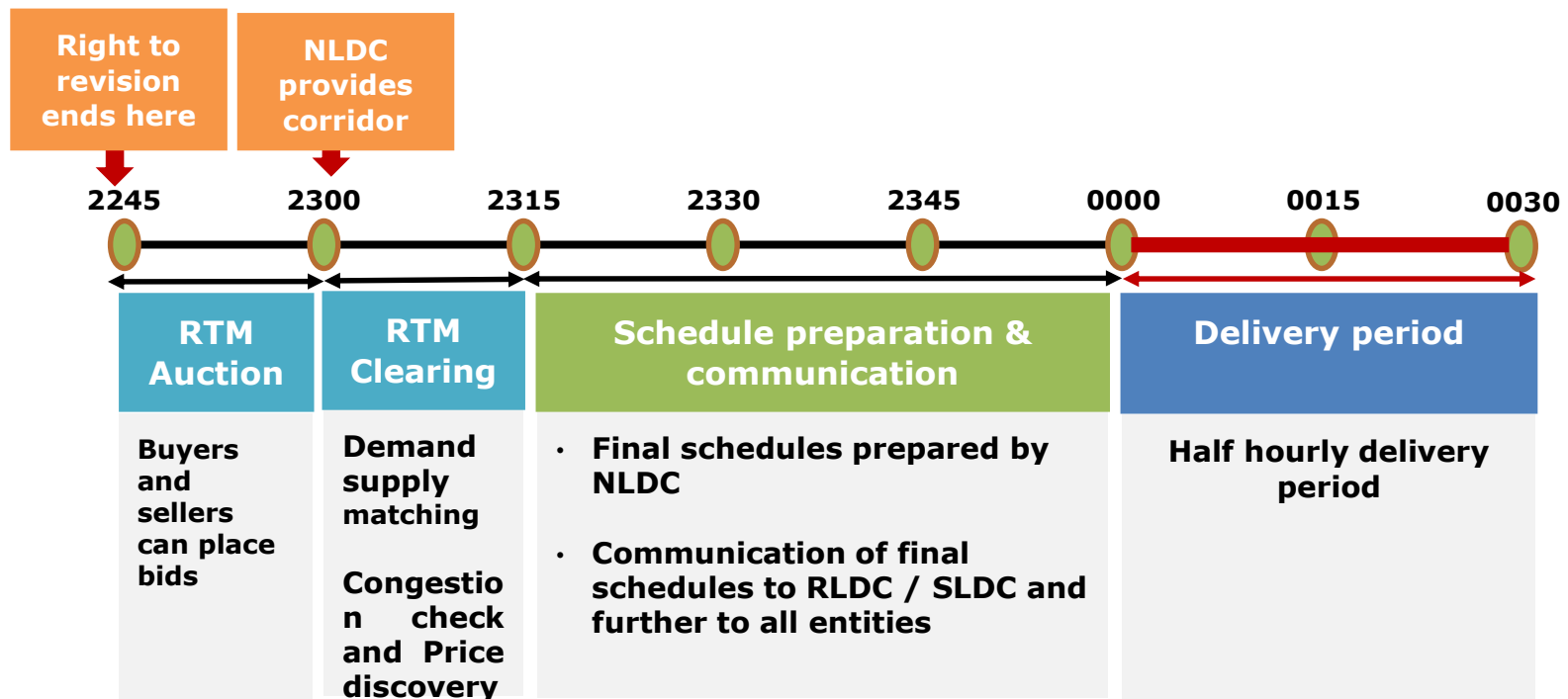
- ☐ Treatment of delay in Transmission system and Generation Projects
- ☐ Cyber Security
- ☐ System Security Aspects
- ☐ Declaration of Transfer Capability
- ☐ Scheduling, Metering, Energy Accounting & Settlement
- ☐ Coordination Between System Operators
- ☐ Payment of Transmission charges and other charges
- ☐ Transmission Losses
- ☐ System Operation Fees and Charges
- ☐ Dispute Settlement and Resolution mechanism

Real Time Market

RTM

Proposed Framework

(Draft Regulation Stage)

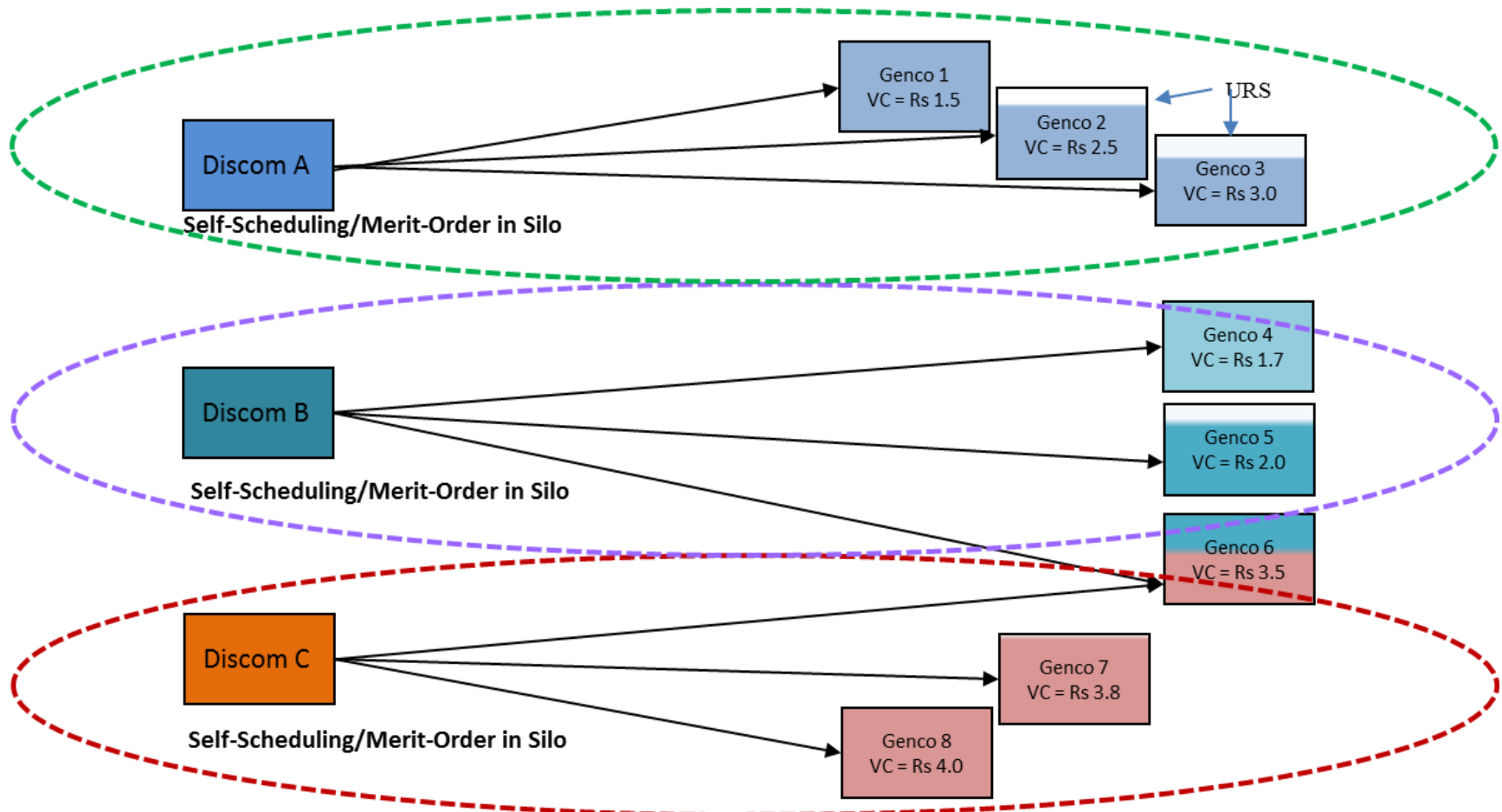


Market Based Economic Dispatch

MBED

Current Scenario

(Discussion Stage)



Source:- CERC Analysis

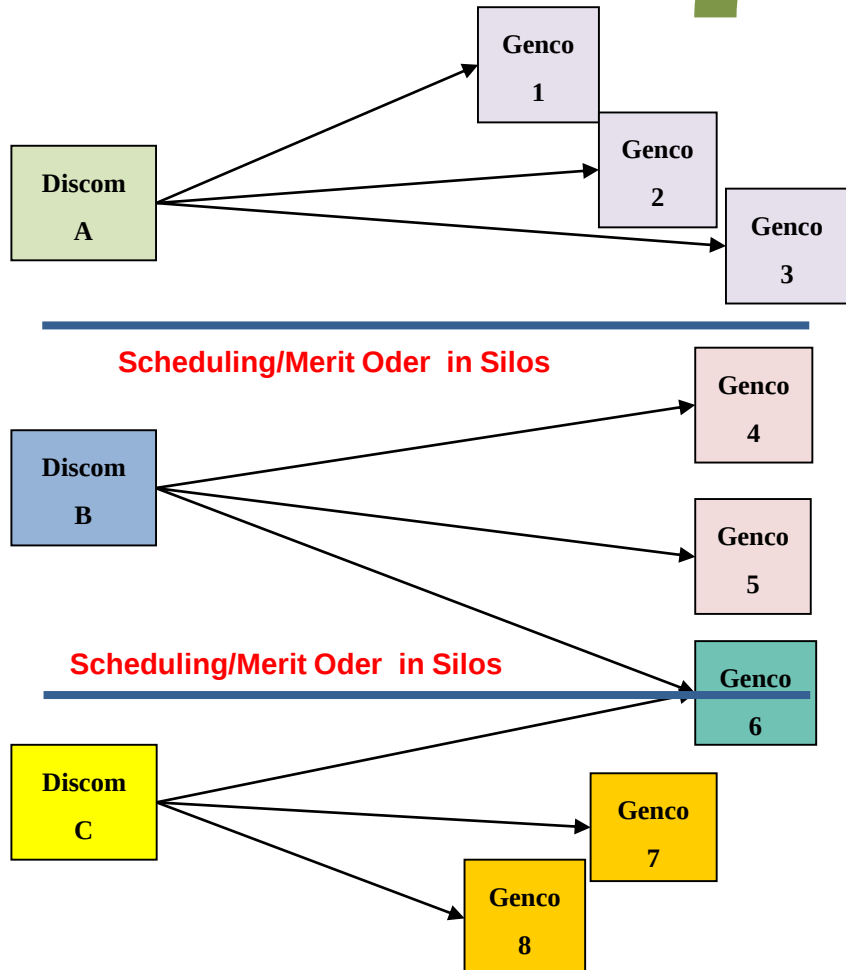
MBED

Proposed Framework

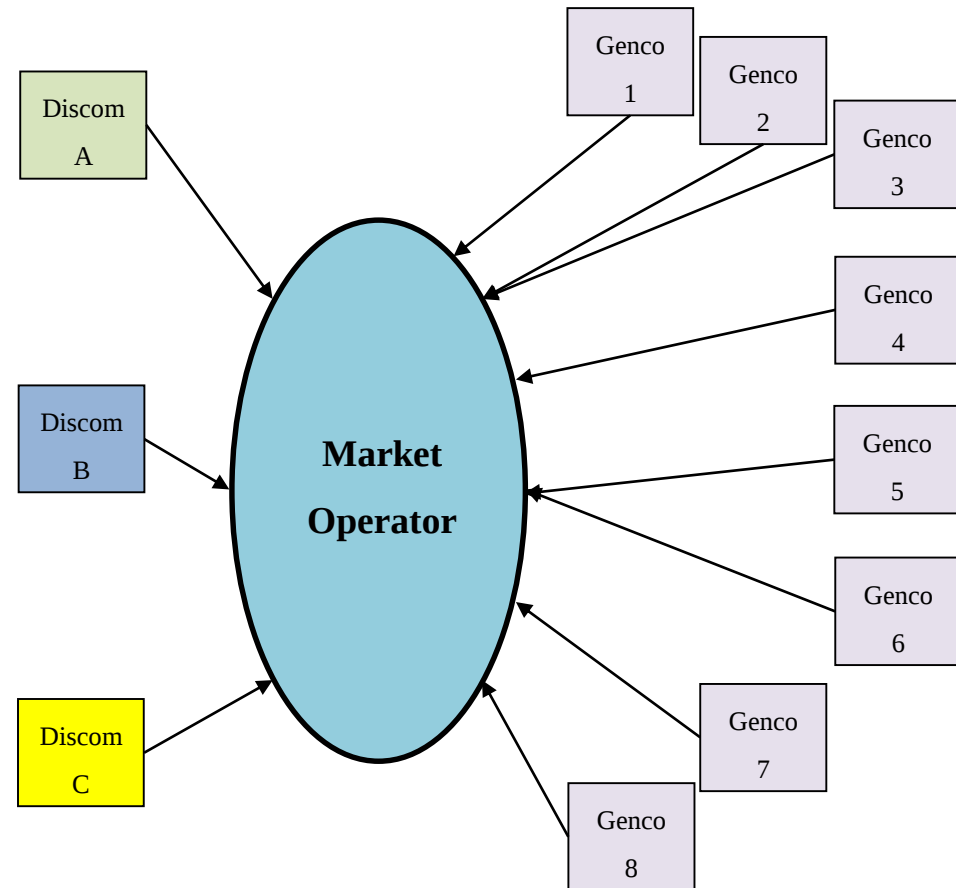


(Discussion Stage)

Existing



Proposed



MBED

Benefits

(Discussion Stage)



Benefits of Market based economic dispatch mechanism

- Meeting the system load with the **least-cost and efficient generation** plants would help to reduce the total cost of fuel inputs such as coal, gas etc; economize consumption of fuel to generate electricity.
- Need for promoting efficient power plants and better technology in power generation
- Need to increased utilization of thermal plants having sufficient availability
- Facilitate cheaper renewable penetration in the system
- Move towards enhanced power market operations

Market based economic dispatch of generation would lead to increased generation efficiency, reduced cost of generation and lowering procurement cost of discoms

Ancillary Services

Ancillary Services

Key Issues

(Discussion Stage)

Demand side

- NLDC to be the procurer of AS based on Demand Curves
- Requirement of each “type” of reserve to be specified

Supply side

- FFRS, FRS and RAS will be procured on Day Ahead and allowed to be adjusted in the Real Time Market.
- FFRS, FRS and RAS shall be procured along with Energy through joint co-optimization mechanism
- Resource providers are paid only Opportunity Costs (commitment costs) unless they are dispatched in real-time.

- Opportunity cost is computed as a difference between discovered Market Clearing Price for AS (FFRS, FRS or RAS) and Market Clearing Price for Energy

Institution of CERC has ...



- Brought **Transparency** in Regulatory process
- Introduced **Efficiency** in Operation
- Created environment to attract **investment** in Generation
- Promoted **Competition** in generation and transmission
- Created **Market Structure** in power sector
- Facilitated **Sustainable development** through promotion of **Renewable Energy** and **Energy Efficiency**

Thank you

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