

# Competitive Markets Setting the Perspectives

EMP @ LUMS  
July 17-22, 2018



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## Scheme of Presentation

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Part-1 Electricity Markets: Setting the Perspective

Part-2 Pakistan's Electricity Market Framework

Part-3 Electricity Market Team (EMT)

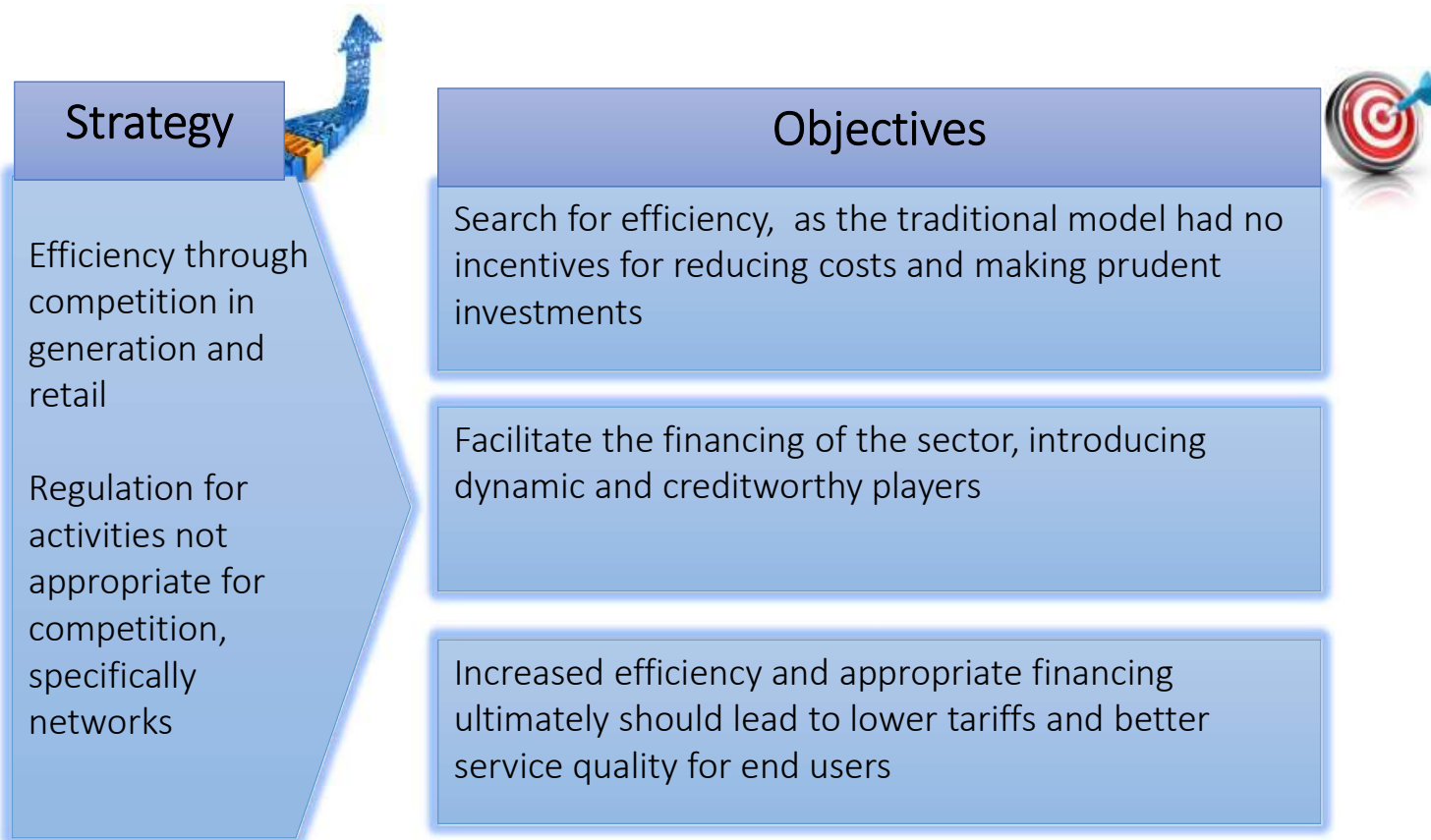


# Part – I

Electricity Markets: Setting the Perspective



## Drivers of the Change to the Market Model





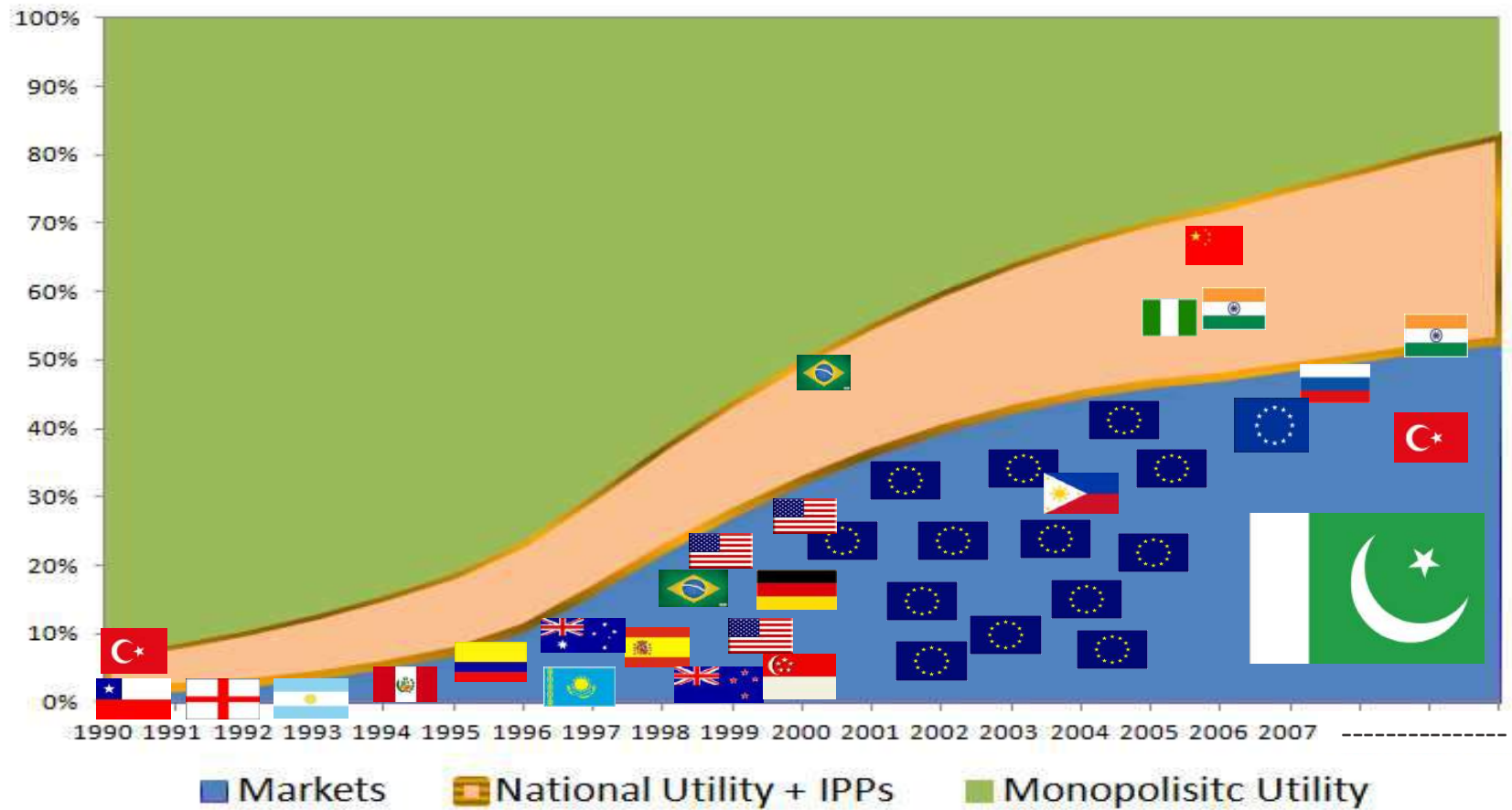
## A bit of history - Models of the Power Sector

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- Practically every country has defined its own model of the power sector. However, it would possible to group these models in three categories:
  - The traditional vertically and horizontally integrated utilities, almost exclusively before the 1990's
  - Integrated utility that produces energy but also buys from Independent Power Producers.
  - The market model, initially developed in the 1990's and which was implemented in most of developed economies



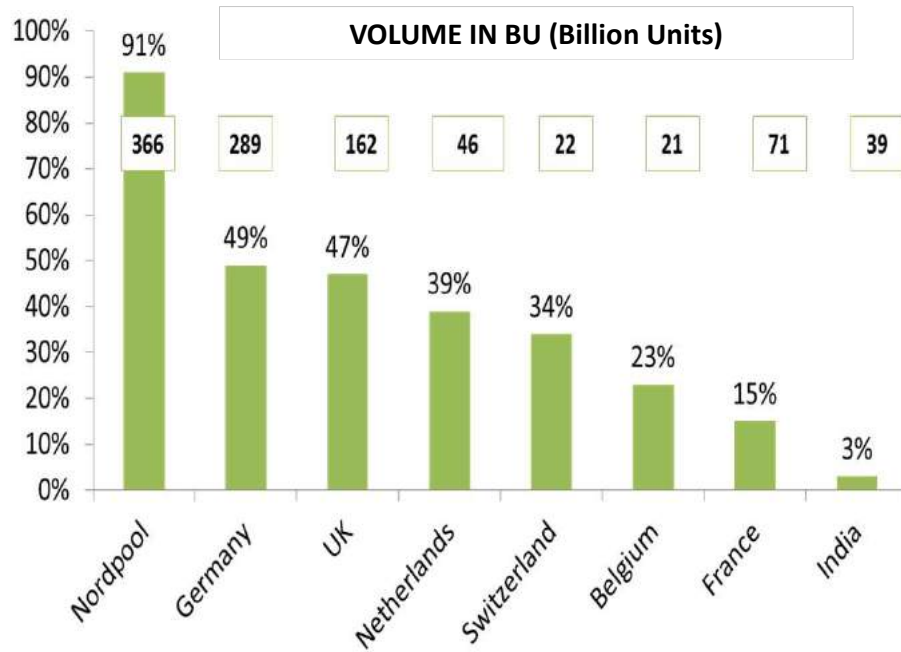
## Evolution of Each Model





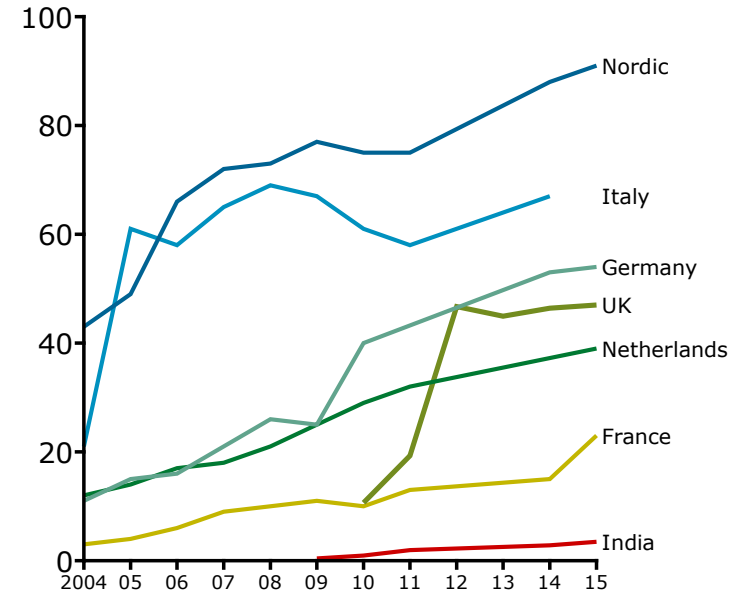
# Exchange Traded Volume

## EXCHANGE MARKETS 3-91% GLOBALLY



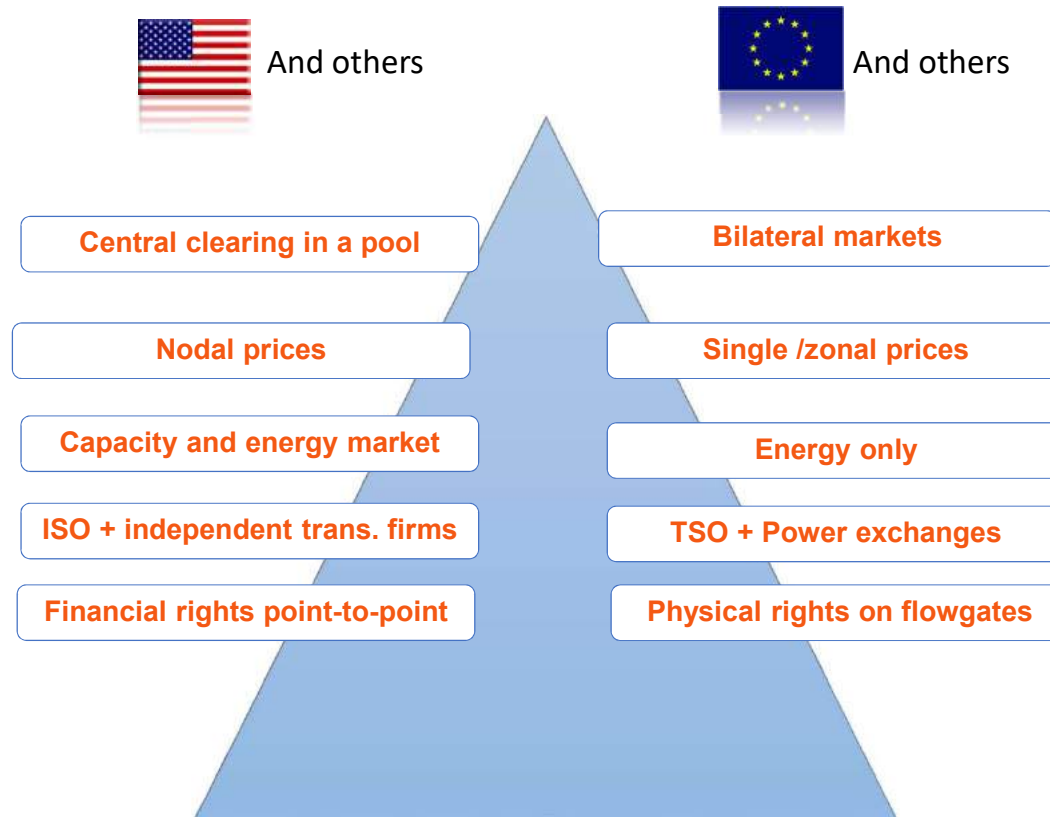
## GLOBAL BENCHMARKS ON PENETRATION OF ST MARKETS

Exchange traded ( % total consumption)



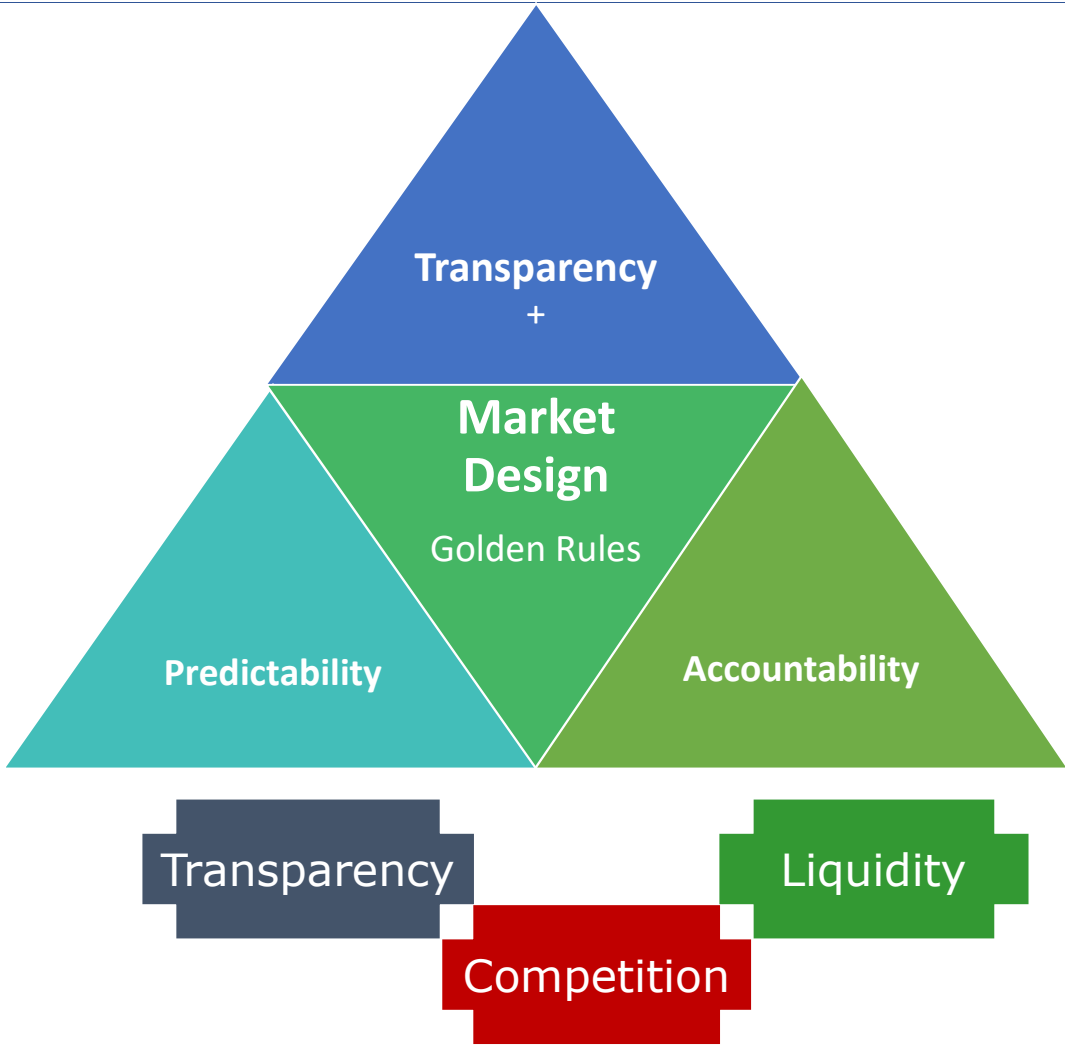


## Lack of an agreed “best practice” design of the markets



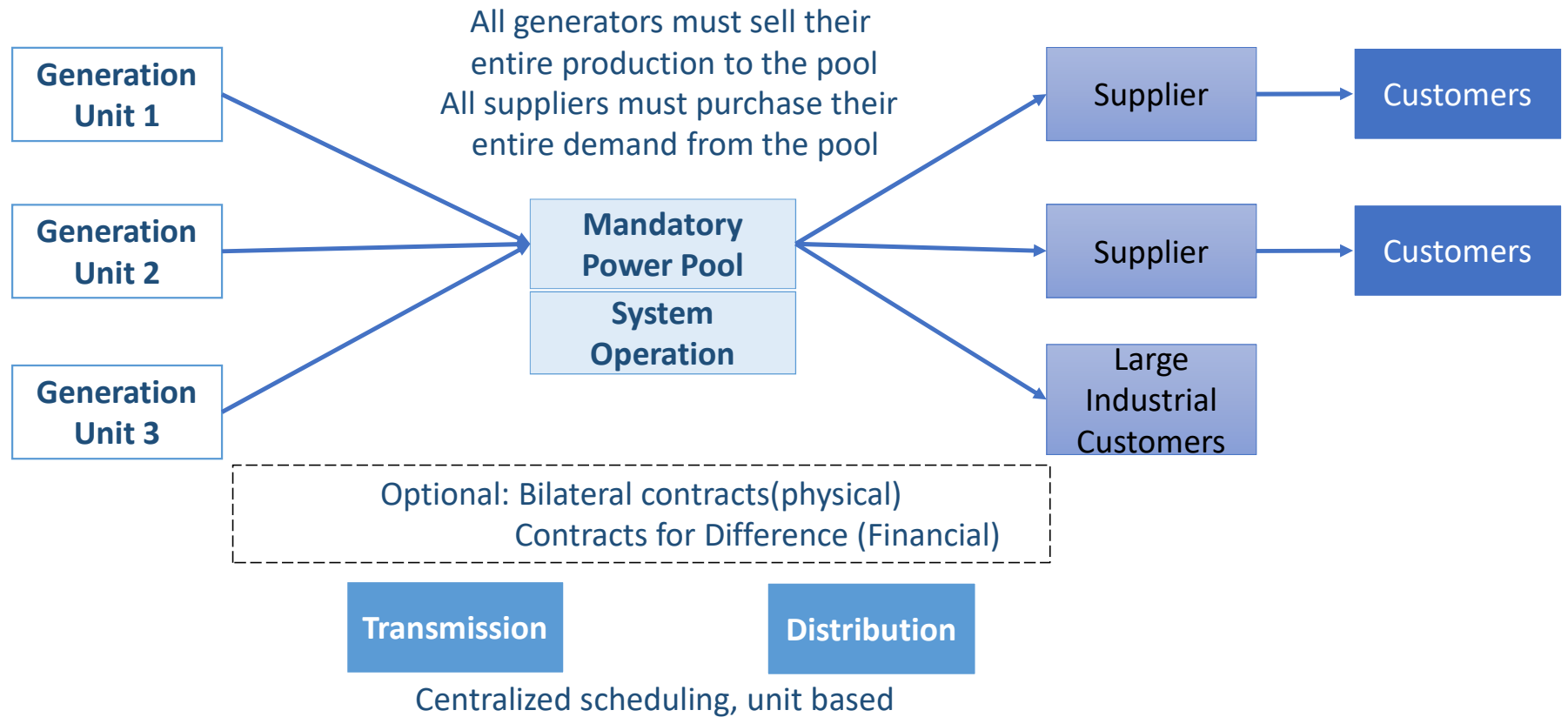


# Pillars of Market Design



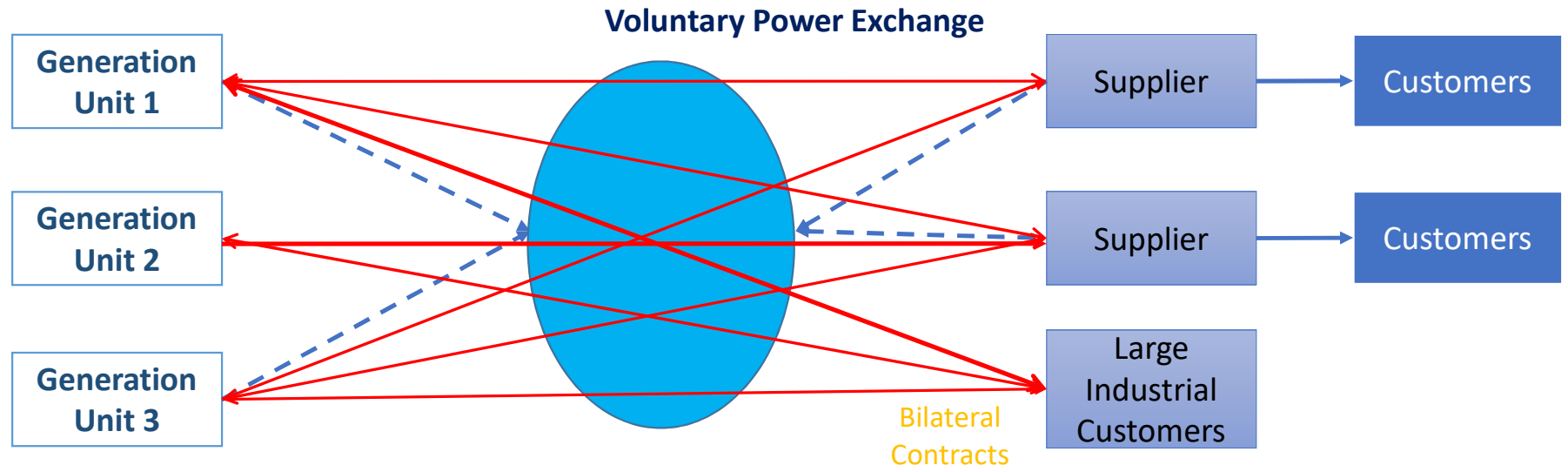


# Mandatory Power Pool





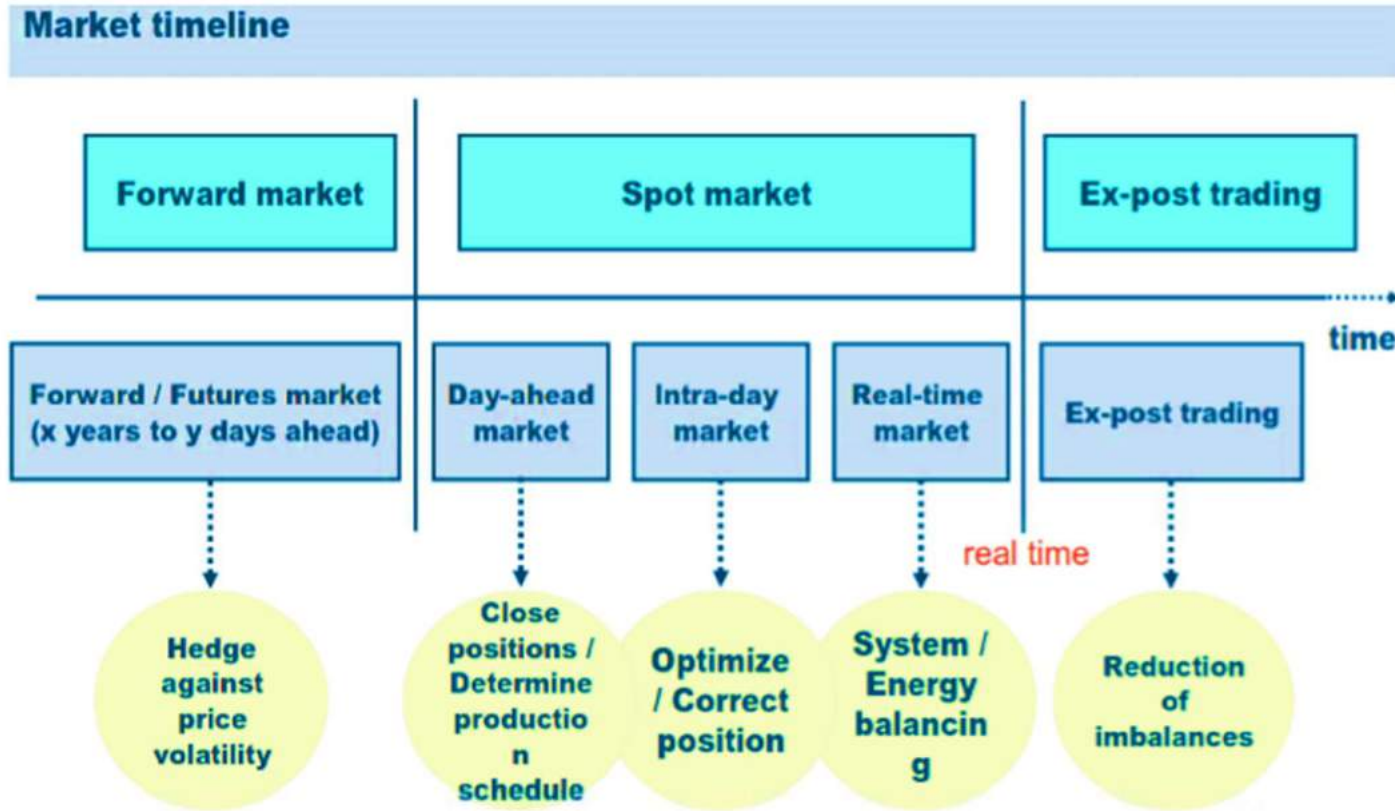
# Voluntary Power Exchange



Decentralized scheduling, company based



# Trading Markets



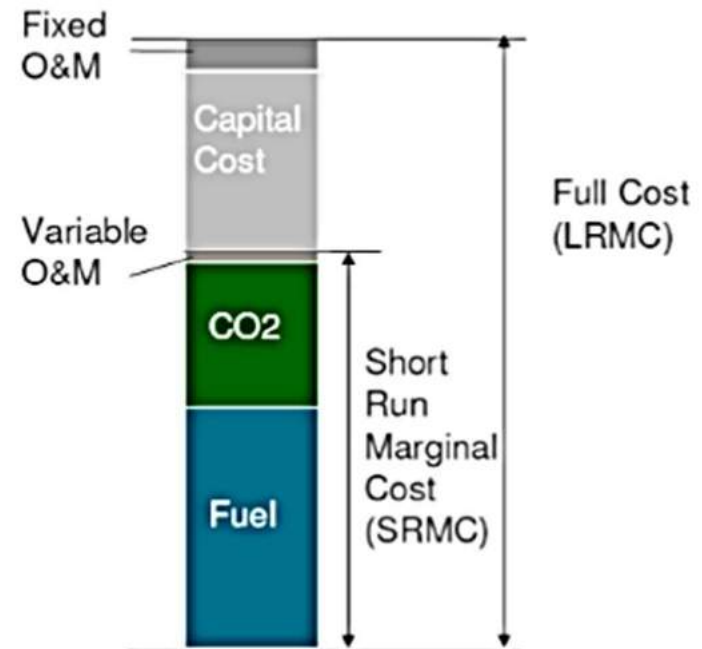


## Power Price is SRMC of Power Plant

- The power stack or Merit Order defines the marginal cost of each plant at each time
- The short-run marginal cost (SRMC) includes:
  - Operations & Maintenance costs
  - Fuel price
  - CO<sub>2</sub> exhaust

But not:

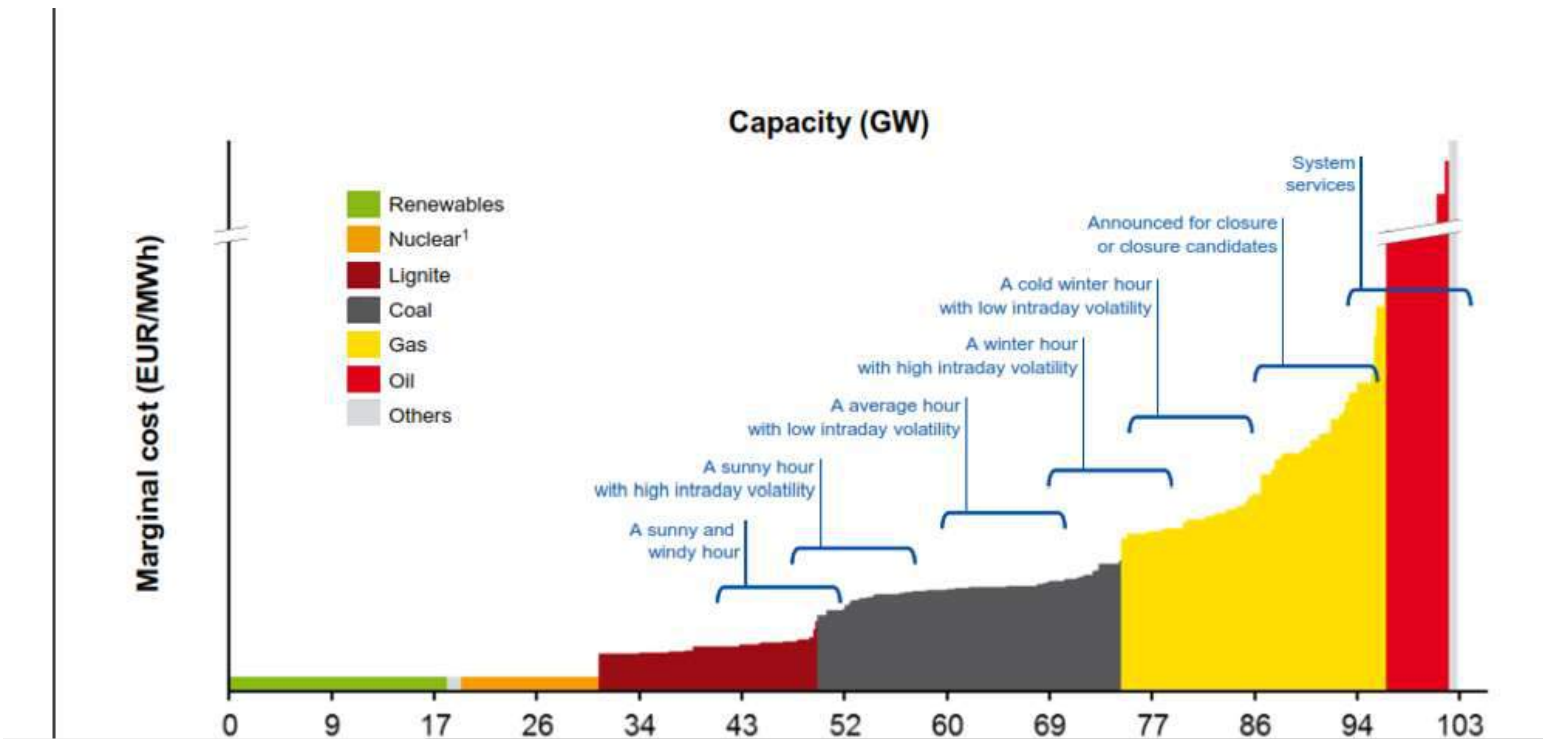
- Labour expenses
- Investment costs
- Fixed Maintenance costs





# Merit Order

Example : Germany



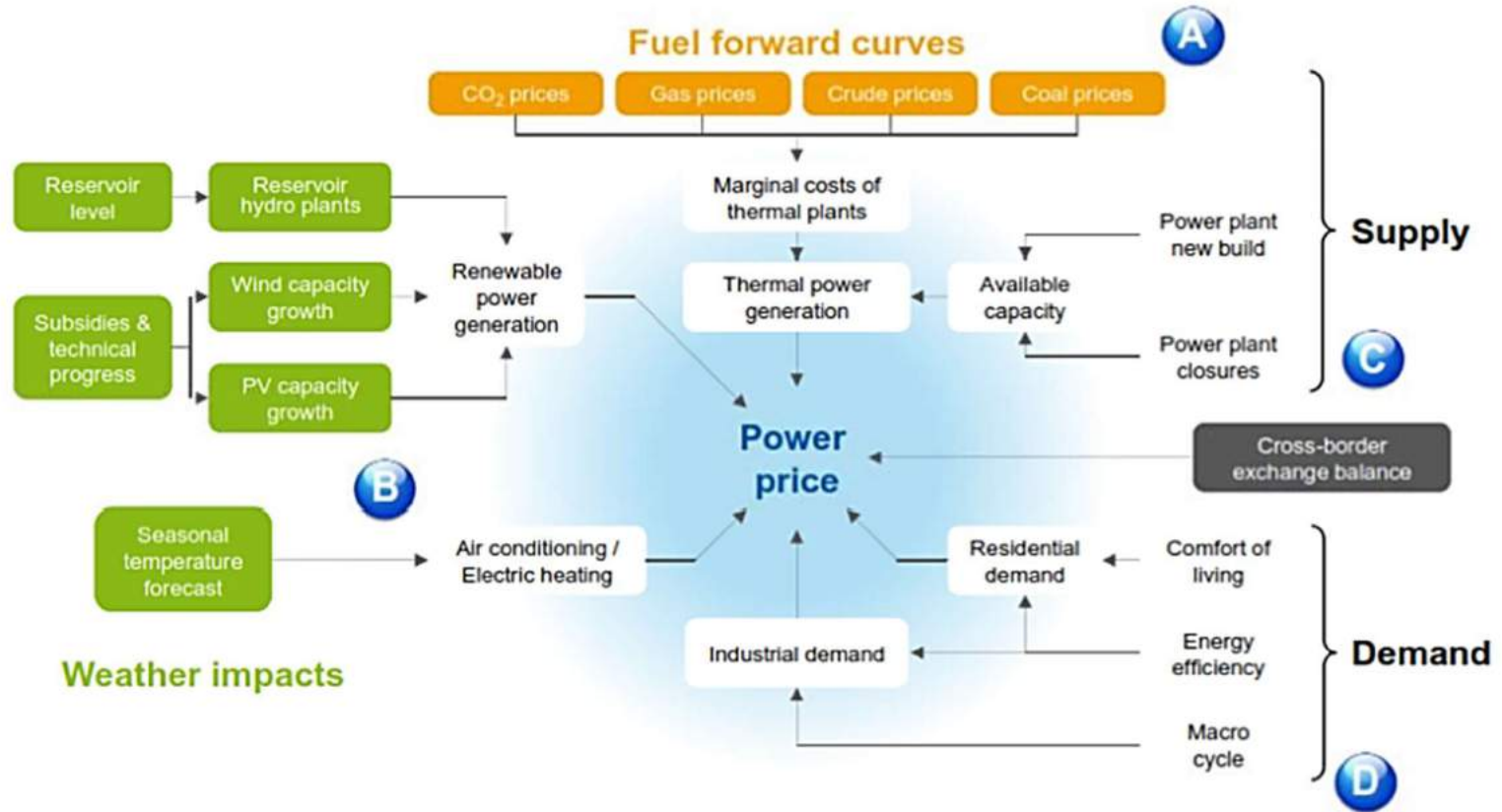


## How to Manage Demand Fluctuations





# Factors Affecting Power Price

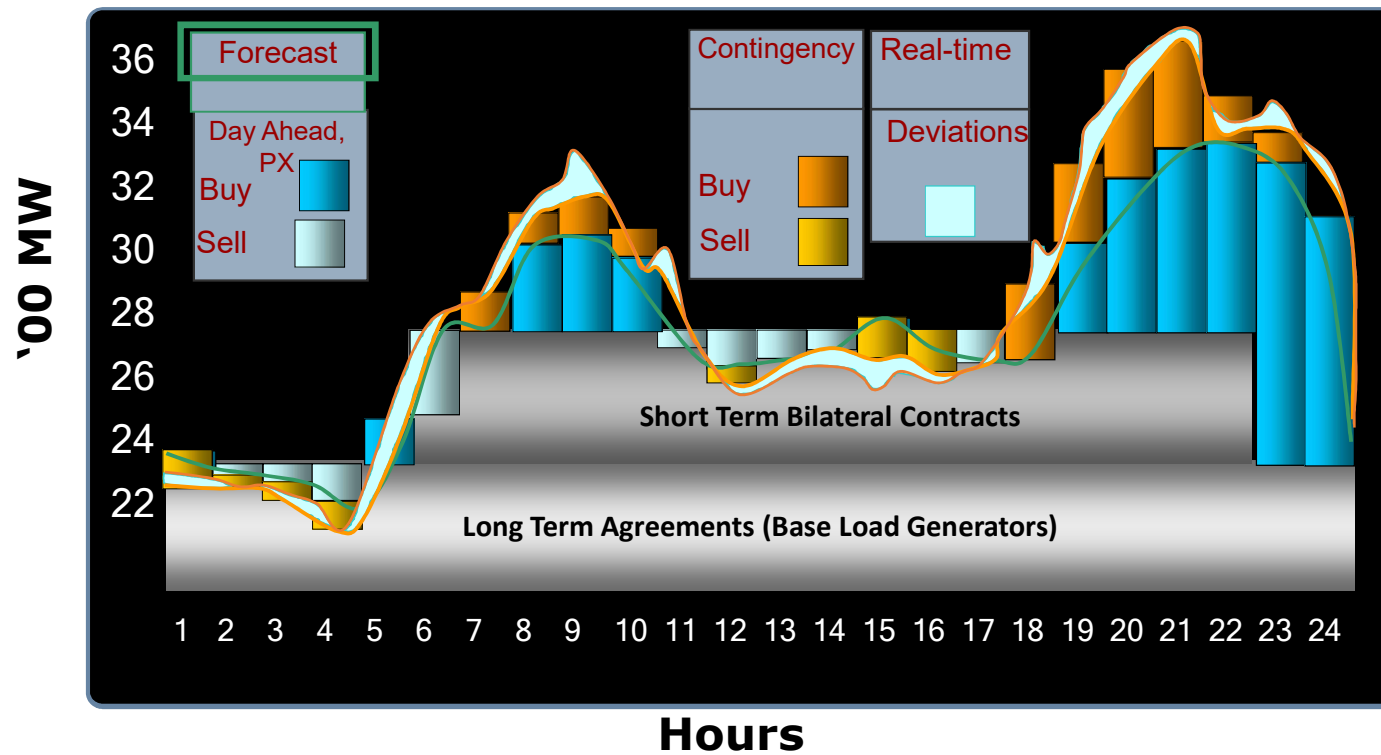






## Portfolio Management: A Typical Dispatch

Balancing supply and demand  
Handling surplus and deficit





## Benefits of Competition

- Market-based price signals are transparent and can stimulate appropriate infrastructure investment, energy conservation, and demand response
- Achieve efficiency both in energy and economic terms
- Pressure on Price / Adequacy
- Create the conditions for a fair allocation of risk and benefit sharing between investors/sellers and buyers/consumers
- Level the playing field; removing conflict of interest to facilitate entry of new investors and participation of private players, including Bulk Power Customers
- Ensure transparency and predictability
- Competition provides customers with choices—i.e., customer sovereignty



## What World has achieved Through Wholesale Competition

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- **US (PJM):**
  - **Downwards Trend in Power Prices :** Average annual wholesale energy price of \$36.26 per megawatt hour (MWh) in 2015 was lower than the 2000 price of \$42.28/MWh
  - **Capacity Resources:** Gain of 17% in installed capacity, which ensures that sufficient resources are available for reliability
  - **Operational Efficiency:** Improvement in generator operational efficiencies (e.g. increased thermal efficiency, reduced reactor outages) and reduced labor and non-fuel costs



## What World has achieved Through Wholesale Competition

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- Argentina:
  - Access to electricity supply by the maximum population
  - Quality of service improved greatly
  - Improvement in Supply Security: Due to the increment on thermal generation capacity by Investors which in results complemented the hydropower capacity
  - Financial sustainability
  - Environmental sustainability
  - Foster competition in the supply business



## What World has achieved Through Wholesale Competition

- UK:
  - Reduction in electricity prices for end user
  - Increase in the generation investment
  - Active participation of demand
- Turkey:
  - Market transparency for new entrants both on production and retail side
  - Sufficient diversity of active players
  - Development in the installed capacity
  - Market price decreased from 100 \$/MWh to 49 \$/MWh over a period of 2009 to 2017



# Part – II

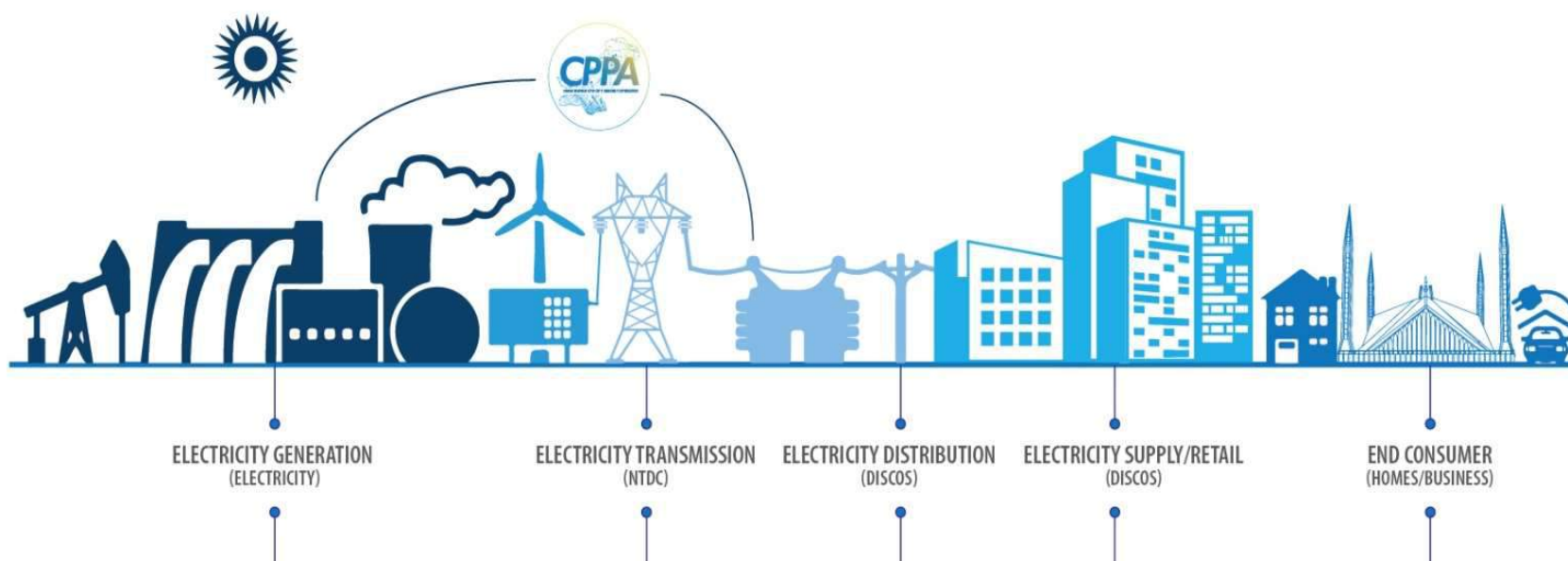
Pakistan's Electricity Market Framework



# Electricity Market: Service Providers and Participants

## Wholesale Electricity Market Operator

Energy purchased in FY2017 = 107 TWh



### Generators as Market Participants

- Total Generators Online = 73
- Installed Capacity = 31,222 MW
- Total PPAs/EPAs signed = 113

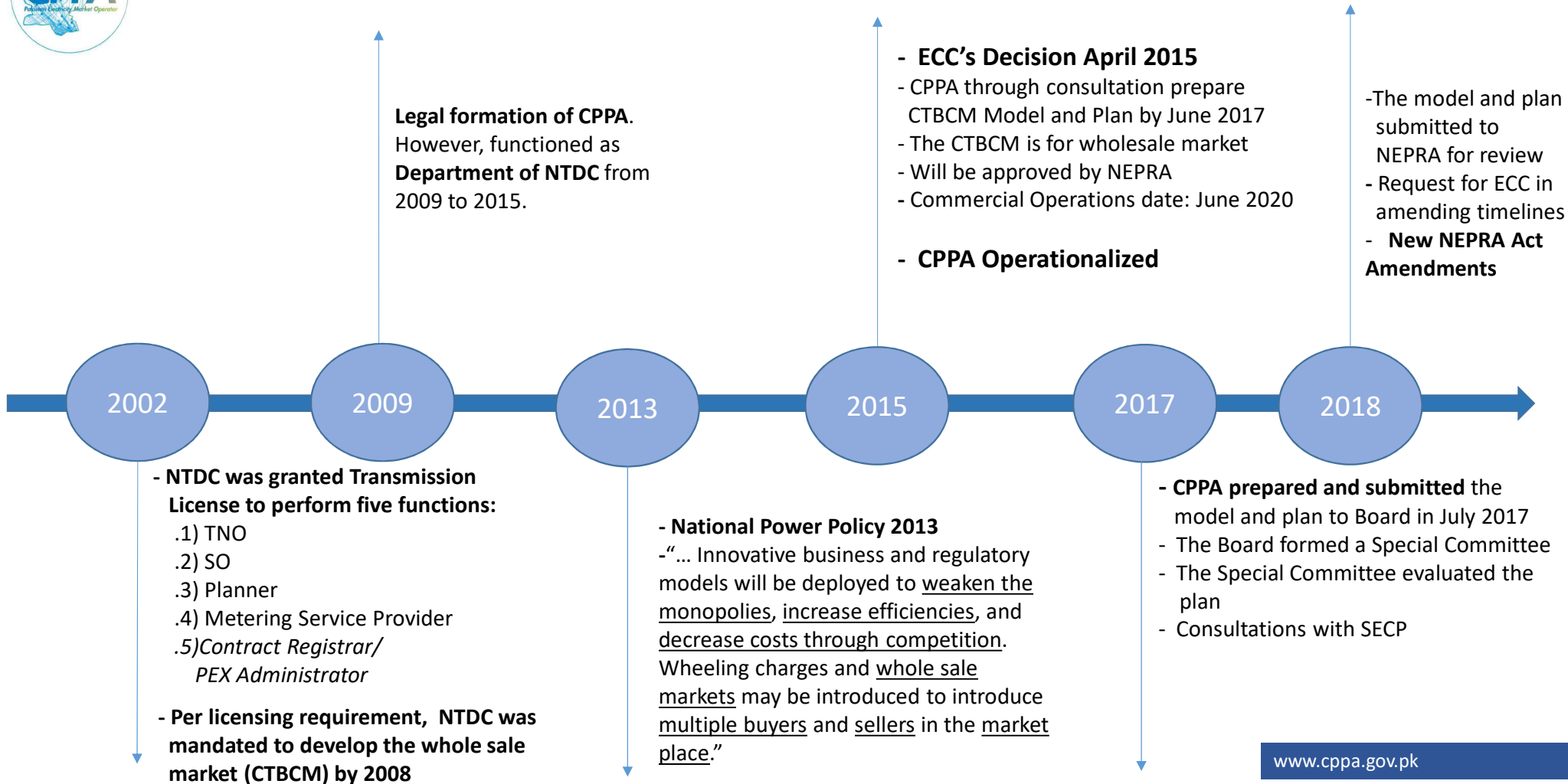
### Transmission Service Provider NTDC

- DISCOs: Wire Business & Supplier
- **Participants** as Retail Suppliers
- 10 DISCOs and KE
- **Service Provider** for wire business/distribution
- Energy Sold in FY2017 = 104 TWh

- BPC > 1MW
- Others non-eligible customer



## Background on Market Development





## NEPRA Act As Amended 2018

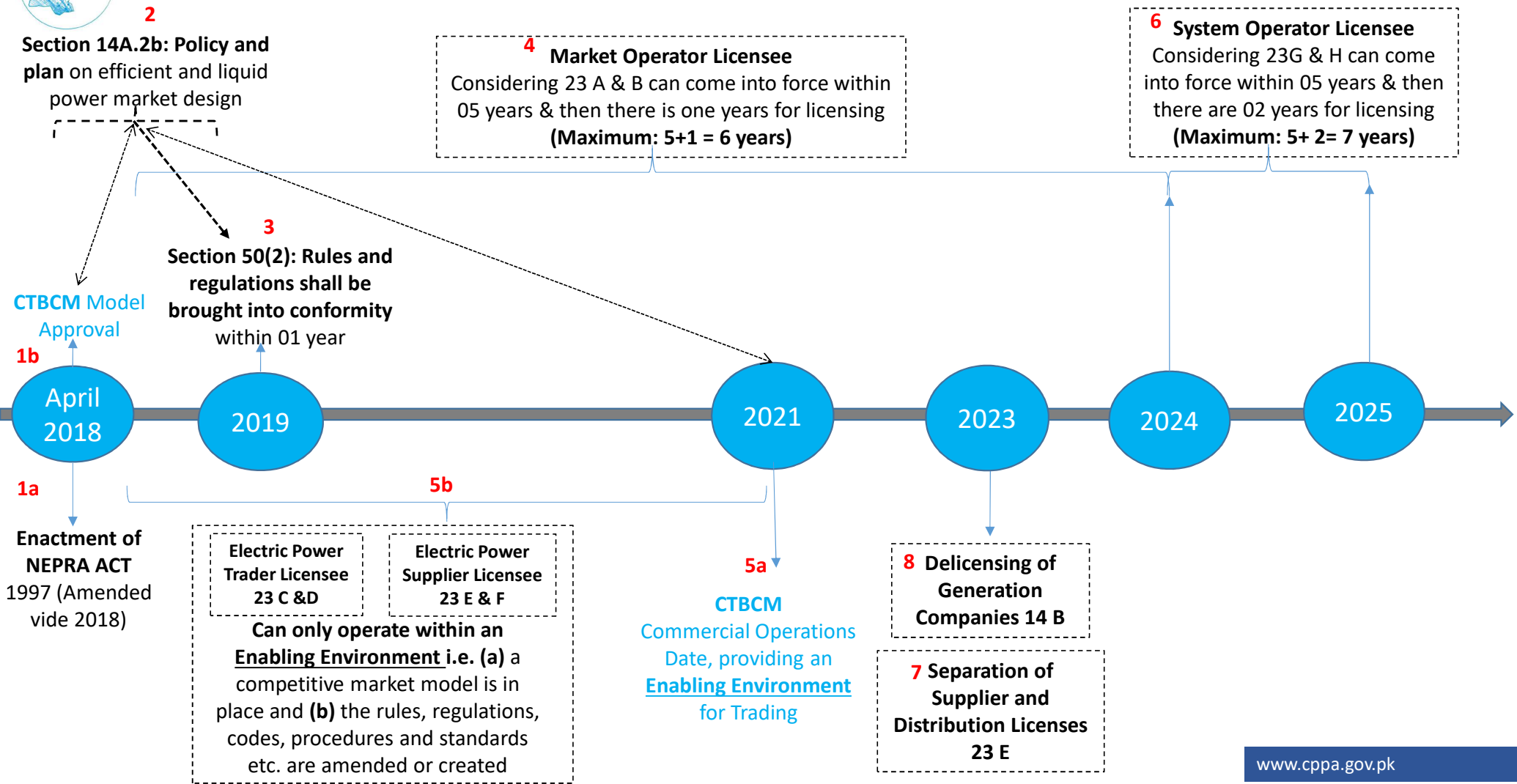
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- Licensed Entities:
  - Market Operator
  - System Operator
  - Transmission Operators
  - Distribution Service Provider
  - Traders
  - Suppliers
  - De-licensing of Generators



# New NEPRA ACT Amendments : Important Timelines and Sequencing





## Important Timelines and Sequencing

1b. CTBCM Approval &  
2. National Electricity Policy & Plan

3. Rules and Regulations in conformity

4. Market Operators License

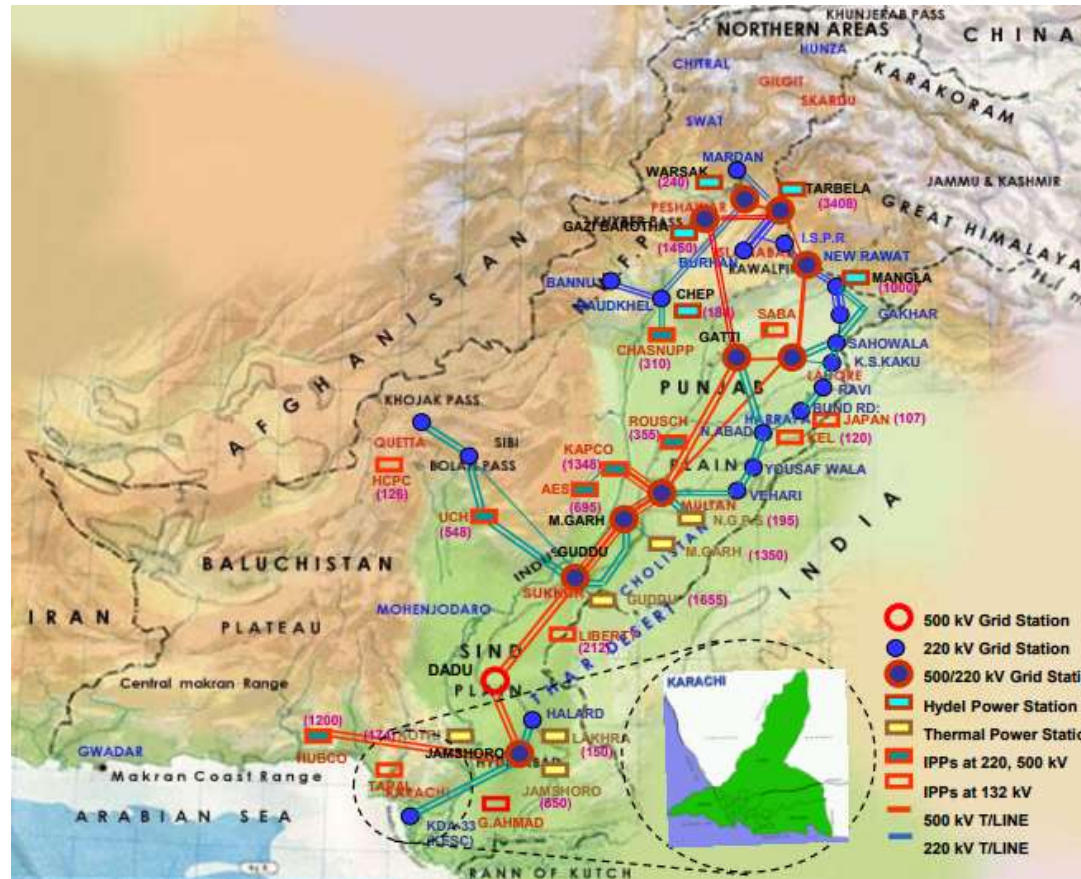
5a. CTBCM COD &  
5b. Licensing of Suppliers and Traders for BPCs

6. System Operators License &  
7. Separation of Supplier and Dist. Licenses



# Power Sector Overview

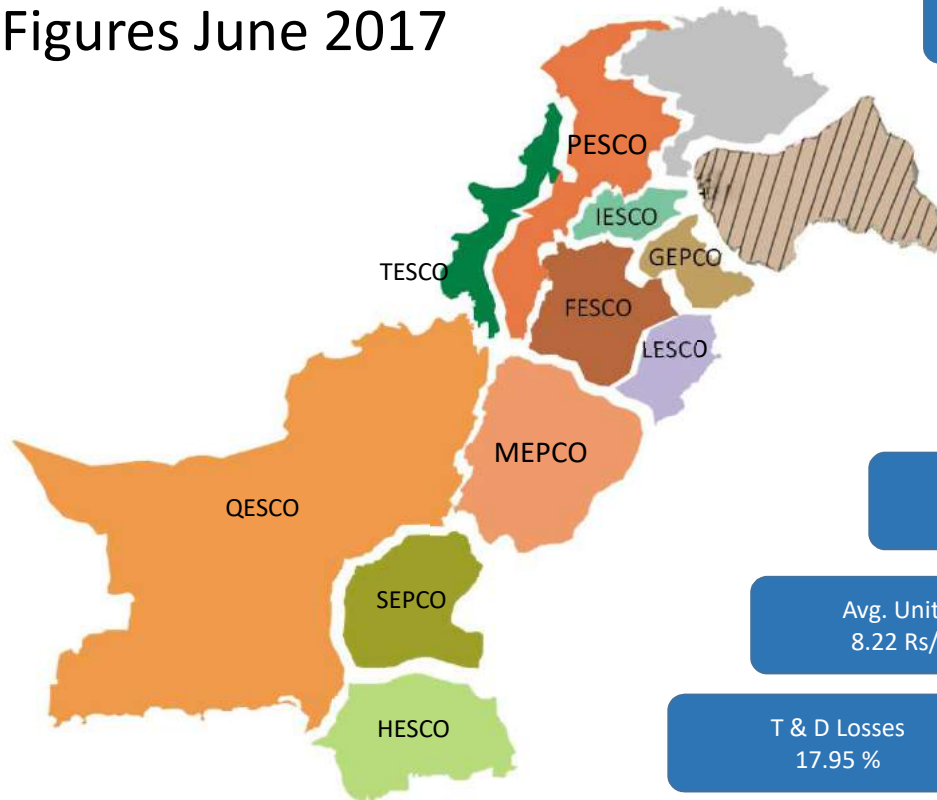
## National Grid





# Power Sector Overview

## Key Figures June 2017



Installed Capacity  
31,222 MW

De-rated Capacity  
29,467 MW

Maximum Demand  
26,700 MW

Total Traded Volume  
107,071 GWh

Energy Sales  
97,233 GWh

No. of Consumers  
24.5 Million

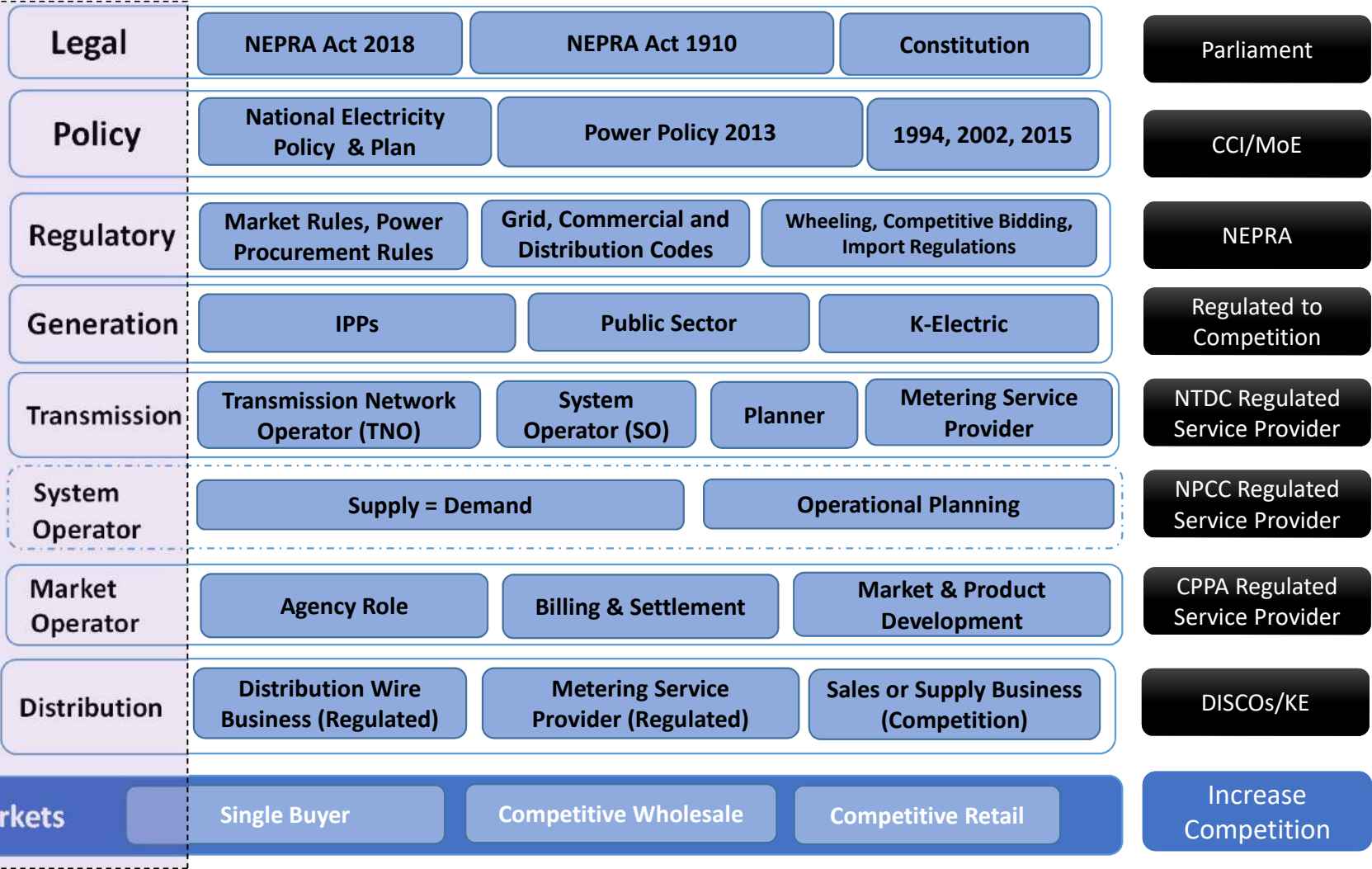
Avg. Unit Price  
8.22 Rs/KWh

T & D Losses  
17.95 %



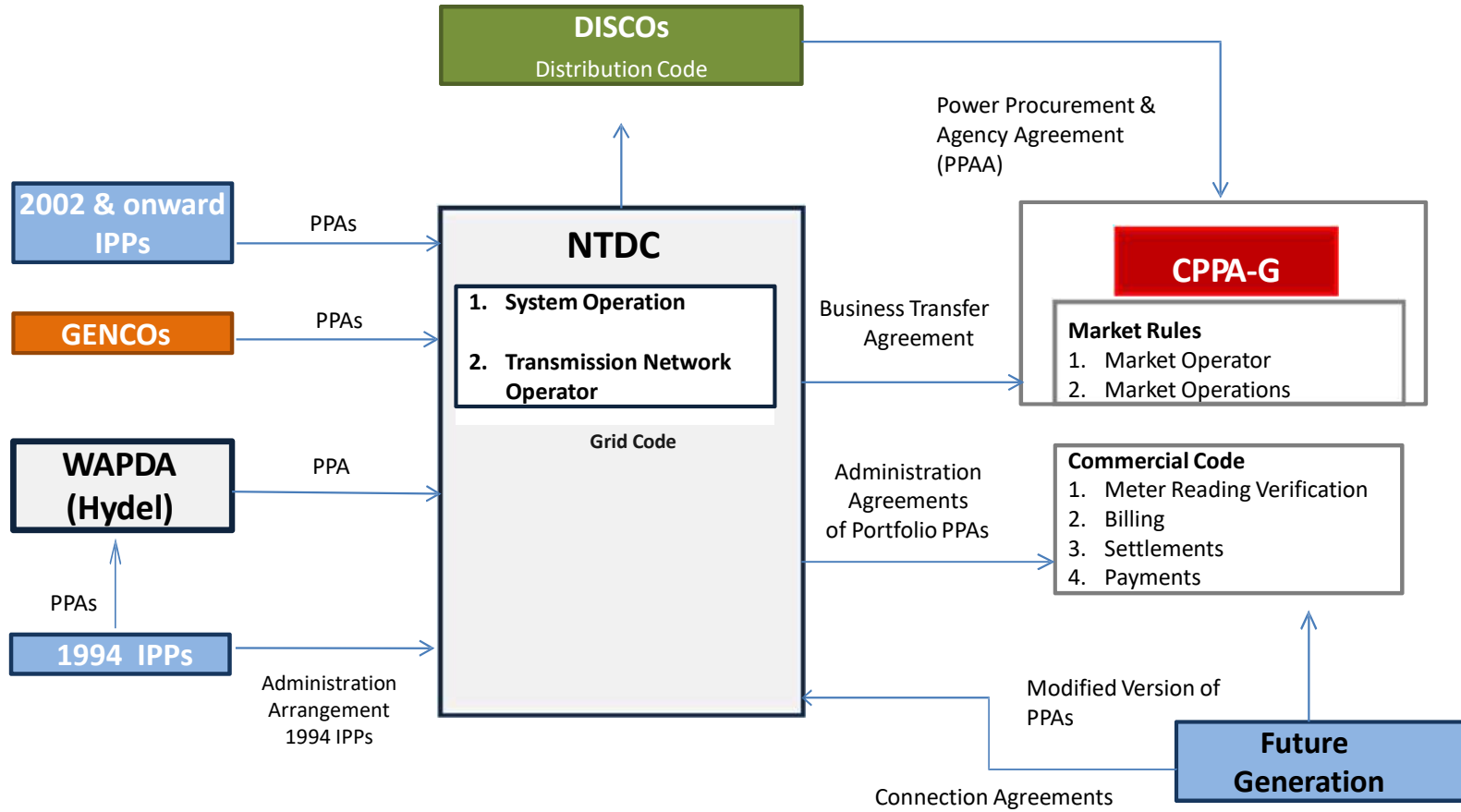
# Power Sector Overview

Pakistan's Electricity Market Framework





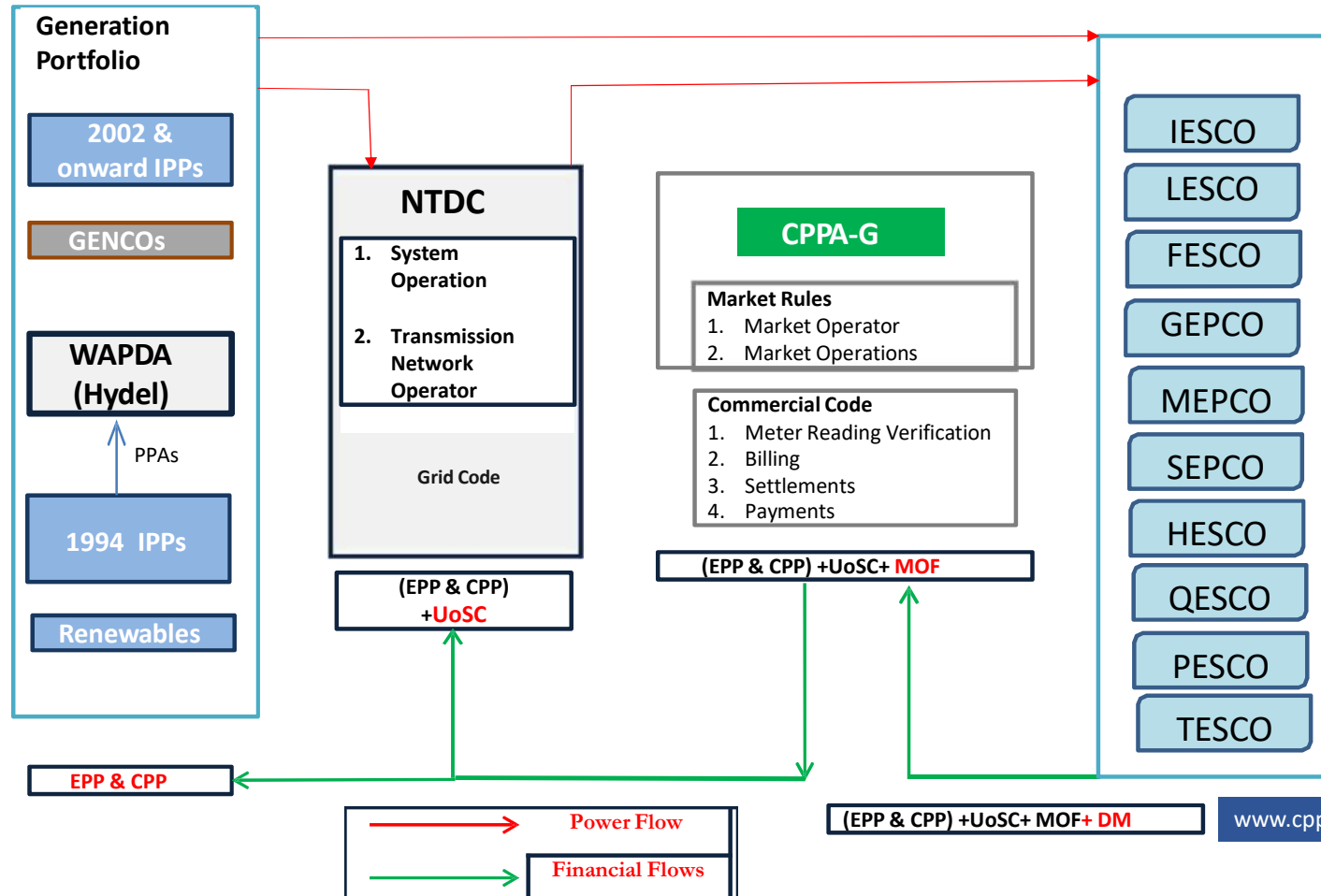
# Contractual Canvas





# CPPA-G (The Market Operator)

## Power and Commercial Flows







## Market Structure

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**Market Structure:** Pakistan has a single-buyer market structure in place.

**Buyer:** Central Power Purchasing Agency Guarantee (CPPA-G) Ltd.

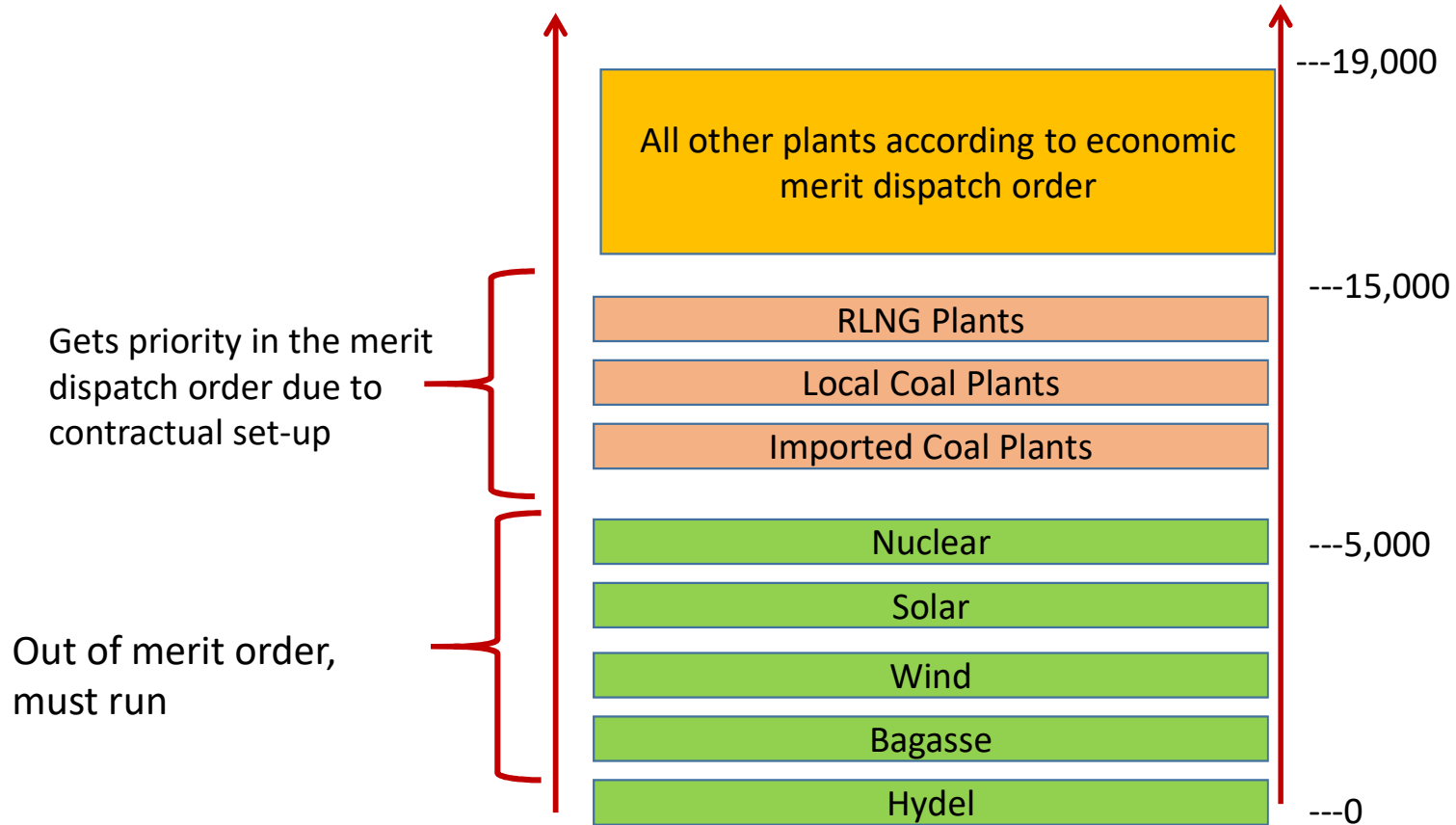
Three major types of power purchase mechanism in place

- Power Purchase Agreements a.k.a take or pay
- Energy Purchase Agreements a.k.a must run
- Power Purchase Agreements with fixed energy supply clause



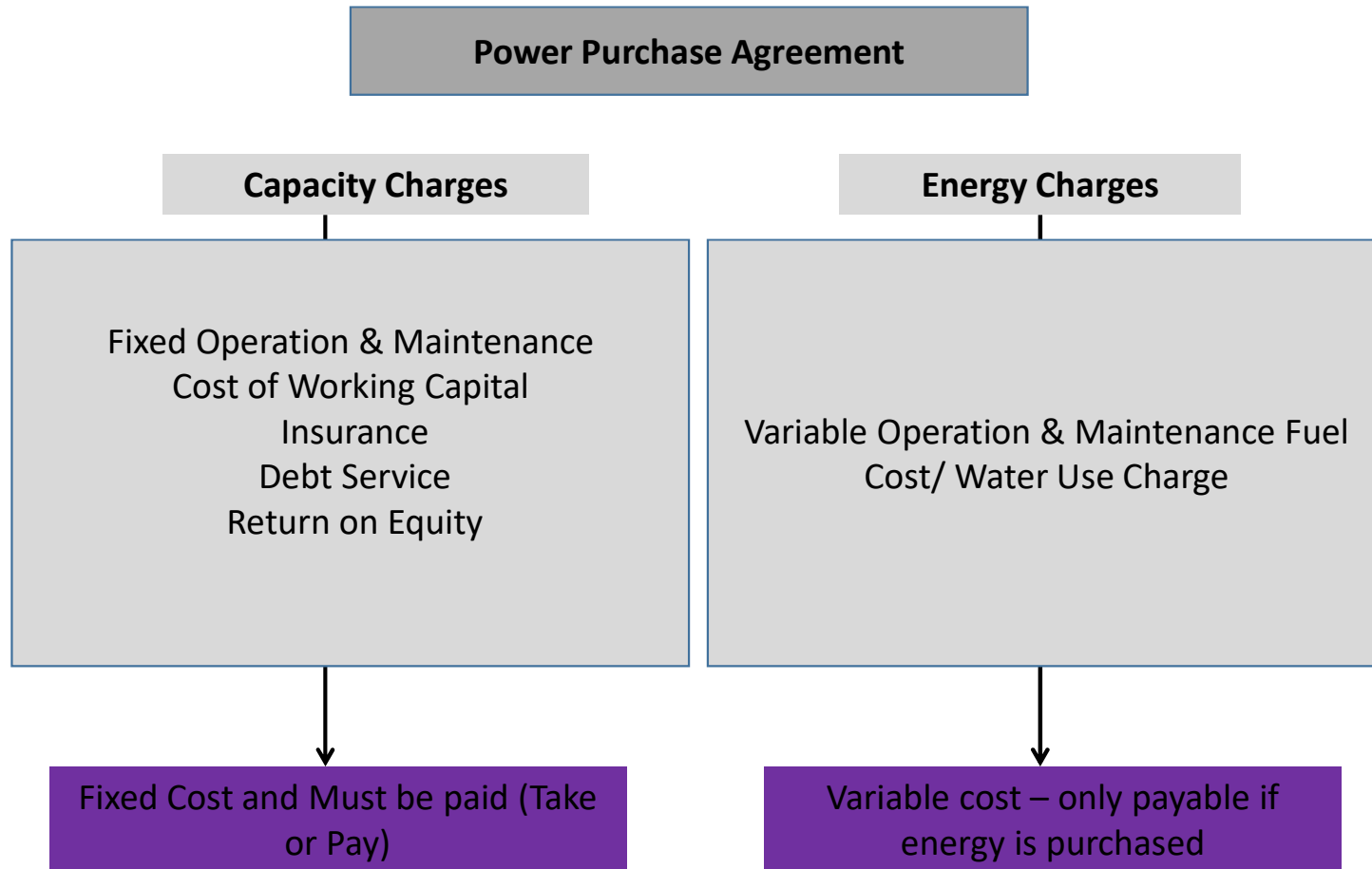
# Power Dispatch Illustrated

E.g. Demand: 19,000 MW



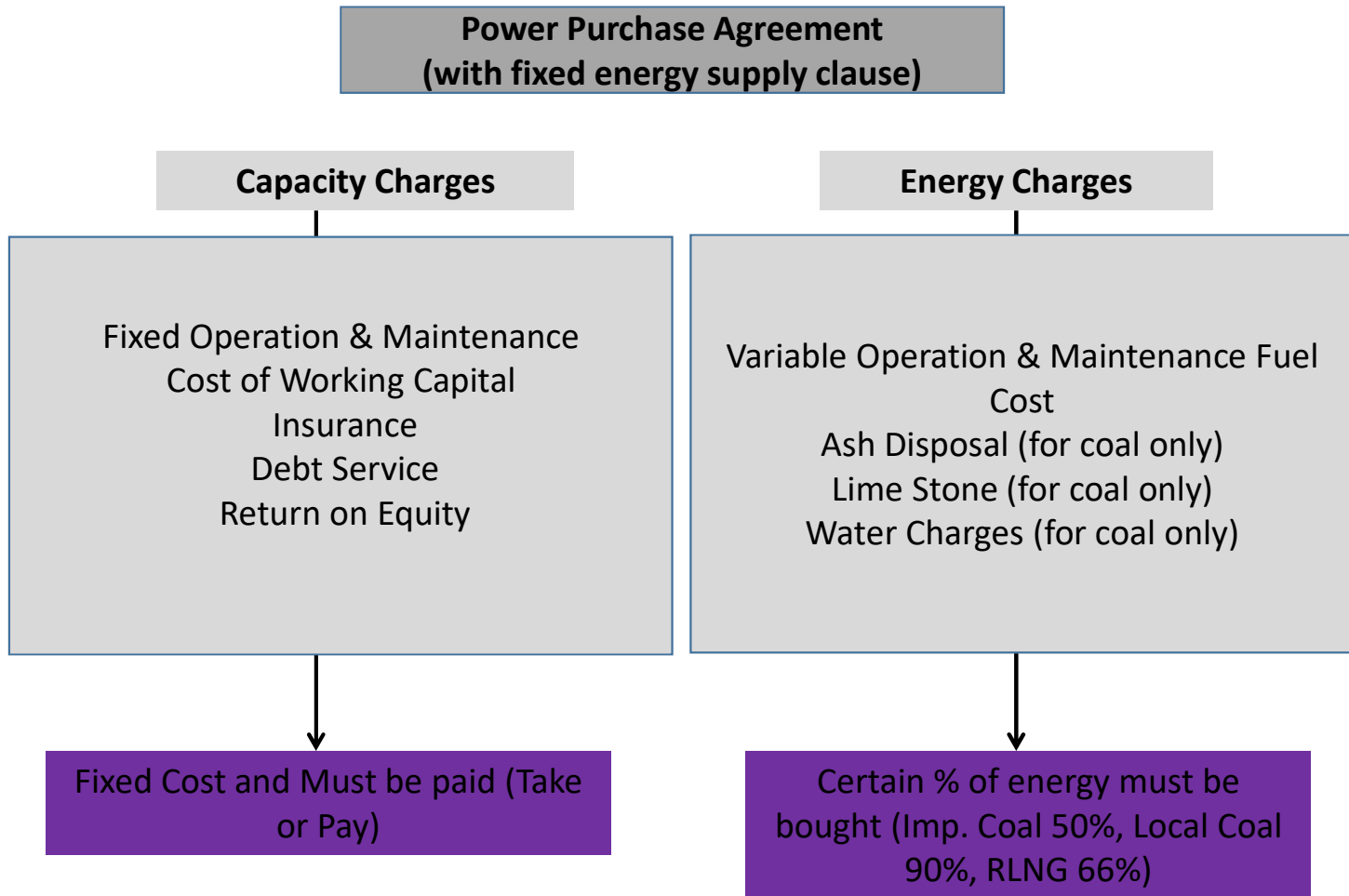


## Types of Agreements





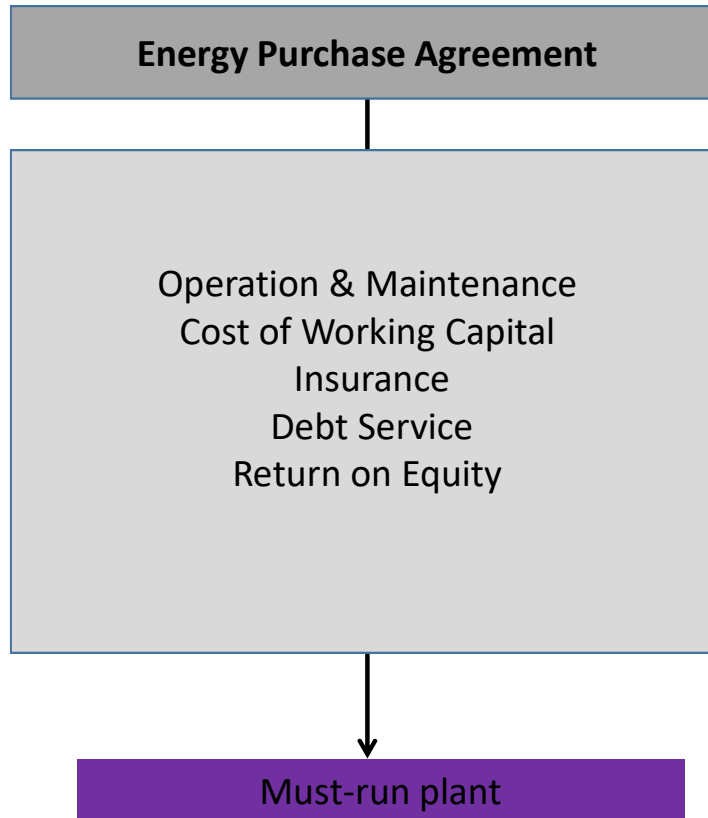
# Types of Agreements





## Types of Agreements

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# CTBCM – Model & Roadmap



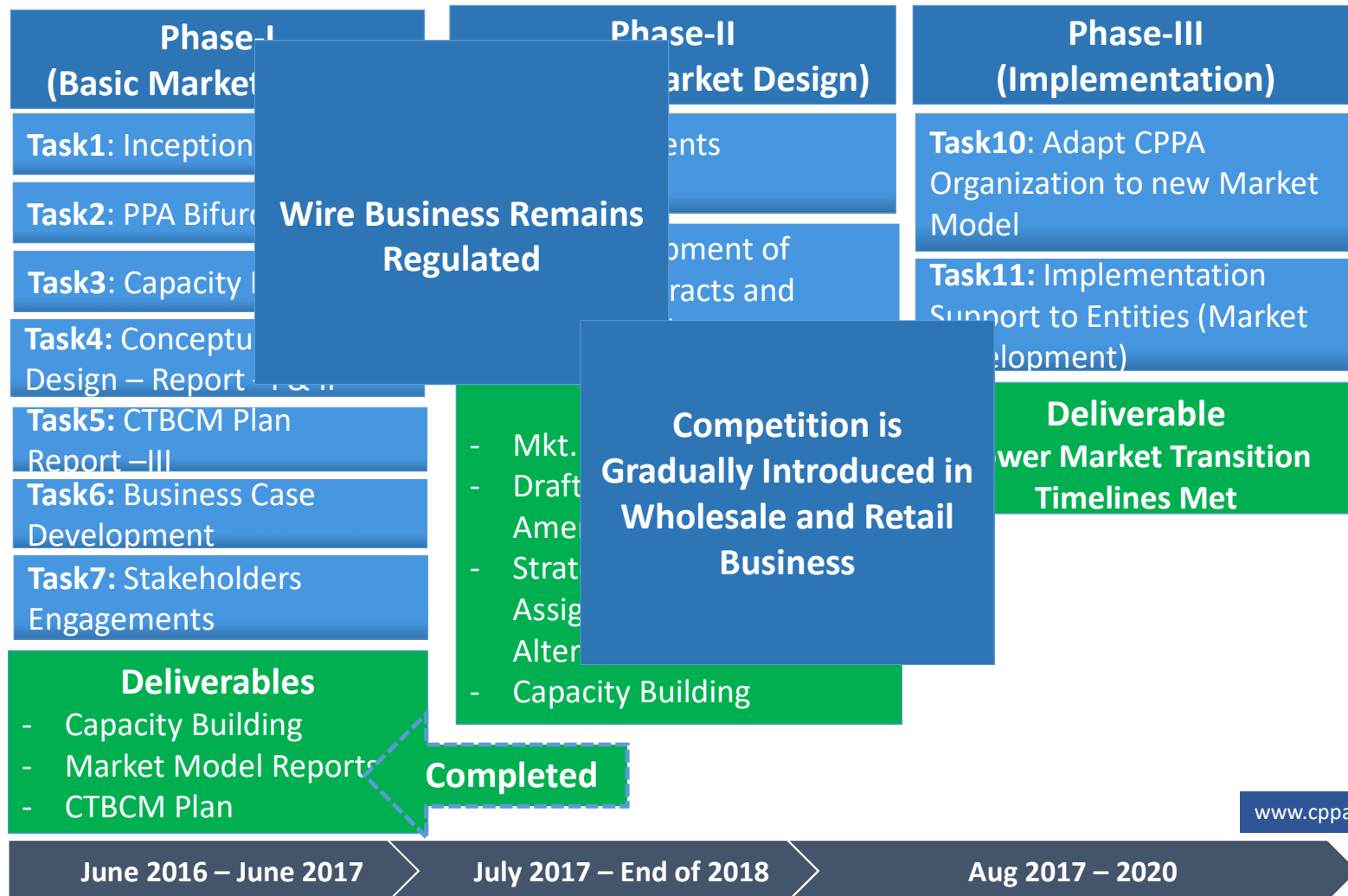
## ECC Decision 2015 on Power Market Development

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- ECC Decision April 30, 2015
- Point 9 of the Decision:
  - Wholesale Competitive Trading Bilateral Contract Market (CTBCM)
  - CPPA-G prepares CTBCM Plan through consultation with stakeholders
  - Transition to be completed not later than July 2020
  - Model to be submitted for approval by NEPRA



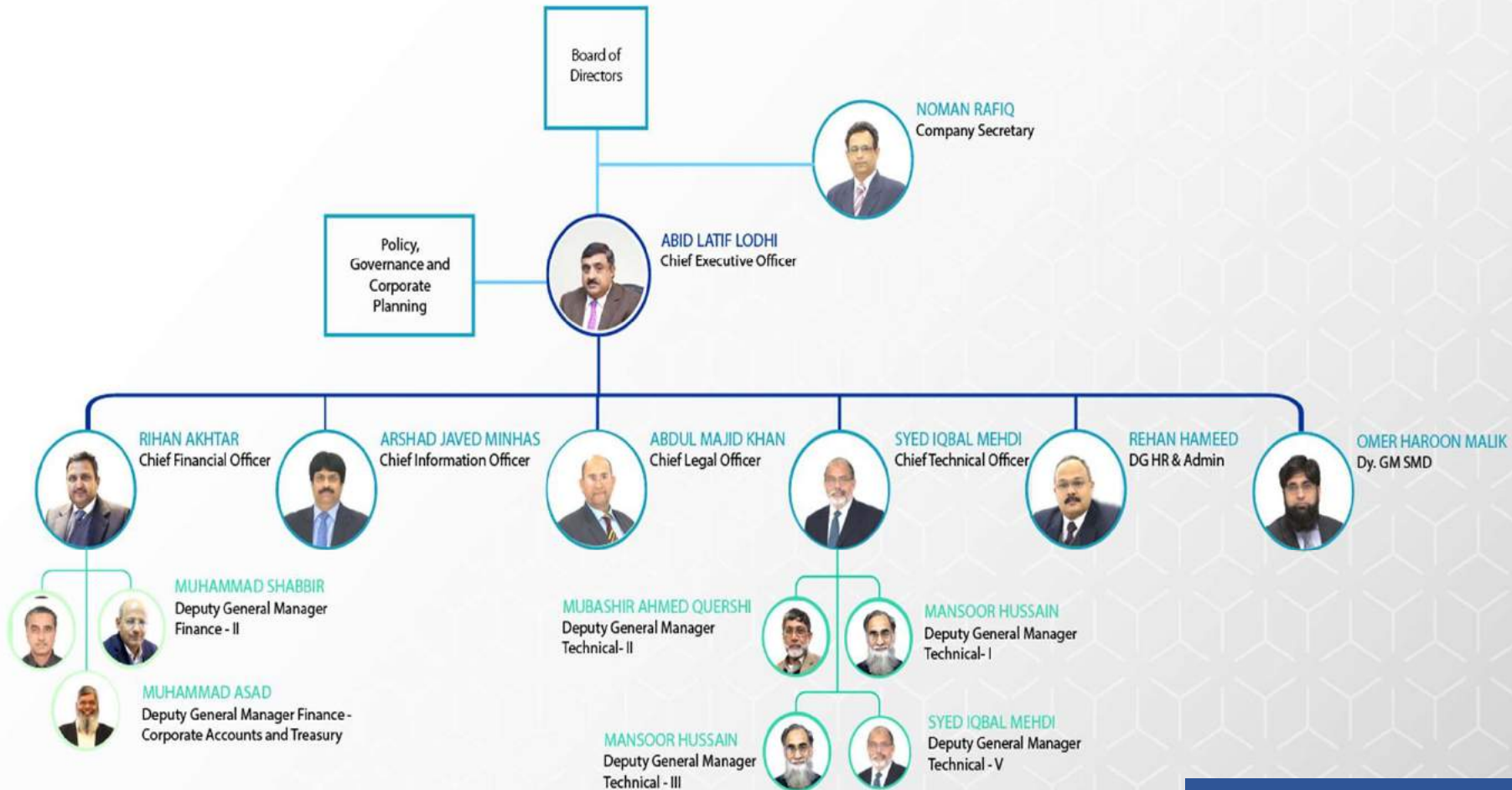
# Market Design and Implementation Strategies







# CPPAs Functional Heads / Senior Management





# CPPA's 3 Year Strategic Plan

**Vision** To become a world-class power Market Operator by providing the optimum environment for trading electricity in the Pakistani Power Market.



**Mission** To achieve our vision, we are determined to become one of the best-run public organizations in the world, a place where people love to work, developing capacity of stakeholders and providing systems, tools and processes for enabling an transparent and competitive power market. During the transition period, our company will also procure the required energy on behalf of the Distribution Companies for retail sales to their customers transparently and efficiently



**Strategic Targets for next 3 years**

1. Improve the current business operations and ensure adherence to existing business compliances
2. Develop healthy Corporate Culture
3. Invest in good people
4. Data institutionalization and publishing
5. Strengthen relationships with Market Participants and Service Providers
6. Design and facilitate implementation the wholesale Competitive Market Model
7. IT transformation of CPPA
8. Rebrand CPPA



**Corporate Culture**

Transparency      Excellence      Teamwork      Be-respectful



2016 &  
2017

**P**rogress  
&  
**R**esults



## Results: Market Development Achievements

- Developed CPPA-G's **Internal Market Development Capacity**
- **Market Model and Plan Reports** review completed by Special Committee and formally submitted to NEPRA
- **Transition an Inclusive Process:**
  - Several **consultations** sessions on the Model
  - **Seven** Consultation and Capacity Building **workshops**
  - **Two international exchanges & other foreign study tours**
- Market Implementation & Monitoring (**MIMG**) group formed
- **Support to DISCOs and NTDC:** PMS and Econometric Forecasts
- **Support to NTDC:** Indicative Least Cost Gen. Plan
- **Support to NPCC:** SO strengthening
- Launch of **Power Market Professional Course Program** in collaboration **with EPIAS, LUMS / NUST** in July 2018





## Results: Global Strategic Partnerships

MoU Singed

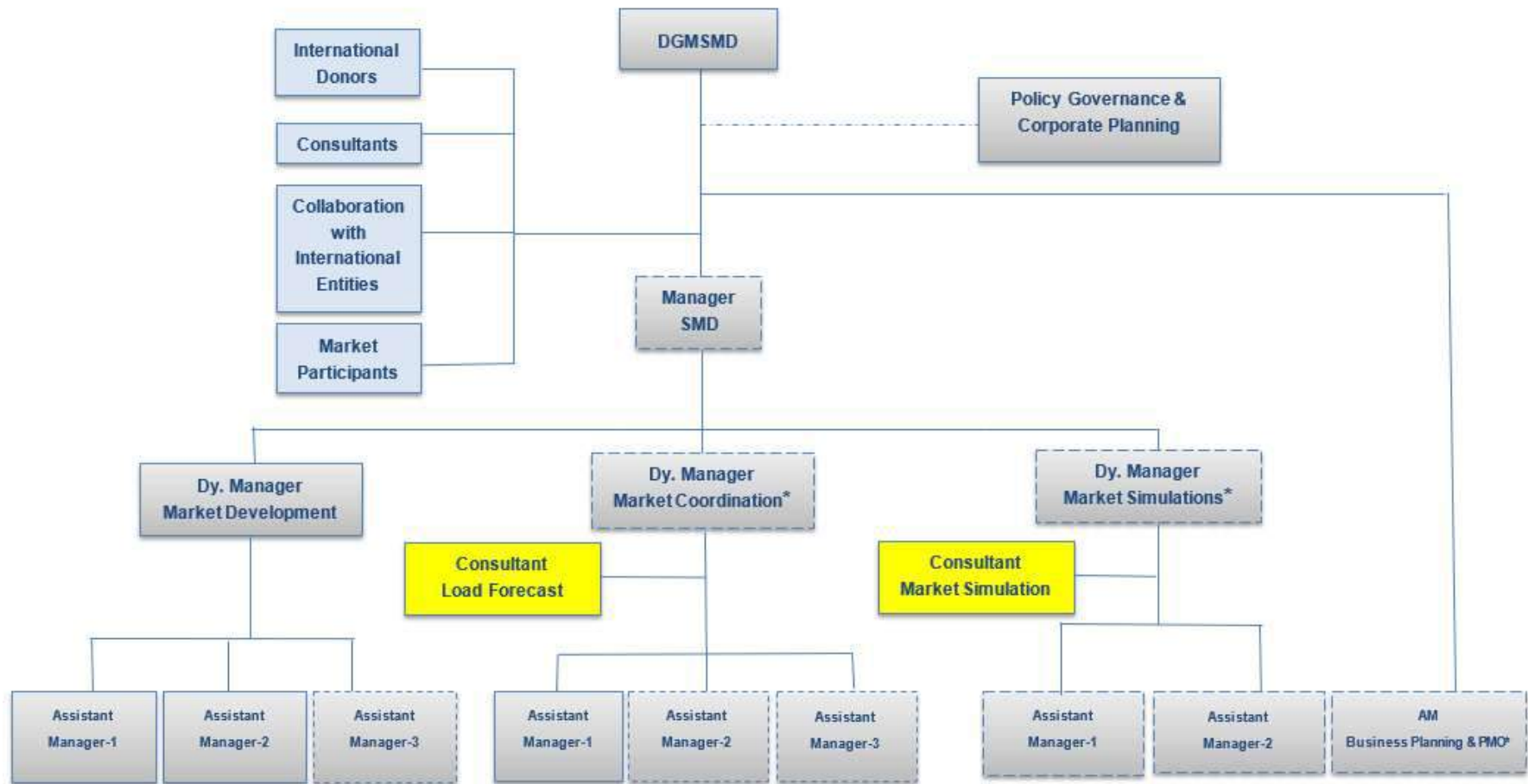
- Full Time Member
- CPPAs active participation



- MoU Singed
- Several exchanges conducted
- Collaborating on fronts of IT, capacity building and knowledge transfer

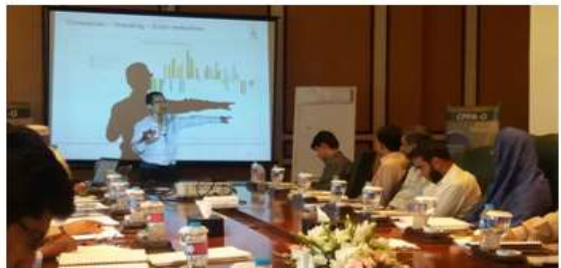


# Strategy and Market Development (SMD): Core Team





# Trainings and Consultations





# Trainings and Consultations

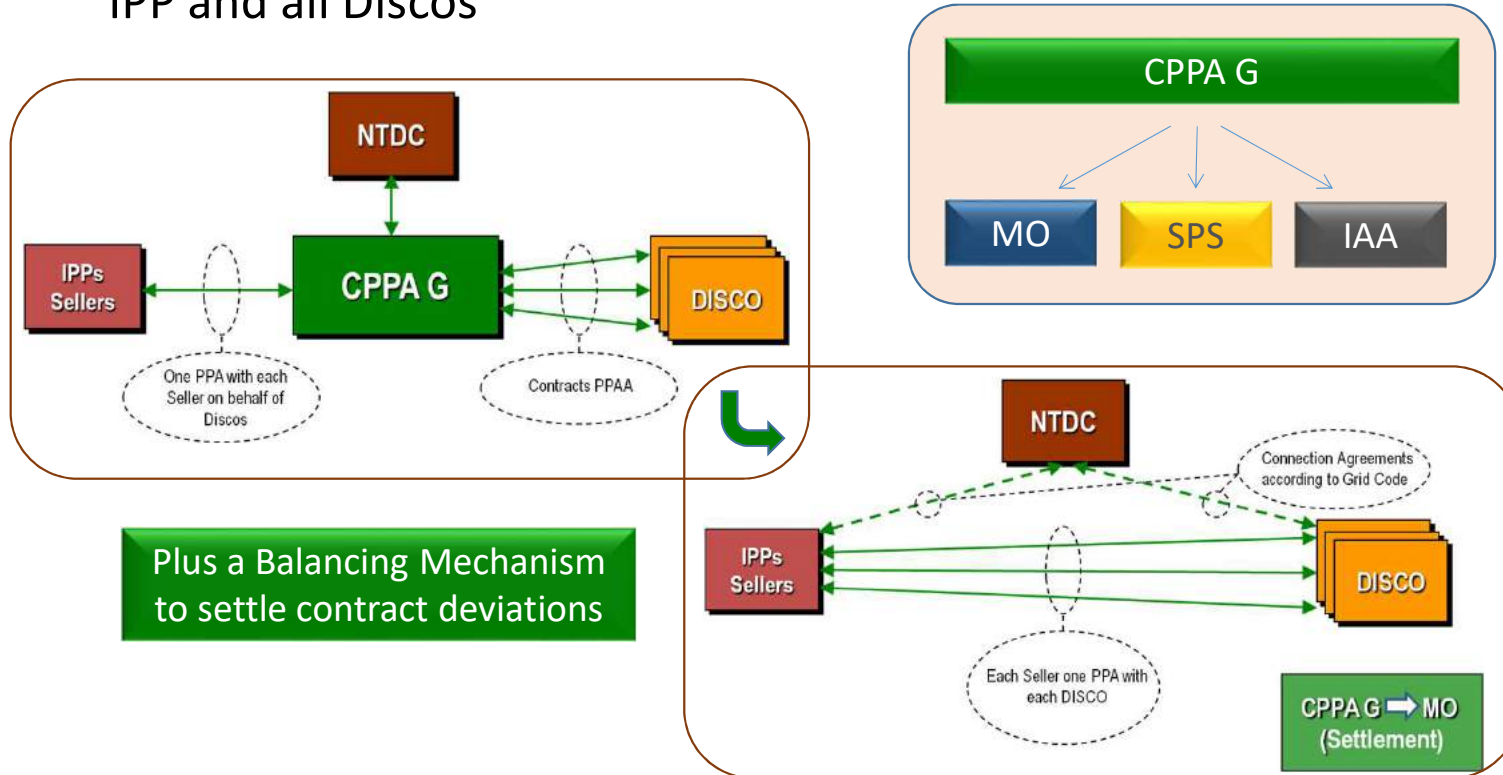






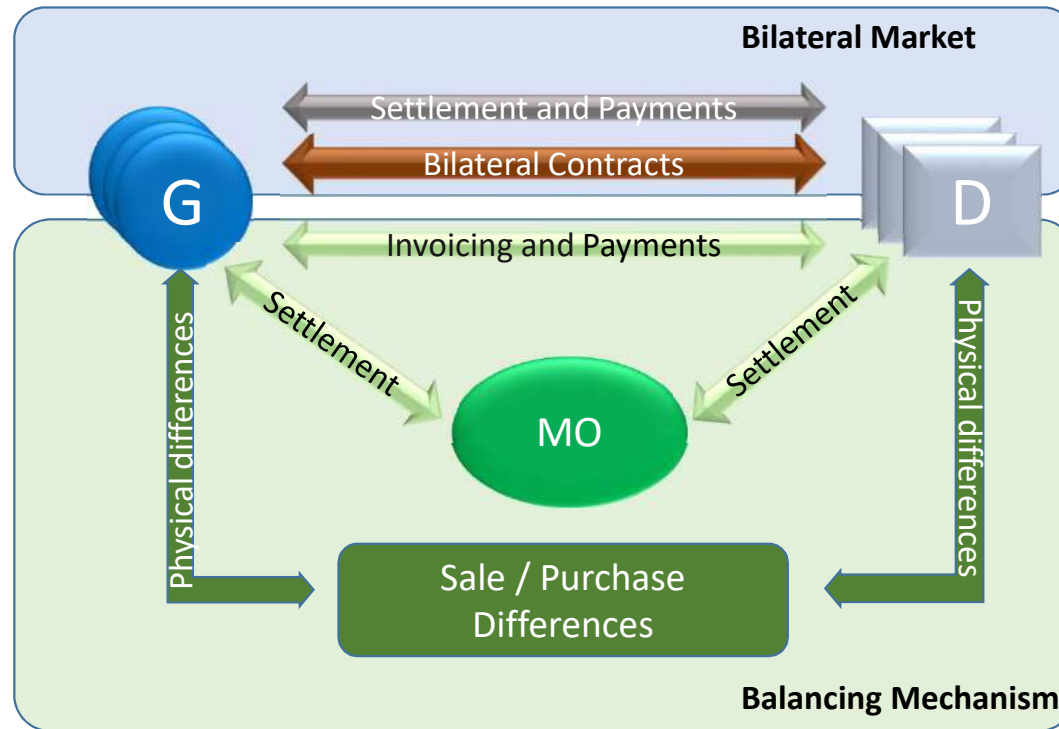
## CTBCM Concept

- Existing PPAs between IPPs and NTDC/CPPA G (on behalf of Discos) will be converted into bilateral contracts between each IPP and all Discos





# Bilateral Contract Market with Balancing Mechanism





## New Market: Challenges

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New Culture

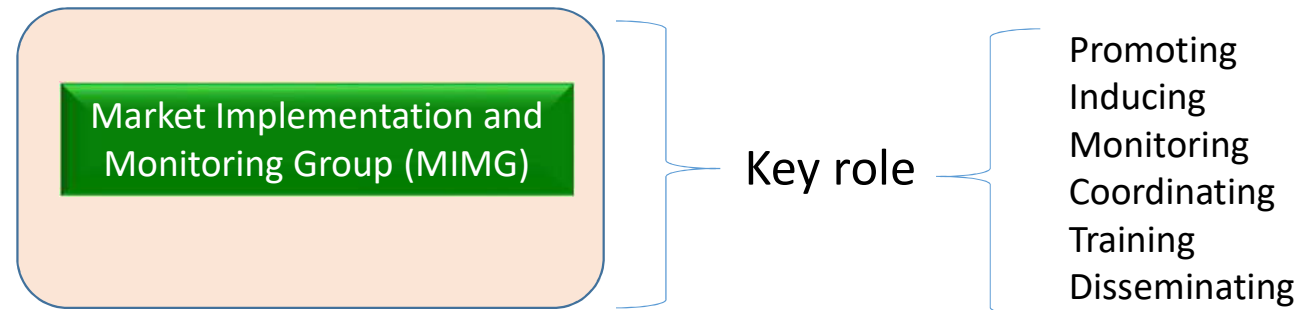
New HR Approach

New Capacities

New Accountability

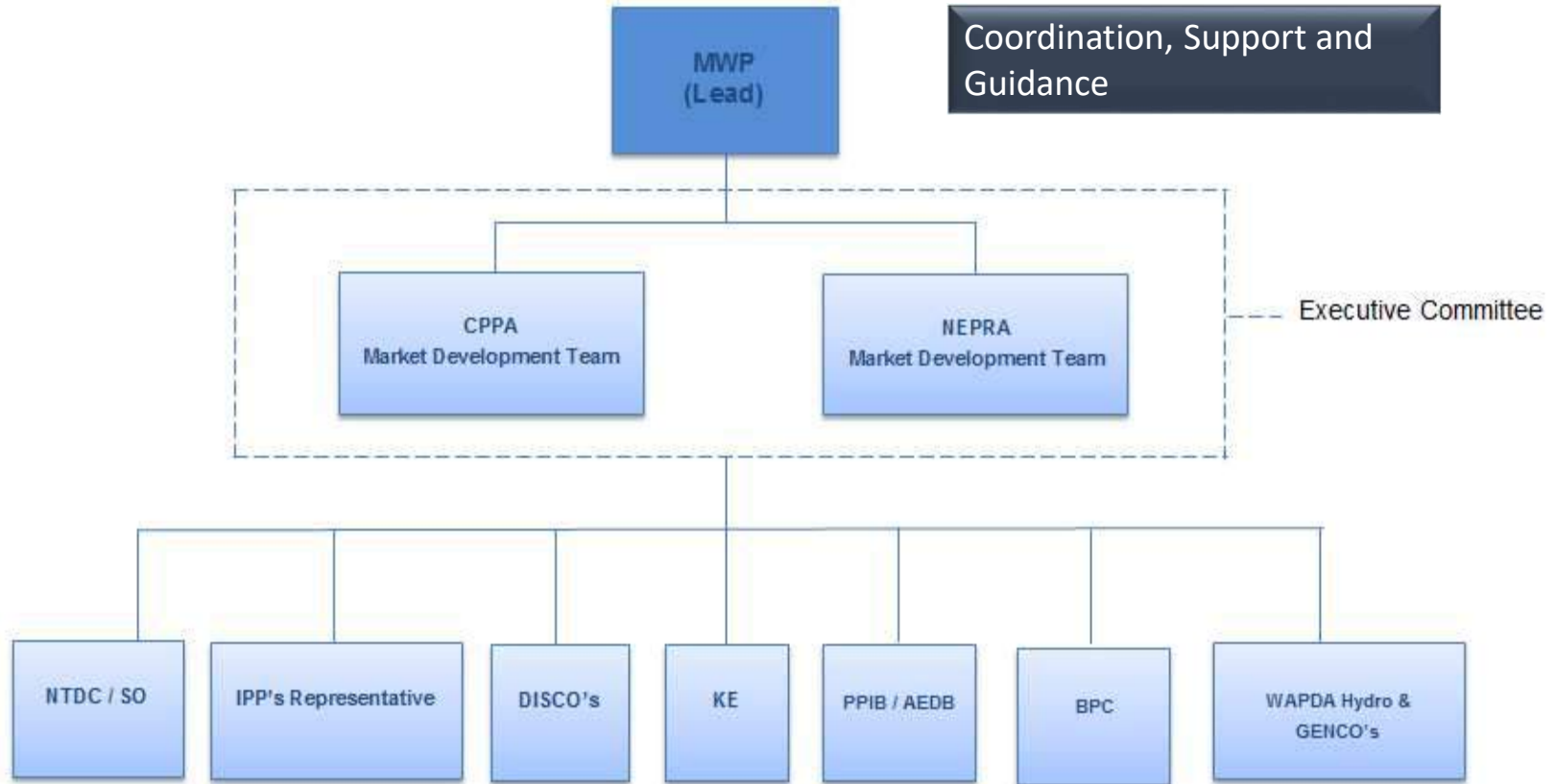
New Technologies

New Efficiency





# Market Monitoring & Implementation Group (MMIG)





## CTBCM - Main Timetable Targets

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- High-level Model and Plan Approval by January 2018
- Detailed Design
  - Initiated by January 2018
  - Completed in 2018
- Market Organization
  - Jan 2018: CPPA G restructuring preparation
  - Jan 2019: CPPA G new organization
  - Jul 2019: 3 companies registration (empty shells)
  - Jan 2021: transfer of functions, staffs, etc. to new Co.
- Commercial Operations Date
  - Jul 2020: launch trial market
  - CTBCM launched Jan 2021



| No. | GROUP OF ACTIONS   | Stakeholders directly involved   | No.  | GROUP OF ACTIONS  | Stakeholders directly involved  |
|-----|--|--|------|---|---|
| 0   | Implementation Process Start; Overall Decision and Actions; Coordination   | MWP<br>NEPRA<br>CPPA G   | 10.1 | Codes: New Market Commercial Code   | CPPA G draft and consultation, NEPRA review and approval  |
| 1   | Policy on market development, White Paper describing the market conceptual design  | NEPRA;<br>CPPA G (draft);<br>MWP public consultation and with other institutions | 10.2 | Codes: Update Grid Code   | NTDC and Grid Code Review Panel.<br>NEPRA review and approval.                                    |
| 2   | Amendment to legal framework   | MWP with CPPA G support  | 11   | Strengthening of System Operator, enforce rights and obligations  | NTDC and NPCC   |
| 3   | Modifications to adapt or replace energy policies to be consistent with the market development policy                      | MWP  | 12   | Strengthening Discos credit worthiness and readiness as market participants                                     | Discos & MWP as the owner of Discos and SPS   |
| 4   | Modifications to power sector regulatory framework to be consistent with the market development policy                     | NEPRA.   | 13   | Open access to transmission services: formalize transmission services rights and obligations                    | NTDC as Transmission Network Owner<br>NPCC as System Operator.                                    |
| 5   | Assignment of pre-existing PPAs/EPAs signed or administered by CPPA G among Discos   | MWP and CPPA G, IPPs and Gencos Imports Discos                                   | 14   | NTDC as Planner (Least cost expansion plan) and Metering Services Provider (adequate revenue settlement meters) | NTDC,<br>NEPRA review and approval of plan<br>CPPA G (as observer of                              |
| 6   | Separation of CPPA G into Market Operator and Special Wholesale Supplier Functions   | CPPA G   | 15   | Measures to enhance wholesale payment culture: credit cover mechanisms and payment system                       | CPPA G/Market Operator<br>Discos<br>MWP<br>IAA  |
| 7   | Creation of the Market Operator as a separate company  | CPPA G in particular Market Operator Business Unit                               | 16   | Readiness for commercial operation of electricity market:   | Lead by CPPA G, includes all market participants; CPPA G reporting of readiness tests and results |
| 8   | Creation of the SPS as purchaser of not yet not assigned PPA/EPA   | CPPA G in particular SPS Business Unit; Discos                                   | 17   | Declaration of date to start commercial operation of the market   | MWP   |
| 9   | Creation of the Independent Auction Administrator (IAA) and scheme for credit cover / guarantees for low performing Discos | MWP (PPIB);<br>CPPA G<br>Discos  |      |   |   |



## Conclusions (the good, the bad, the ugly)

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- The good
  - Competitive markets leads to costs reflective prices
  - That maximises social welfare
  - Demand participation increases overall efficiency
  - Regulatory decisions independent of political needs (not always)
- The bad
  - Political decisions that distort market
  - Barriers to access (implicit and explicit)
  - Unnecessary subsidies
- The ugly
  - Lack of effective measures to control market power



## Conclusions (Liquidity is a paramount)

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- Lack of enough participants jeopardises competition.
- Market Models should be adapted to the number of participants
  - <5\*: PPAs and a balancing market. With dispatchable PPAs, an economic dispatch with merit order based on variable costs can be implemented
  - <5 and < 50: day ahead market with offers/bids based on variable costs or price offer, OTC bilateral contracts and balancing market. Some level of demand participation (large consumers). Ancillary services mechanism or market based.
  - > 50 day ahead and intraday market, OTC bilateral contracts, power exchange and balancing market. All demand based on purchasing bids. Ancillary services market.

\* Approximate numbers



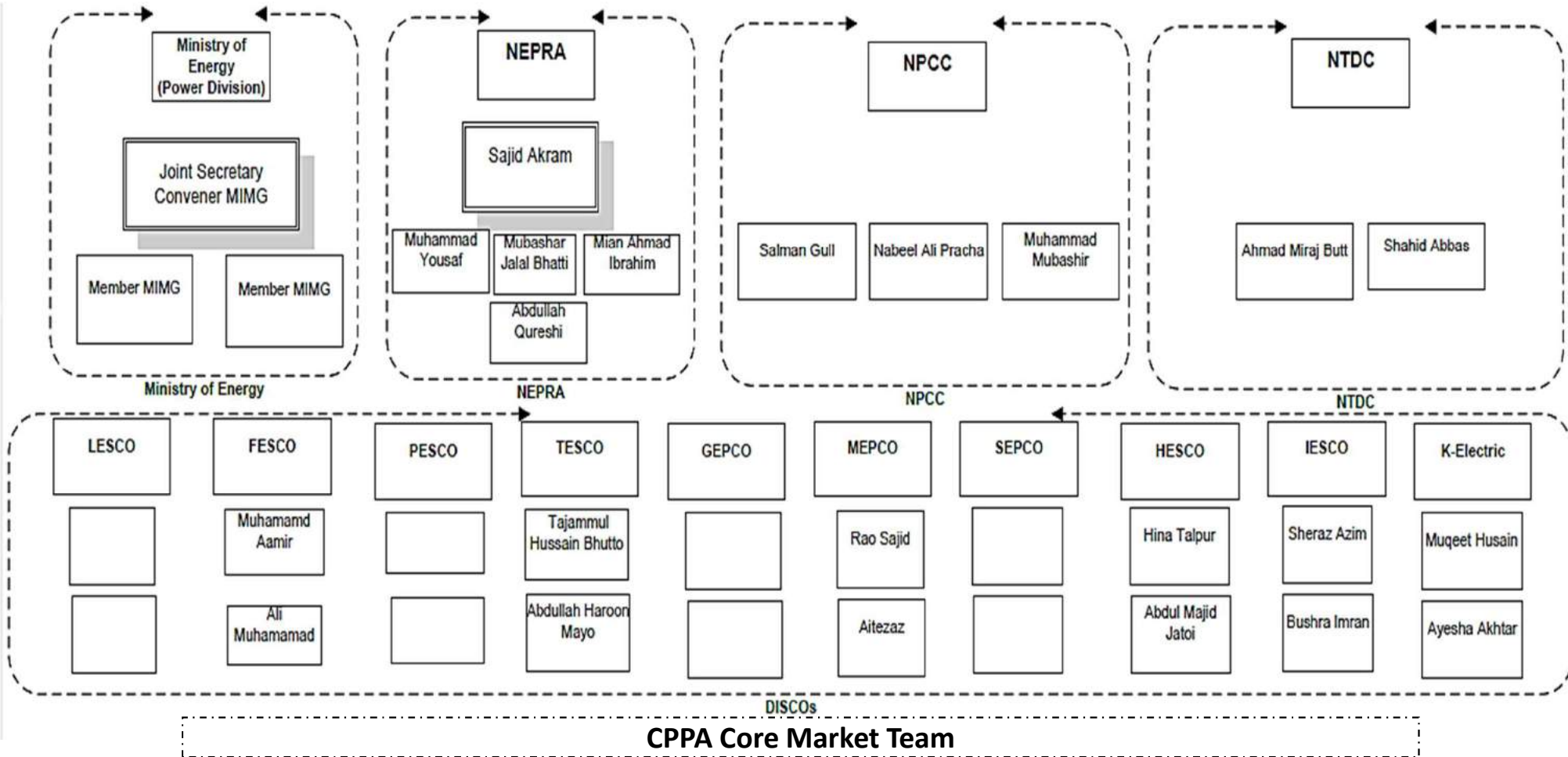


# Part – III

Electricity Market Team (EMT)



# Electricity Market Team (EMT)





**Thanks**