Orientation Session for Honorable **Brothers** from Afghanistan

SAARC Training for Professionals of Afghanistan

20th Sept, 2019

www.cppa.gov.pk

Scheme of Presentation

- Part-1 Legal Regulatory Framework
- Part-2 Strategic Plan of CPPA (2018-20) & CPPA Functions
- Part-3 Regulatory Compliance
- Part-4 Market Model and Future Evolution
- Part-5 Take-aways / Recommendations / Q&A

PART – 1

Legal / Regulatory Framework

An Overview

Historical Development of Pakistan's Electricity Market

1947-58

Localized generation and distribution of power

1958

Pakistan Water and Power Development Authority (**WAPDA**) was established through an Act of Parliament in 1958. It was an autonomous and statutory body under the administrative control of the Federal Government. The Authority consisted of a Chairman and three Members (Water, Power and Finance)

1982

Provisional Electricity Departments were transferred to WAPDA and accordingly Area Electricity Boards (**AEB**s) were established in 1982

1992

In order to reform power sector and transition from monopoly to privatization and from integration to disintegration, the Government of Pakistan approved the **WAPDA Strategic Plan in 1992** to privatize the Power Sector. **There were three Critical Goals of the Strategic Plan**: 1. Enhance capital formation, 2. Improve efficiency and rationalize prices, and 3. Move over time towards full competition by providing the greatest possible role for the private sector through privatization

Power Sector Overview

1997

Enactment of **NEPRA Act in 1997**

NEPRA's main responsibilities are to:

1. Issue Licenses for generation, transmission and distribution of electric power;
2. Establish and enforce Standards to ensure quality and safety of operation and supply of electric power to consumers;
3. Approve investment and power acquisition programs of the utility companies; and
4. Determine Tariffs for generation, transmission and distribution of electric power.

1998

WAPDA was unbundled into separate companies for generation, transmission and distribution. WAPDA was bifurcated into **DISCOs, NTDC and GENCOs.** DISCOs were given Distribution Business including secondary transmission system

NTDC was formed to perform five functions namely, TNO, SO, Planner, Meter Service Provider and Contract Registrar / Power Exchange Administrator

2002

NTDC was granted Transmission License to perform five functions namely, **TNO, SO, Planner, Meter Service Provider and Contract Registrar / Power Exchange Administrator. NTDC was given the responsibility to develop the whole sale market as per the timetable given in the license.**

2015

CPPA was separated from NTDC and formed as in independent company owned by GoP. It is presently functioning as the Market Operator and performing following functions:

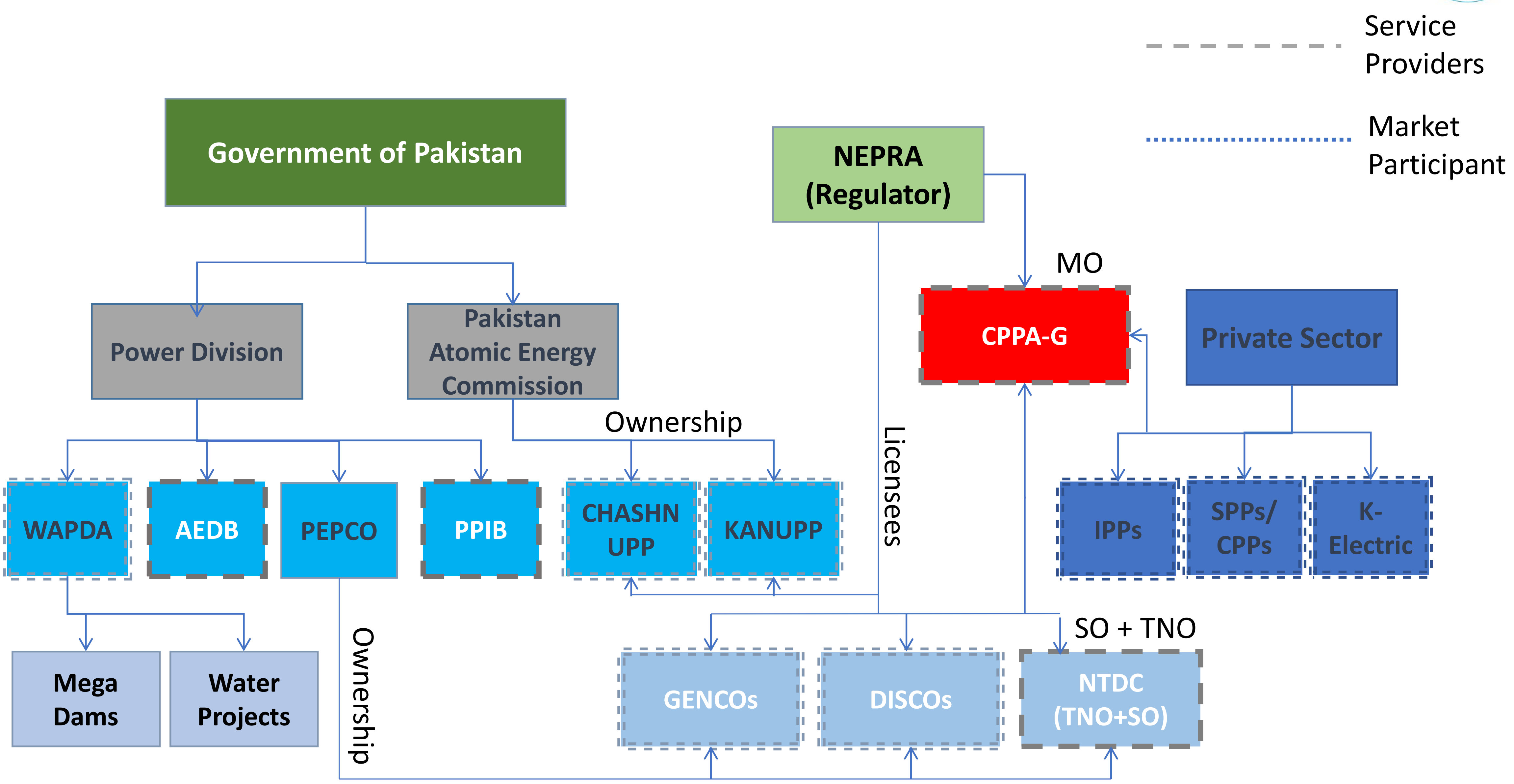
1. Billing and Settlement
2. Power Procurement
3. Legal
4. Market Development

Pakistan's Electricity Market Framework

Pakistan's Electricity Market Framework

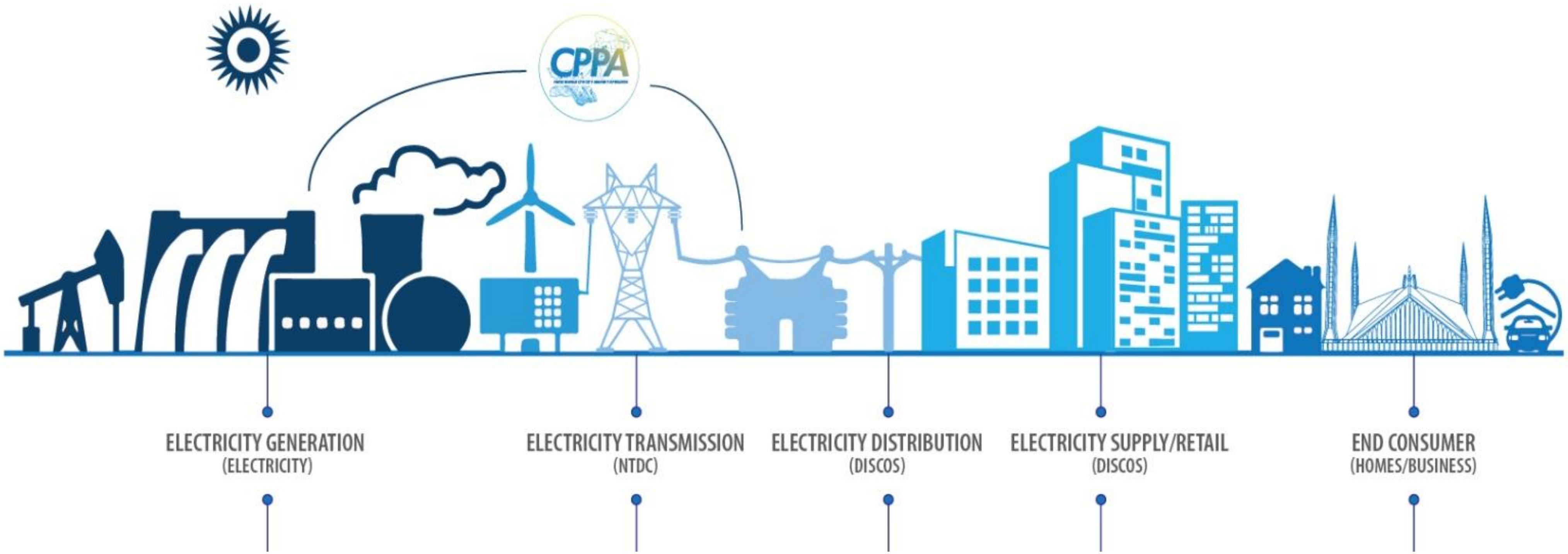
Legal	NEPRA Act 2018	Electricity Act 1910	Constitution		Parliament
Policy	National Electricity Policy & Plan	Power Policy 2013	1994, 2002, 2015		CCI/MoE
Regulatory	Market Rules, Power Procurement Rules	Grid, Commercial and Distribution Codes	Wheeling, Competitive Bidding, Import Regulations		NEPRA
Generation	IPPs	Public Sector	K-Electric		Regulated to Competition
Transmission	Transmission Network Operator (TNO)	System Operator (SO)	Planner	Metering Service Provider	NTDC Regulated Service Provider
System Operator	Supply = Demand	Operational Planning			NPCC Regulated Service Provider
Market Operator	Agency Role	Billing & Settlement	Market & Product Development		CPPA Regulated Service Provider
Distribution	Distribution Wire Business (Regulated)	Metering Service Provider (Regulated)	Sales or Supply Business (Competition)		DISCOs/KE
Markets	Single Buyer	Competitive Wholesale	Competitive Retail		Increase Competition

CPPA G in the Power Market



Electricity Market: Service Providers and Participants

Wholesale Electricity Market Operator
Energy purchased in FY2018 = 121 TWh



Generators as Market Participants
- Total Generators Online = 96
- Installed Capacity = 35,961 MW
- Total PPAs/EPAs signed = 112+

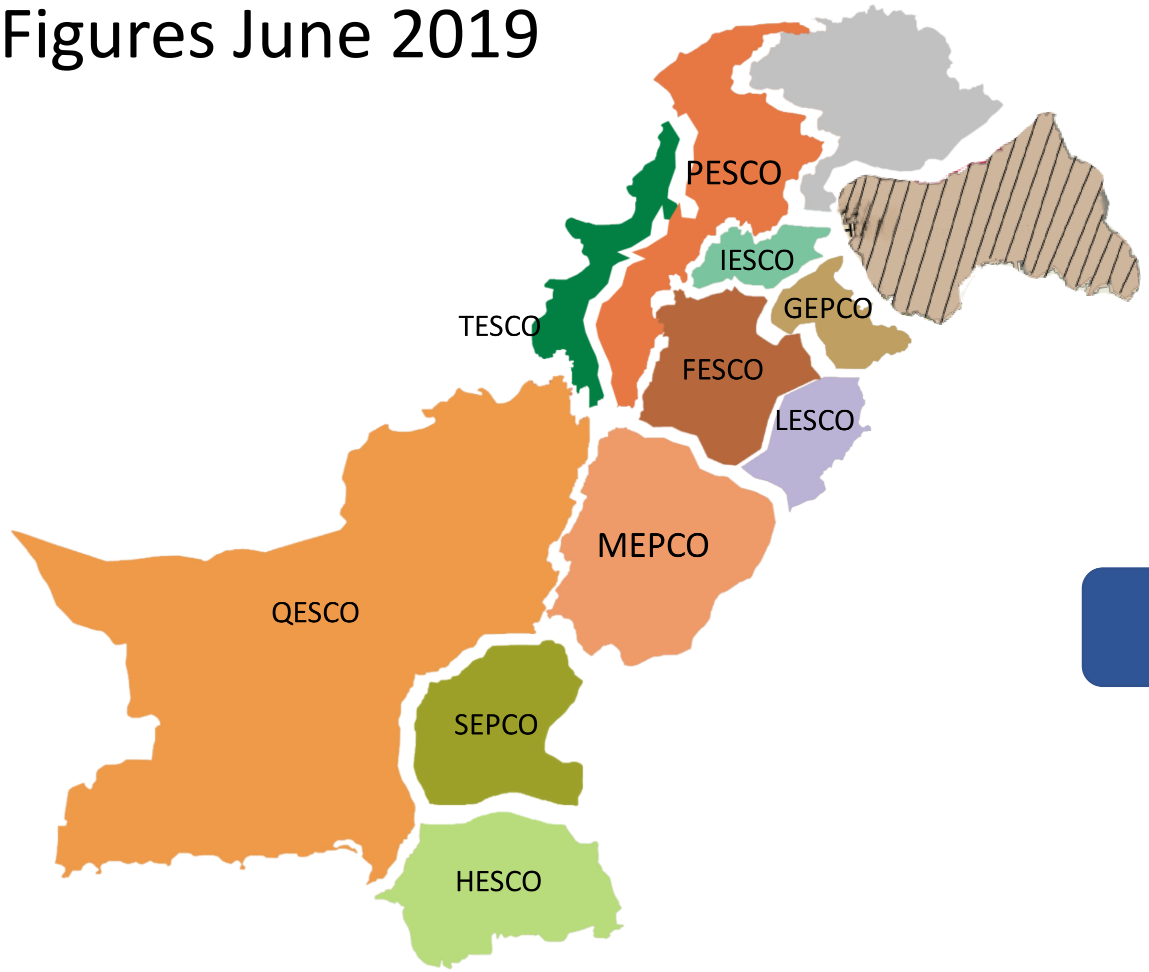
Transmission Service Provider NTDC

- DISCOs: Wire Business & Supplier
- **Participants** as Retail Suppliers 10 DISCOs and KE
- **Service Provider** for wire business/distribution

- BPC > 1MW
- Others non-eligible customer

Power Sector Overview

Key Figures June 2019

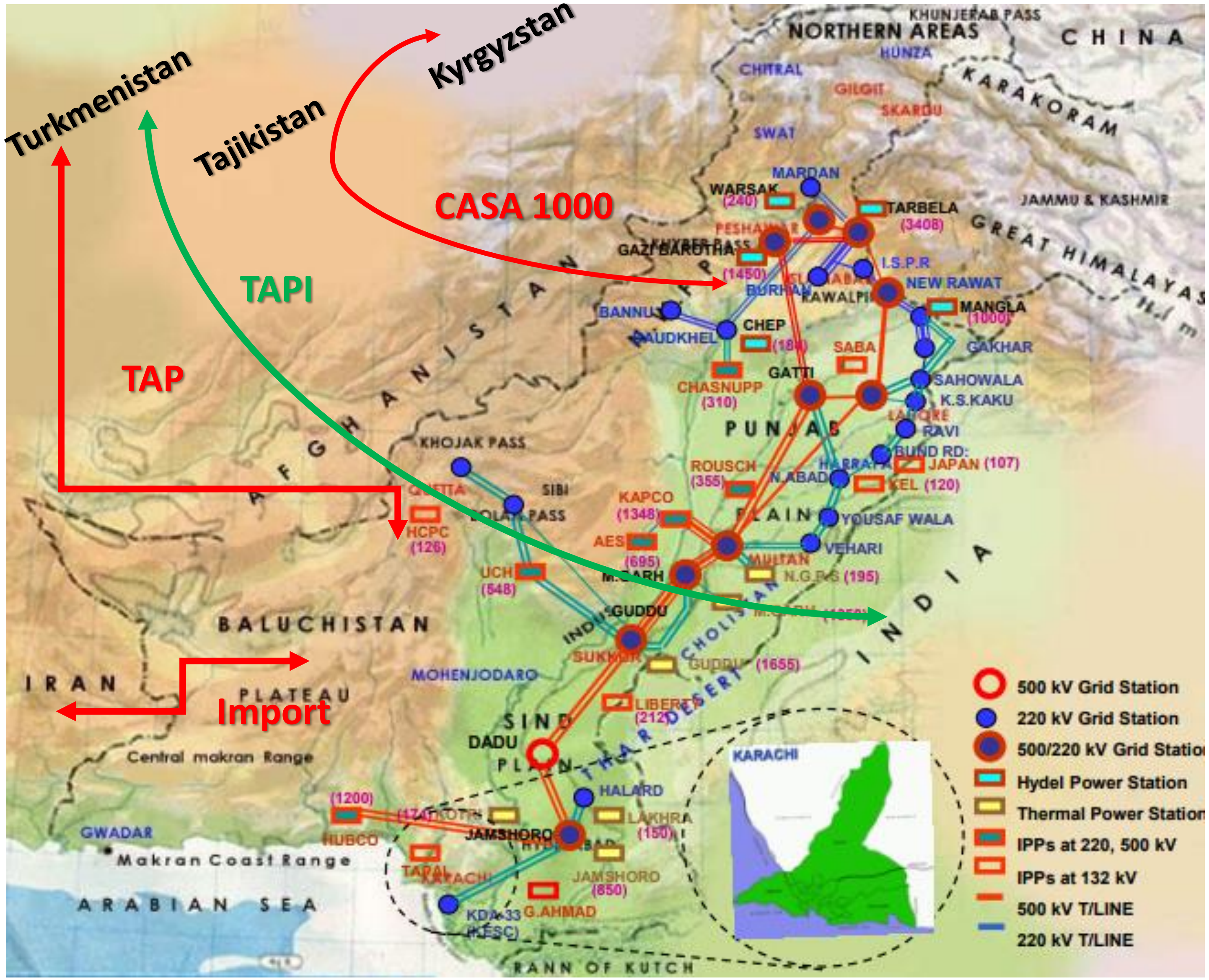


Installed Capacity
(35,961 MW)

Maximum Demand
(25,627 MW)

Total Traded Volume
(123 TWh)

Inter-Regional Arrangements (Existing and Proposed)



Development through Cooperation

CAREC

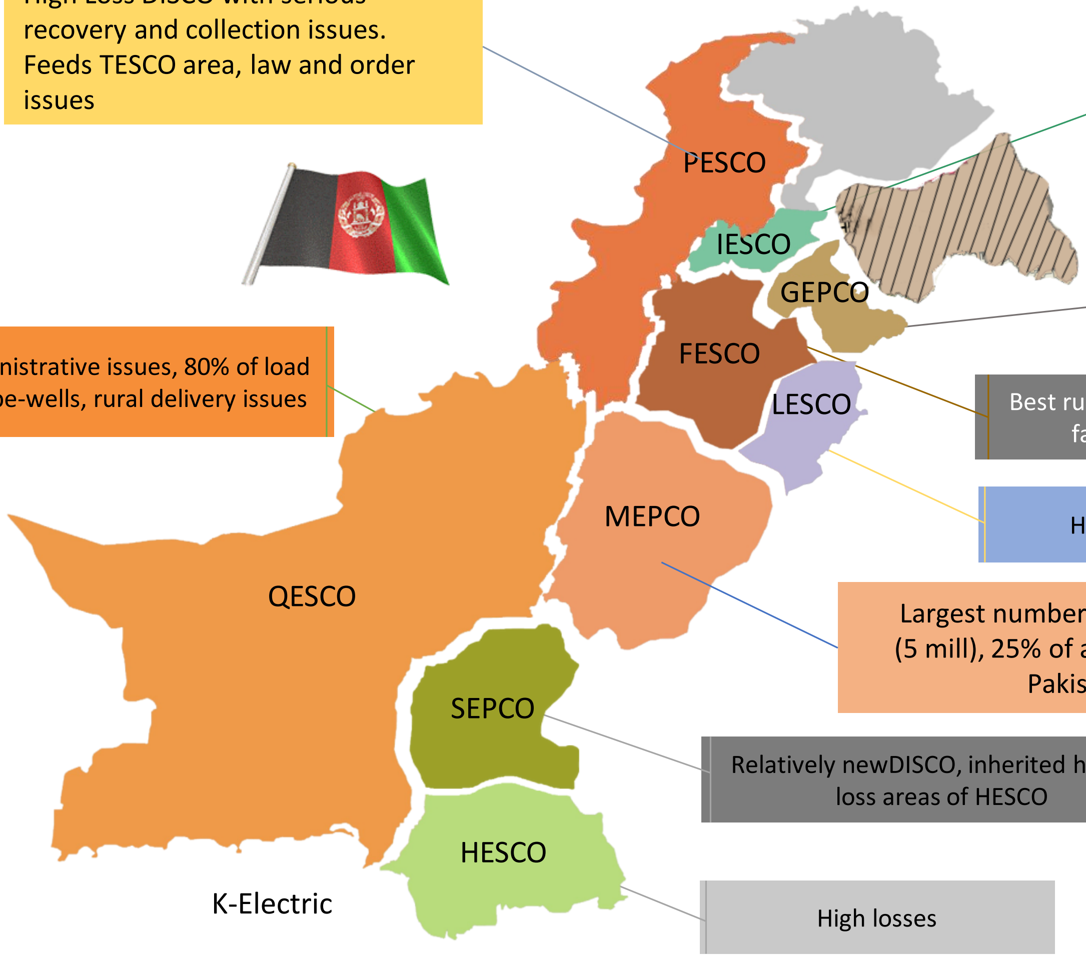
SAARC

Power Sector Overview

Distribution Companies (DISCO's)

High Loss DISCO with serious recovery and collection issues. Feeds TESCO area, law and order issues

Administrative issues, 80% of load is tube-wells, rural delivery issues



Large % of government consumers, collection issue with feeding Kashmir

Well-run DISCO with steel industry and cottage industry as consumer base

Best run DISCO, many industrial textile factories as consumer base

Highest density service area

Largest number of consumers (5 mill), 25% of all tube-wells in Pakistan

Relatively newDISCO, inherited highest loss areas of HESCO

High losses

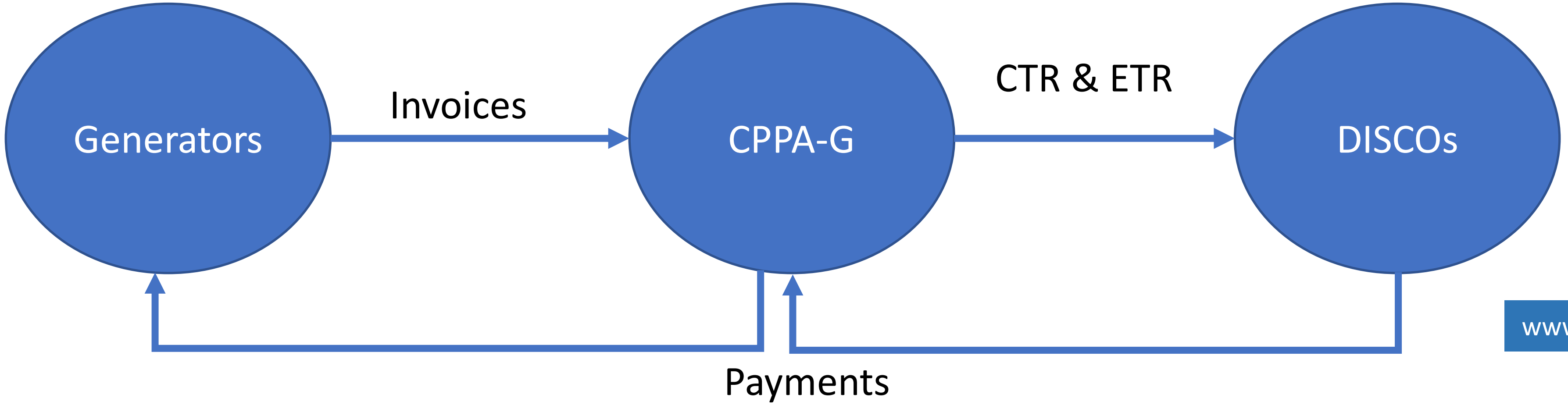
Current Wholesale Market Structure

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

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

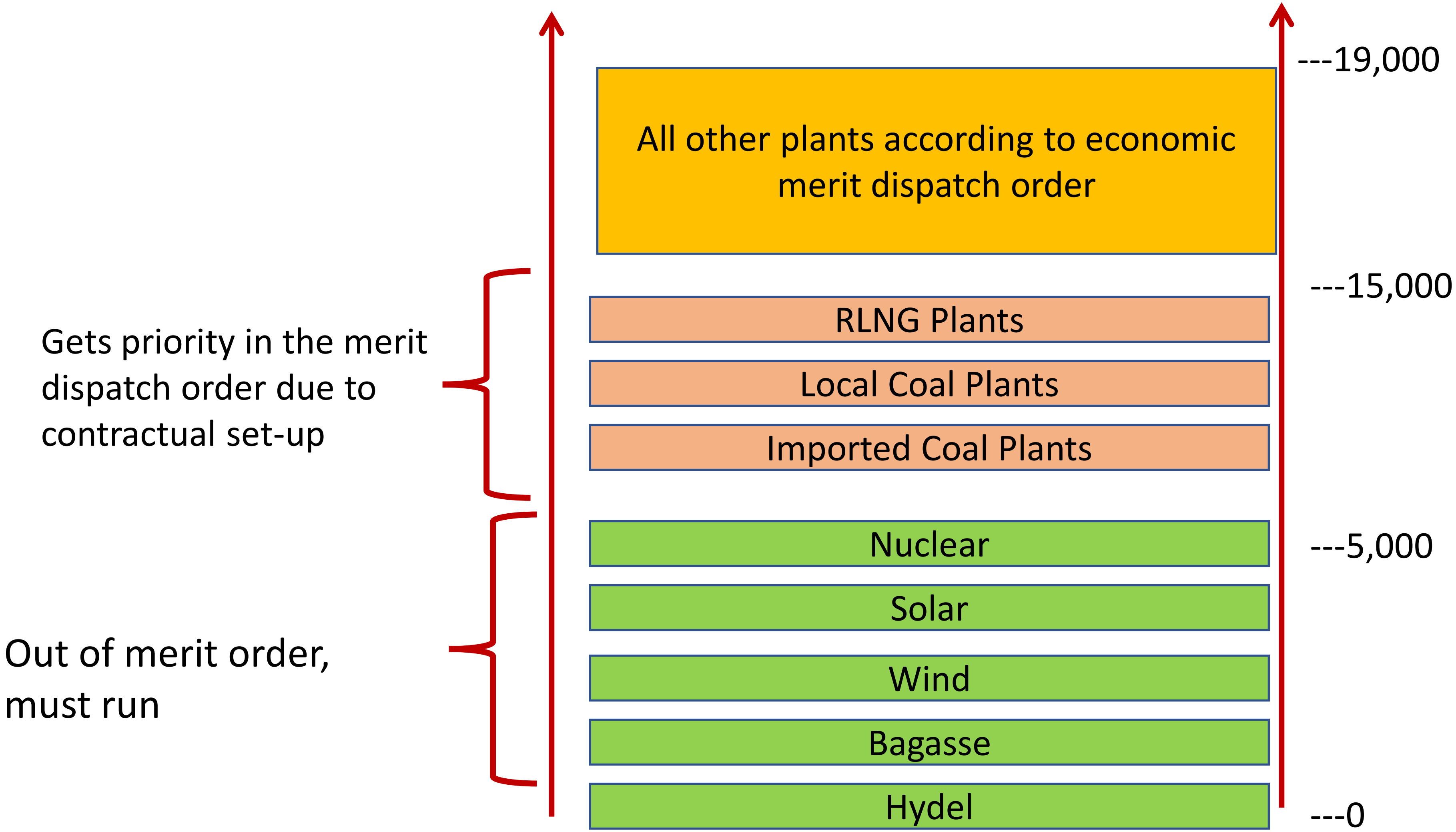
Types of Agreements: Three major types of purchase agreements are in place:

- Power Purchase Agreements (PPAs) with take or pay Capacity only
- Power Purchase Agreements (PPAs) with take or pay Capacity and Energy
- Energy Purchase Agreements (EPAs) which are must run

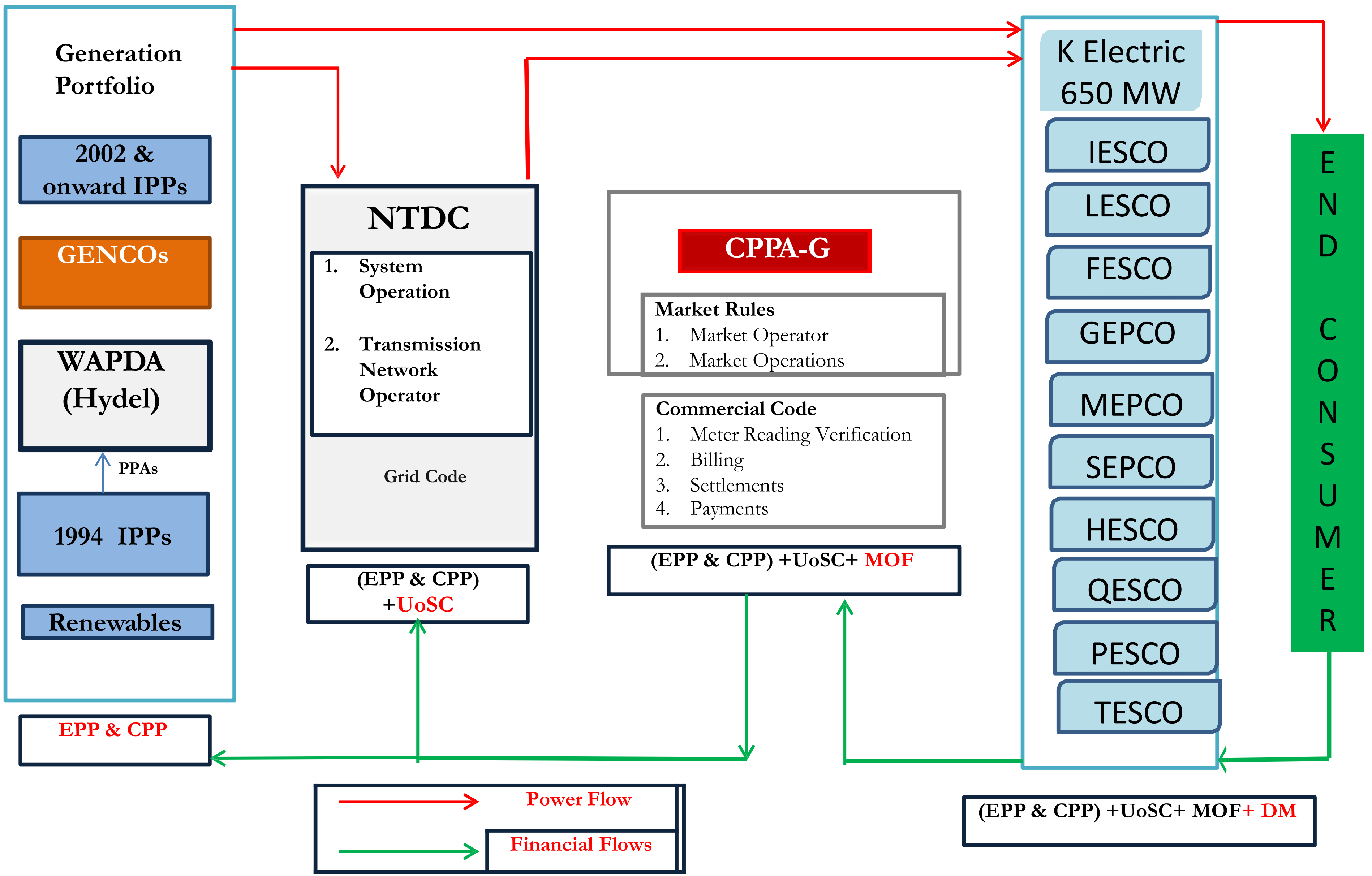


Power Dispatch Illustrated

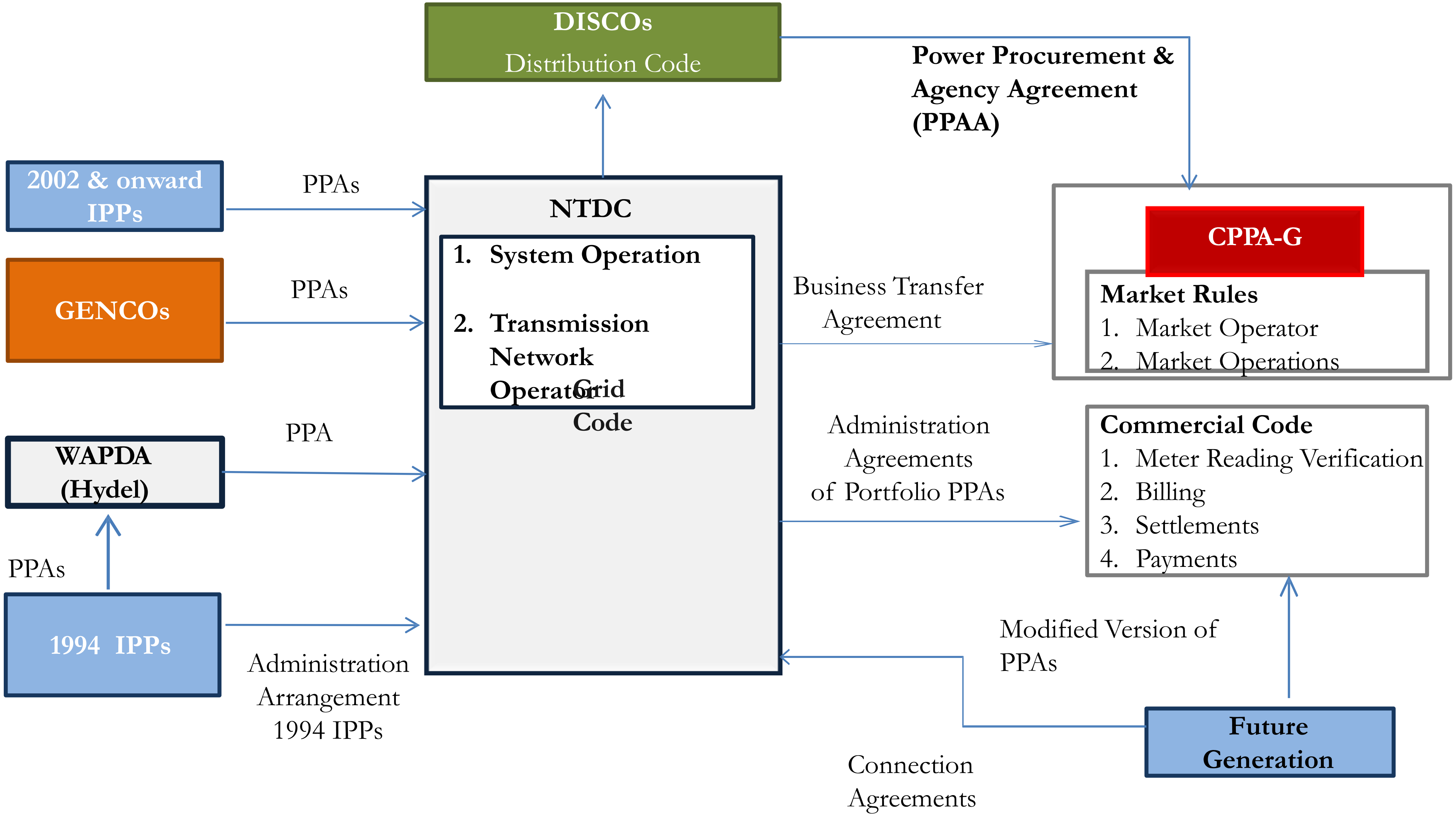
E.g. Demand: 19,000 MW



Power & Commercial Flows



Contractual Canvas



PART – 2

CPPA's Strategic Plan & Functions

Objectives

- The Strategic Plan sets out key delivery strategies for CPPA in its role as Market Operator and Power Purchaser over the three years to 2020.

- The Strategic Plan encapsulates the CPPA's Vision, Mission, Core Values and Strategic Targets

- It summarizes the company's strategy for the next three years. During the next three years CPPA will strive hard for not only to build its internal capacity in-terms of people, processes and technologies but also assist the other power sector entities to become partners during this journey.

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"

Core Values

1. Transparency

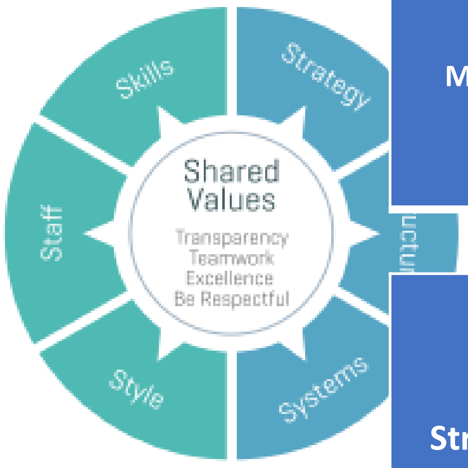
2. Excellence

2. Teamwork

4. Being Respectful

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**



Aligning the Seven Elements in CPPA-G's Way of Working

Corporate Culture			
Transparency	Excellence	Teamwork	Be-respectful

Functional Transition: In Past, At Present, For Future

Legacy	Existing	Getting Prepared For
Billing and Settlement	Billing and Settlement	Billing and Settlement
Treasury	Treasury	Treasury
Agent for Power Procurmt.	Agent for Power Procurmt.	Agent for Power Procurmt.
	Market Development	Market Development
	Taxation	Taxation
	PG & Corporate	Corporate Planning
	Information Tech.	Information Tech.
	HR and Corp. Govern.	HR and Corp. Govern.
		Contract Registrar
		Competitive Wholesale Market
		SPS, MO and IAA
2015	**2015-2018**	**2018-2020**

CPPA's Current Organogram

CPPA Functions

- Finance
- Technical
- IT
- Legal
- HR
- SMD
- PG & CP
- Company Secretary

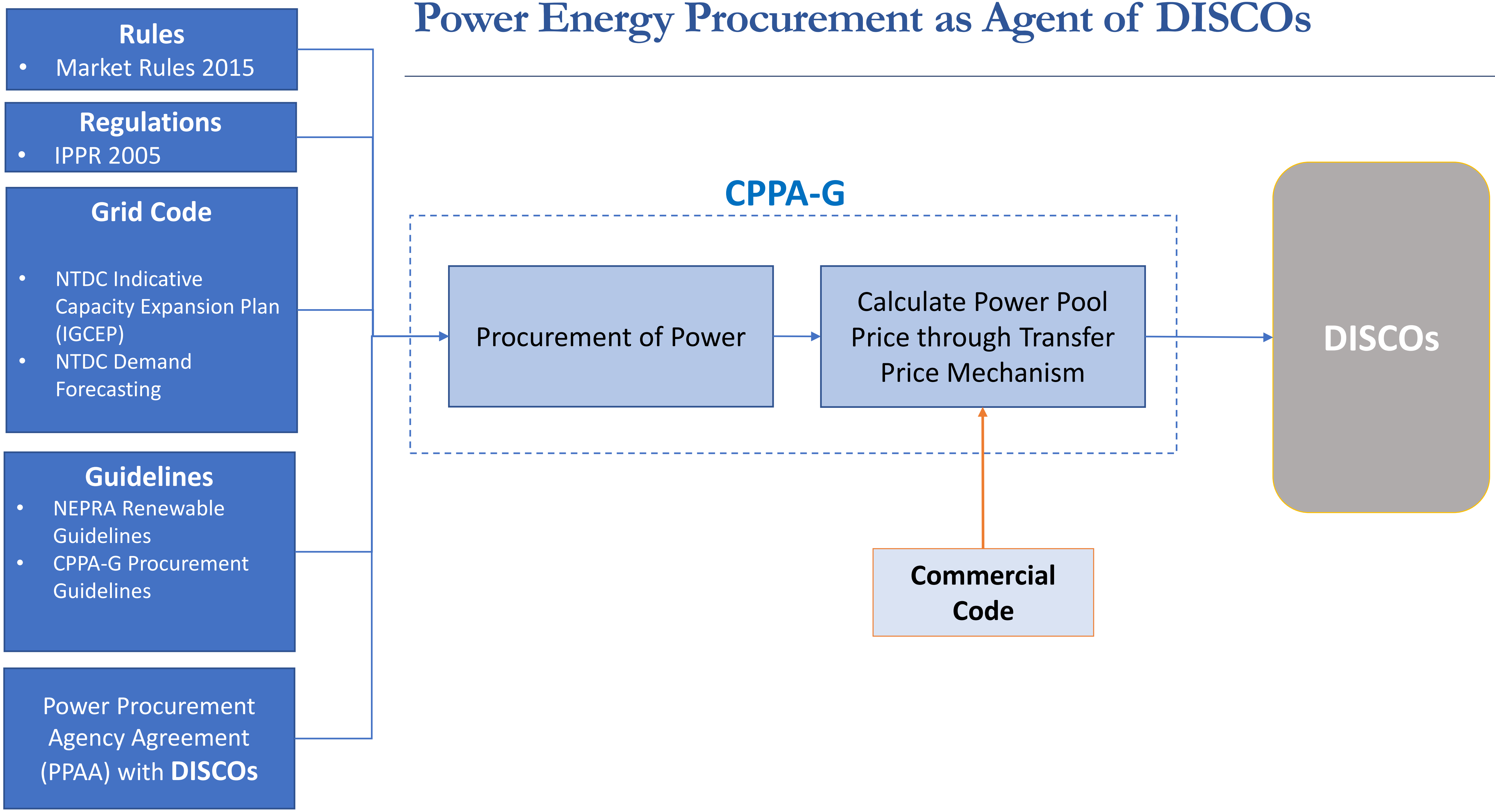
Composition of CPPA-G Board of Directors

S. No.	Name	Designation	Status in CPPA-G Board
01.	Mr. Irfan Ali	Federal Secretary Ministry of Energy (Power Division)	Chairman / Non-Executive Director
02.	Mr. Zargham Eshaq Khan	Joint Secretary (Power Finance) Ministry of Energy	Non-Executive Director
03.	Dr. Khaqan Hassan Najeeb	Director General Economic Reforms Unit (Ministry of Finance)	Non-Executive Director
04.	Mr. Zafar Abbas	Managing Director NTDCL	Non-Executive Director
05.	Mr. Muhammad Imran Mian	Chief Executive Officer, GENCO Holding Company	Non-Executive Director
06.	Mr. Shahid Iqbal Chaudhry	Chie Executive Officer, IESCO	Non-Executive Director
07.	Mr. Abid Latif Lodhi	Chief Executive Officer, CPPA-G	Executive Director
08.	Ms. Ayla Majid	Private Sector	Independent Director
09.	Mr. Hamid Ali Khan	Private Sector	Independent Director
10.	Mr. Ghias Ud Din	Private Sector	Independent Director

CPPA's Board Committees

1. Human Resource Committee
2. Procurement Committee
3. Finance Committee
4. Risk Management Committee
5. Enterprise Resource Planning (ERP) Implementation Committee
6. Audit Committee
7. Nomination Committee
8. Special Committee on K-Electric Issues
9. Market Implementation Support Committee (MISC)

Power Energy Procurement as Agent of DISCOs



Billing & Settlement

1. Verify bills from generators
2. Calculate the transfer Price as per NEPRA's approved Tariff
3. Bill to DISCOs & K-Electric as per transfer price
4. Collection of funds from DISCO, K-Electric and GoP
5. Disbursal of funds to the generators

Human Resource and Administration

The Human Resources & Administration Department (HR/A) provides overall policy direction on human resource management issues and administrative support functions related to the management of employees for CPPA. The main functions of this department are:

- Recruitment & Selection
- Onboarding & Placement
- Training & Development
- Payroll Processing & Disbursement
- Employee Daily Attendance Record
- Employee Terminal Benefits (EOBI, Life, Health, Gratuity, PF)
- Employee Engagement Programs
- Fleet Management and Logistics Support
- Health and Safety
- Organizational Restructuring
- Handling of Disciplinary Cases
- Building maintenance, Office Premises Safety & Security

IT

This department of CPPA is responsible for managing the IT infrastructure and deployment of necessary IT systems, tools and applications as per the IT strategy of the company. The main activities of this department are:

- Lead the preparation of IT strategy aligned with the business strategy and to help implement it

- Design, maintain, and support organization’s information technology infrastructure, thus allowing the organization to leverage both information and technology in an efficient, productive and secure manner

- Procurement and commissioning of IT hardware and software to support the business

- Conduct requirement analysis of IT environment required to support the CPPA in the next phase of market evolution

Legal and Regulatory Affairs

CPPA's in-house legal department plays a pivotal role in its facilitative capacity to ensure the realization of the organization's strategic objectives and is responsible for effectively managing and handling legal matters in order to safeguard CPPA's interests. The department is committed to providing continuous support to all departments of the organization, rendering ready opinions on the applicable laws, advice on the aspects of effective contract management as well as legal compliance, remedial and litigation management.

The main functions of this department are:

- Enabling CPPA in developing practical and logical solutions and addressing issues pertain to the 'legal' domain
- Providing maximum legal protection to CPPA and its clients in all their supply contracts
- Affirming all new supply contracts has explicit provision for novation and or assignment
- Ensuring compliance to financial and legal practices and corporate governance
- Relationship management with the press, public bodies and institutions, parliament and other stakeholders
- Providing legal advice and support to the other department of CPPA

Policy, Governance and Corporate Planning (PG&CP)

This department of CPPA provides executive support in a one-on-one working relationship with CEO. The main functions of this department are:

- Acting as the primary point of contact for internal and external constituencies on all matters related to the functions/ responsibilities of CEO especially pertaining to Policies, Governance & Corporate Planning

- Supporting CEO in development/changes of particular power/ energy policies for sustainable power market operations and to reduce liabilities and guarantees of Government of Pakistan

- Facilitation in internal development and streamlines operations to align with the prevailing policies

- Collaboration for the strategic initiatives being taken in the sector for long term sustainability

Company Secretary Office

The Office of the Company Secretary maintains compliance of SECP Act, 2017 and Public Sector Companies (Corporate Governance) Rules 2013. The other functions of this office are:

- Engagement of External Audit and preparation of Directors Report

- Organizing important hi-level meetings for CPPA including Annual General Meetings / Extra Ordinary General Meetings, Board meetings, Board Committee meetings, Commercial Code Review Panel meetings

- Maintaining documentation of above mentioned meetings

- Provide Secretarial support to the General body, Board of Directors, Board Committees and CCRP

- Follow-up implementation on the General body, Board of Directors, Board Committees and CCRP decisions

- Maintaining the Record, maintenance of Books of Accounts, preparation of financial statements and filing of tax returns of CPPA Employees Gratuity Fund & CPPA Employees Provident Fund.

Strategy and Market Development (SMD)

This department of CPPA leads the development of a competitive wholesale electricity market and facilitates its implementation in Pakistan. SMD department is also involved in outlining the business strategy of CPPA along with the preparation of the company's Strategic Plan. The main objectives of this department are:

- Designing of a wholesale electricity competitive market model and its transition road map
- Research and document conclusions for the next stage of market reforms
- Play the role on behalf of CPPA in implementing the roadmap to develop a competitive market
- Market coordination and development activities including the training / capacity building of market Participants
- Suggesting and building strategic partnerships with global like institutions
- Market simulations for analysis of market architecture on prices moving forward
- Preparation of the Strategic Plan for CPPA and facilitating its implementation
- Program management and coordination for donor funded projects

PART – 3

Regulatory Compliance

Instruments Defining Compliance Requirements

- Market Rules
- Commercial Code
- Annual Market Fee Determinations
- CPPA-G's Registration as Market Operator

Market Rules, 2015

- (Rule-8): The market operator shall file its annual report with the Authority within four months of the close of the accounting period

- (Rule-14): The market operator shall prepare and submit the audited accounts in respect of its market operations, in accordance with the rules and regulations of the Authority, in respect of each financial year not later than six months following the close of the financial year

Commercial Code

- (Clause-10): The Market Operator shall prepare following reports, the contents, periodicity, dates and authority to be submitted shall be as provided in the Annexure 4:

(a) Settlement Report including Preliminary Settlement Statement	Monthly
(b) Settlement Report including Final Settlement Statement	Monthly
(c) Non Payment Report	Monthly
(d) Market Operator Annual Report	Yearly

Annual Market Fee Determination

- To share Basket Price Assessment Model and Market Simulation Model
- To share quarterly progress on Market Development, PPA Bifurcation and HR Development with Authority
- To submit quarterly progress of ERP project implementation
- To finalize the agreement with NTDCL and submit a copy to the Authority
- To submit comprehensive report on circular debt on quarterly basis
- To submit its annual report

MO Authorization – Compliance Status

National Electric Power Regulatory Authority

CERTIFICATE OF REGISTRATION

Market Operator

In exercise of the powers conferred by Rule-3 of the National Electric Power Regulatory Authority (Market Operator Registration, Standards and Procedure) Rules, 2015, the National Electric Power Regulatory Authority hereby grants a certificate of registration to Central Power Purchasing Agency (Guarantee) Limited (having Corporate Universal Identification No. 0088608), as a Market Operator subject to the provisions of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997), as amended or replaced from time to time, the National Electric Power Regulatory Authority (Market Operator Registration, Standards and Procedure) Rules, 2015 or as may be specified or imposed hereafter by the Authority and the terms and conditions prescribed in the annexure attached herewith.

The registration number of the Market Operator is MOR/01/2018

Dated: 16/11/2018

Place: ISLAMABAD

Registrar

REGISTRAR

For and on behalf of THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY

- CPPA shall submit a comprehensive plan to the Authority for novation of PPAs

- a. CPPA-G shall submit a comprehensive plan to for the implementation of the Single Buyer Plus Phase
  b. Adequate amendments to the Commercial Code (CC)to cater for the Single Buyer Plus Phase

- CPPA-G shall submit a comprehensive plan for the implementation of competitive market operations including retail competition

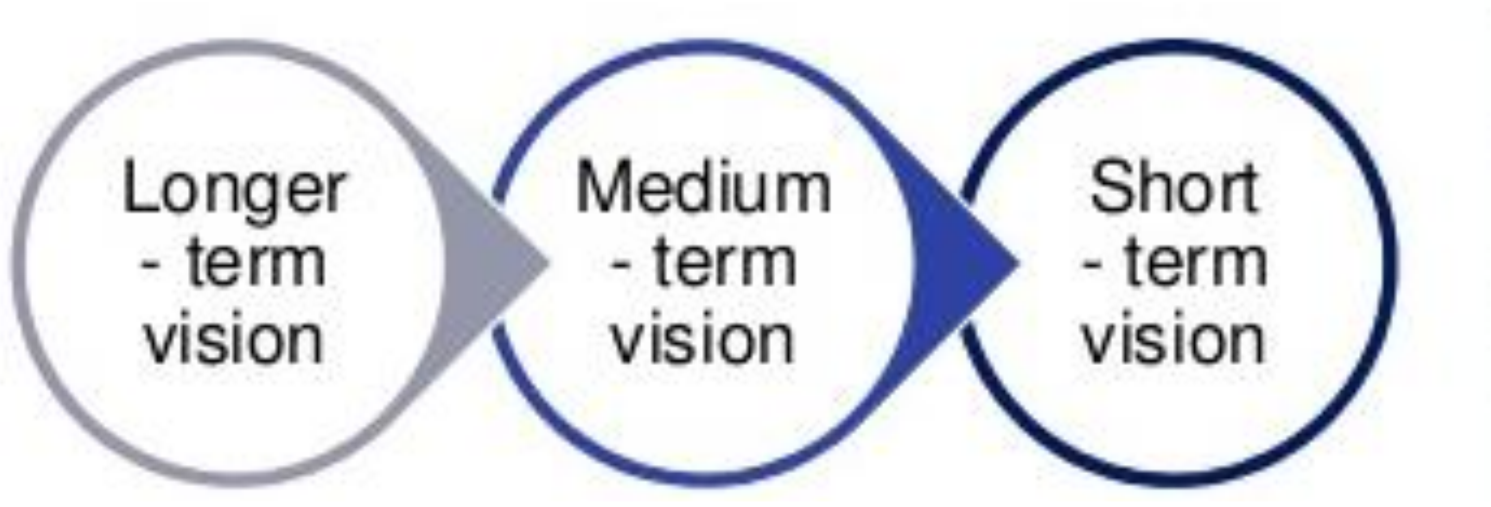
- CPPA-G shall submit the Commercial Code for administering competitive market operations

- CPPA-G shall comply with applicable corporate governance law

- CPPA-G cannot continue its current function of power procurement since this would in effect make the CPPA-G a Market Participant. This creates a blatant conflict of interest concern, where the Market Operator/Regulator is itself participating in the said Market

PART – 4

Market Model and Future Evolution



Historical on Market Development

2002

- **NTDC was granted Transmission License to perform five functions:**
  - .1) TNO
  - .2) SO
  - .3) Planner
  - .4) Metering Service Provider
  - *.5)Contract Registrar/ PEX Administrator*
- **Per licensing requirement, NTDC was mandated to develop the whole sale market (CTBCM) by 2008**

2009

Legal formation of CPPA. However, functioned as **Department of NTDC** from 2009 to 2015.

2013

- **National Power Policy 2013**
- "… Innovative business and regulatory models will be deployed to <u>weaken the monopolies</u>, <u>increase efficiencies</u>, and <u>decrease costs through competition</u>. Wheeling charges and <u>whole sale markets</u> may be introduced to introduce <u>multiple buyers</u> and <u>sellers</u> in the <u>market place</u>."

2015

- **ECC's Decision April 2015**
- CPPA through consultation prepare CTBCM Model and Plan by June 2017
- The CTBCM is for wholesale market
- Will be approved by NEPRA
- Commercial Operations date: June 2020

- **CPPA Operationalized**
- CPPA formed **Market Development Department**

2017

- **CPPA prepared and submitted** the model and plan to **Board in July 2017**
- The Board formed a **Special Committee**
- The Special Committee evaluated the plan
- Board principally approved CPPA's re-structuring and allowed submission of CTBCM submission to NEPRA
- Consultations with SECP

2018

- The model and plan submitted to NEPRA for review
- Request for ECC in amending timelines
  - **New NEPRA Act Amendments**
  - **MO's Authorization**
  - **Comments**
  - **Partnerships**

Completive Power Market Possible Evolution

2018

New NEPRA Act, including Market Law

2018-2020

- **Wheeling arrangements** under NEPRA 2016 Regulations make operational
- **Market Model** and **Roadmap** for developing **wholesale market implemented**

2020

- **Competitive Wholesale Market** starts with a Balancing Mechanism
- Provides the **Market Price**
- **Retail Competition for BPC** can also commence

2020 -2023

- **Market based contracts** are implemented
- **BPC threshold reduced** that enhances retail competition
- A separate roadmap to **bifurcate DISCOs licenses** implemented
- The **capacity in long-term PPAs** will also come in balance

2023-2025

- **Electronic Trading Platform** for Bilateral Trading may start
- At the same time **Reverse E-auctions** may commence

2026 onwards

- Evolution in to **Spot Market**

Market Opening Benefits

- Stimulate **appropriate infrastructure investments** from private sector
- Competition provides **customers with choices**
- Achieve **efficiency** both in energy and economic terms
- Pressure on **Price** / **Adequacy** through competition
- Create the conditions for a **fair allocation of risk** and benefit sharing between investors/sellers and buyers/consumers
- **Standard products** traded in market enhancing liquidity
- 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**

Market Development Updates

- The journey started in 2015
- MO’s capacity in Market Design and Development
  - SMD **department**
  - MRC **Market Design Consultants** hired through ADB’s support
  - MoUs with EPIAS, EPEXSPOT and LUMS as **Market Development Partners**
  - **Training Partners** (PSR Brazil, CRA and others)
- Learning **Exchanges** (Turkey, India, NYISO, IESO, AESO, South Korea)
- Market **Literature** studied (NordPool, European and other Latin American Markets)
- **100+ consultative sessions** including workshop and one-to-one consultation meetings with stakeholders
- Around **2,000 man days of training** on market development

Wholesale Market Design – Phased Approach

Phase-I
(Conceptual Market Design)

Phase-II
(Detailed Market Design)

Phase-III
(Implementation)

June 2016– | July 2017 | In parallel

Number of Reports Produced

- Following reports have been produced:
  - Report 1 CTBCM Model Design – Concept Paper
  - Report 2 CTBCM Model – Roadmap
  - **Report 3 CTBCM – Model Consolidated Report**
  - **Report 4 CTBCM – Detailed Design Report**
  - Report 5 CTBCM- Market Modelling /Simulations based on SDDP
  - Report 6 CTBCM Financial System for CPPA Report
  - Report 7 NPCC Gap Analysis Report*
  - Report 8 CPPA's Restructuring Report & Plan
  - **Report 09 Integrated Electricity Market Simulation Model (IEMSM) and Report**
  - Report 10 Data Institutionalization Report*
  - **Report 11 Single Buyer Plus Model – Concept Paper and Plan**
  - Report 12 Marginal Price Discovery Report

- Assistance by CPPA to DISCOs and NTDC in preparation of:
  - Report 13 PMS Report – Country Level x 2
  - Report 14 PMS Report – All DISCO x 2
  - Report 15 NTDC Regression Report
  - Report 16 Power Market Survey Manual
  - Report 17 Integrated Generation and Capacity Expansion Plan (IGCEP)
  - Report 18 NPCC Annual Production Plan based on SDDP

Market Development Core Team

MRC | GROUP OF COMPANIES
Abuja - Edinburgh - Helsingborg - Madrid - Milan
Montevideo - Moscow - New York - Rio de Janeiro

Strategy & Market Development Department

- Gen. Planning & Load Forecast Consultants

Training Partners in Market Development

CRA Charles River Associates

PSR

Houmoller Consulting QUALITY ADVICE

MAYCROFT

LUMS

Strategic Partnerships

EPIAS

EPEXSPOT

APEx Association of Power Exchanges

aeso

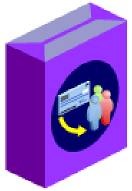
CPPA Core Market Dev. Team

DISCOs Working Groups

CPPA’s IT Enablement for Competitive Market Operations

IT Enablement for Future SPS Function

ERP



SFS

CDXP

Monitoring Portal

IT Enablement for Future MO Function

Cost Opt. Tools

MP App

Data Inst.

Balancing Mechanism (BME + BMC)

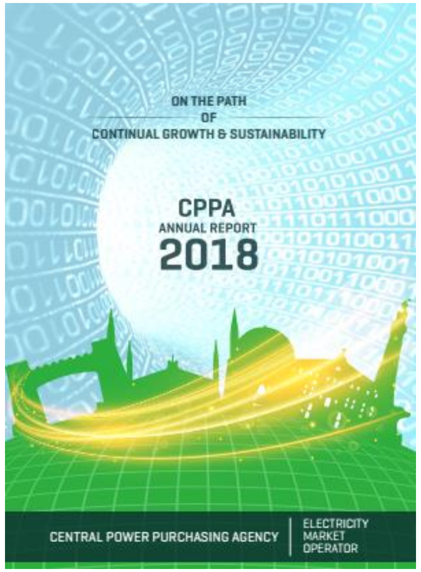
Data Center

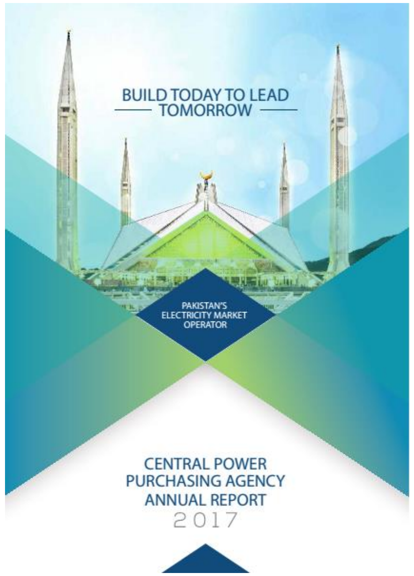
DR Site

Electricity Market Team

EMP Program 2018

Annual Reports

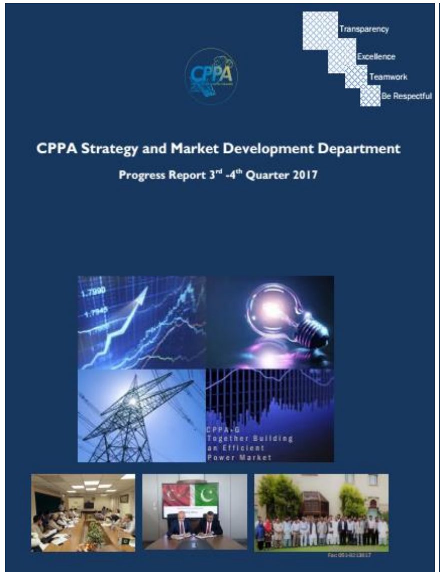


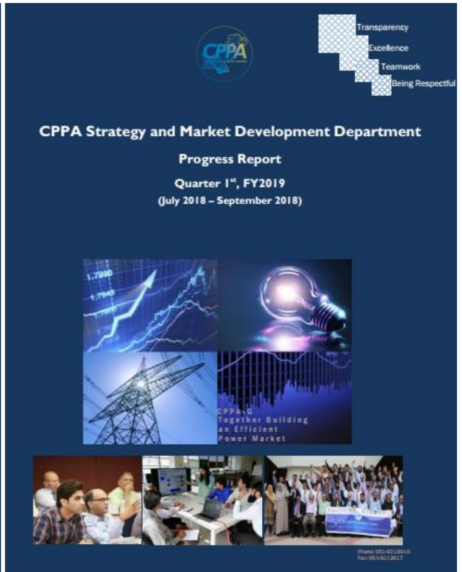


News Letters

Website

Progress Reports

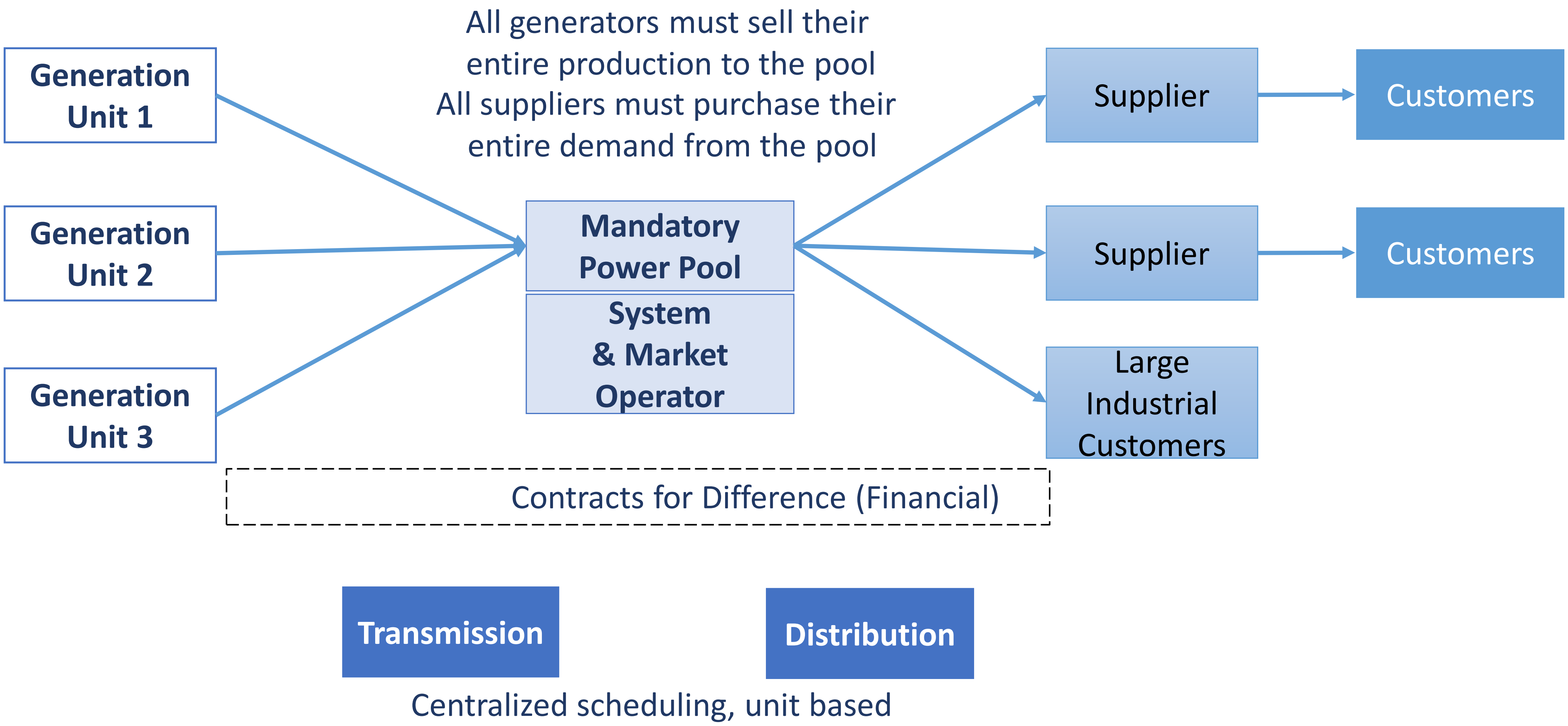




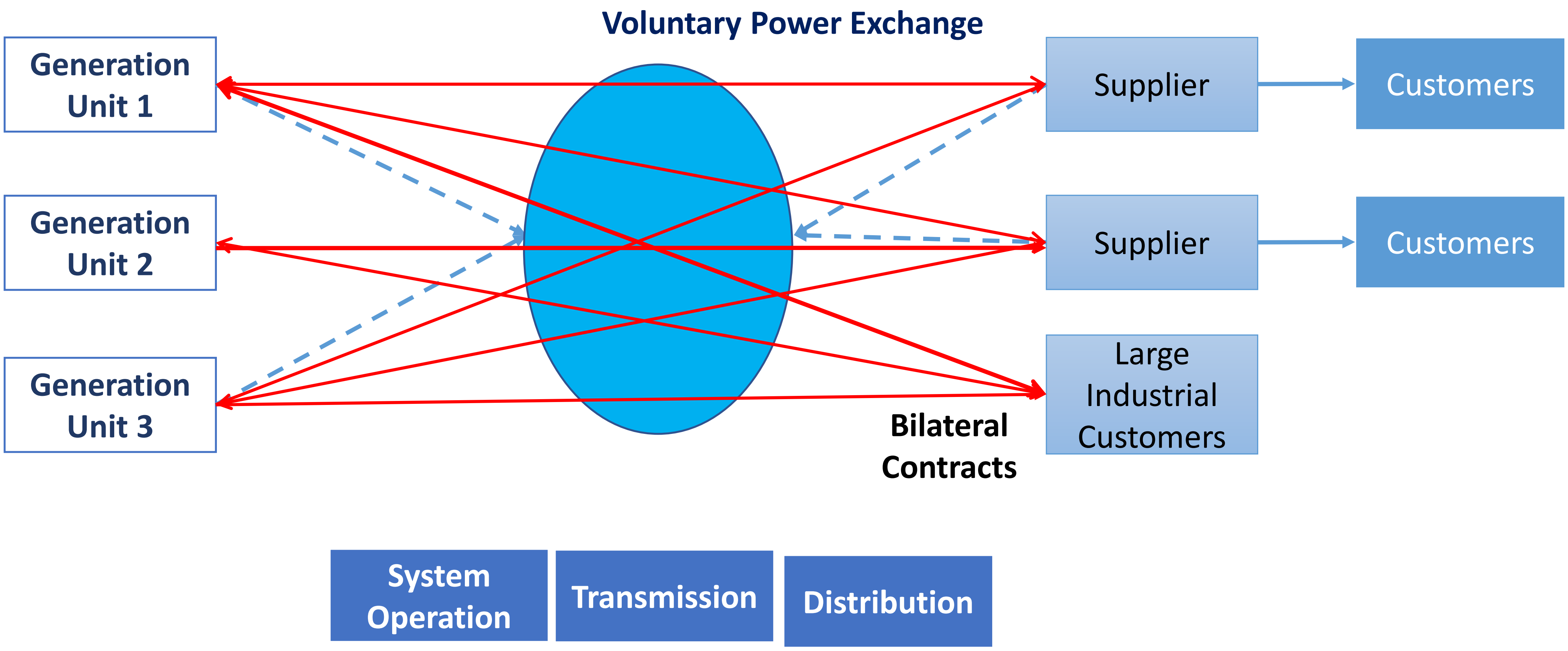

PAKISTAN-TURKEY


CPPA-G

Mandatory Power Pool

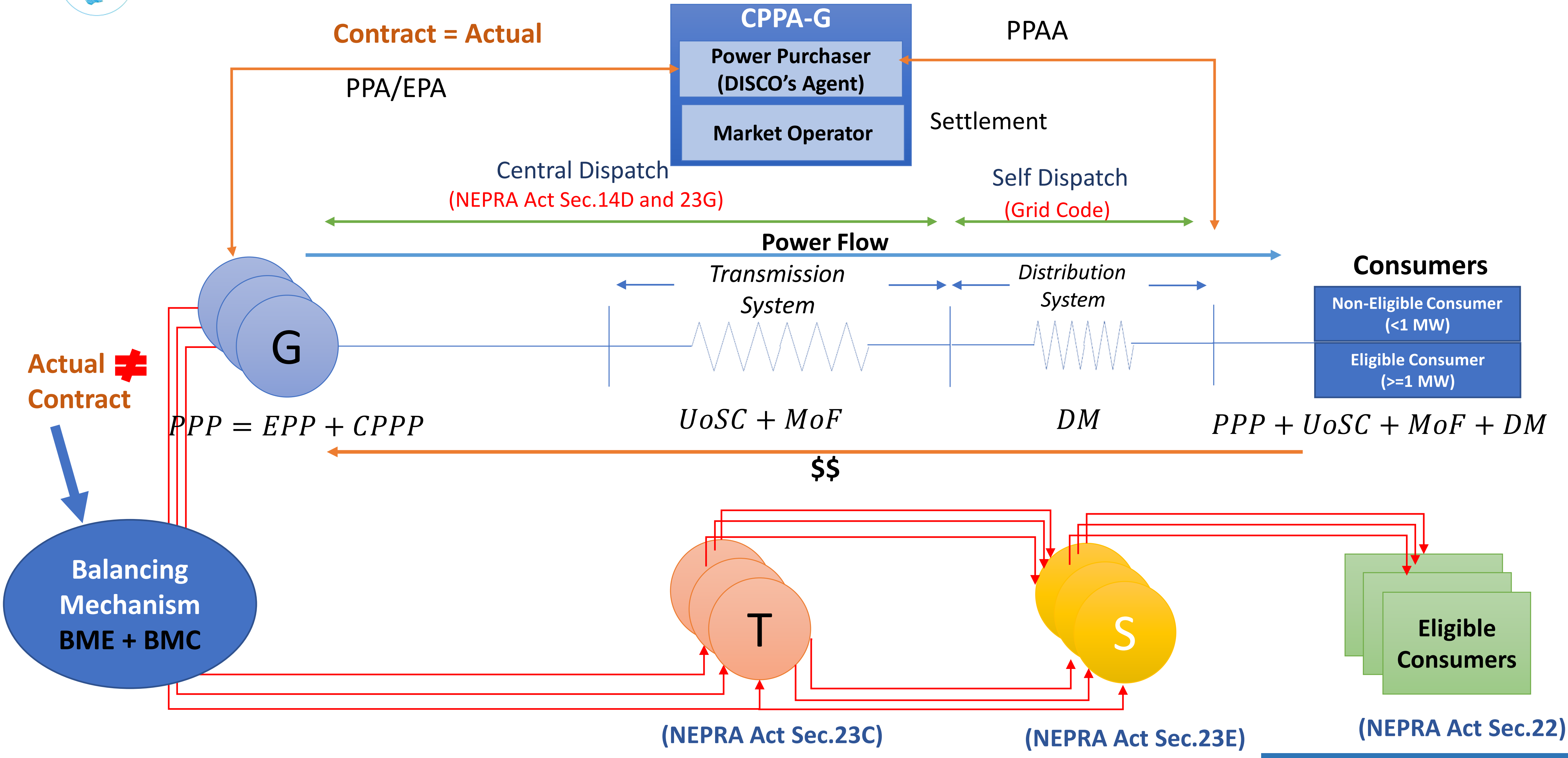


Net Pool



Decentralized scheduling, company based

Technical and Commercial Transaction in CTBCM



Objectives of CPPA's IT Initiatives for the Market

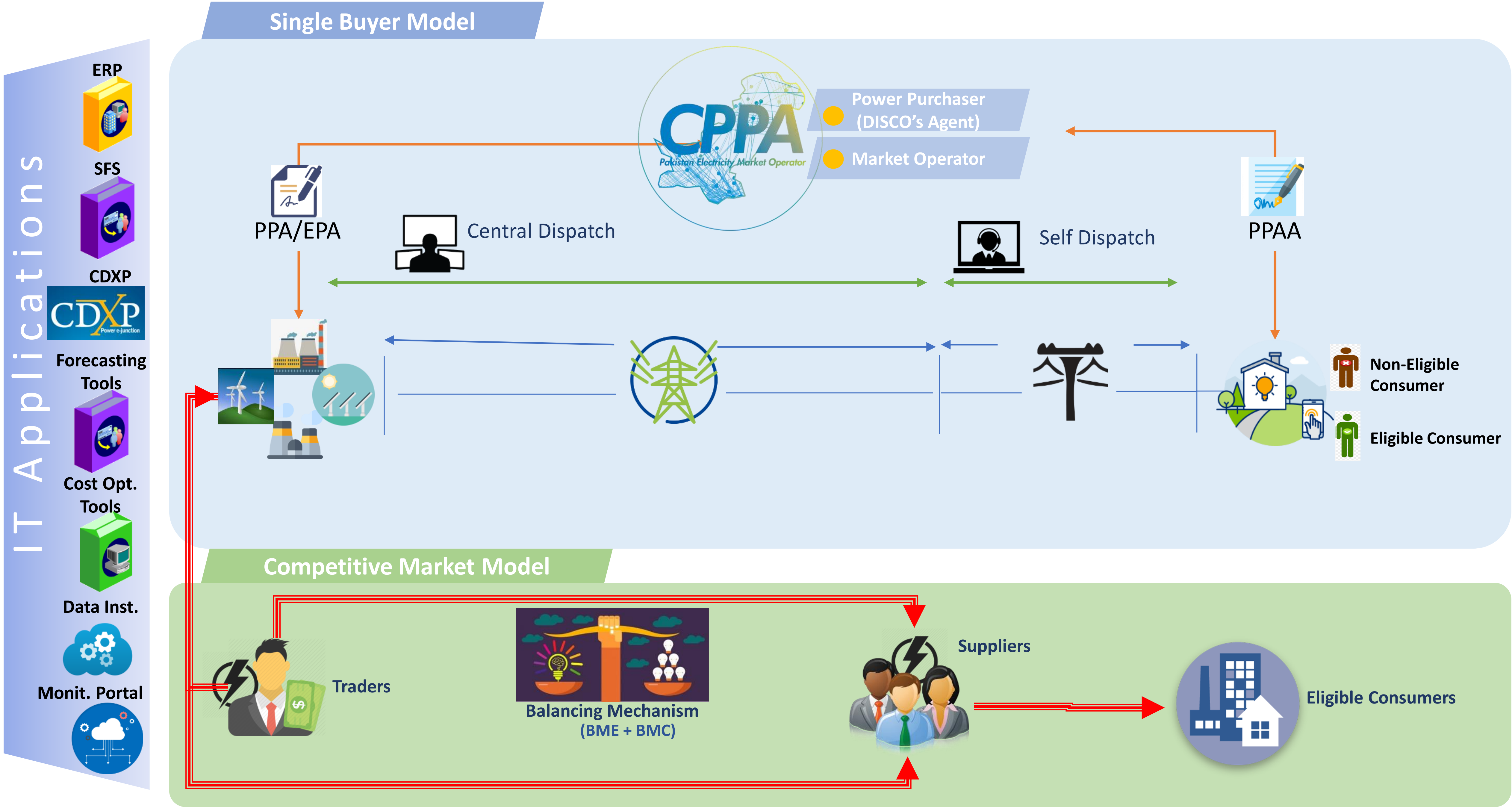
Transparency

Reliable Communication

Efficiency & Effectiveness

Integration of Power Market Participants

Technical and Commercial Transaction in CTBCM



Types of Balancing Mechanisms Proposed in CTBCM

- There two types of Balancing Mechanisms proposed in the CTBCM
  - Balancing Mechanism for Energy (BME)
  - Balancing Mechanism for Capacity (BMC)
- The BME is designed to clear the imbalances in the Energy Market. The BME always leads to zero sum.
- The BME measure the differences among contracted energy and actually Generated/demanded energy (MWh) and clears the differences at a price i.e. marginal price
- The BMC is designed to clear the imbalances in the Capacity Market. The BMC doesn’t always leads to zero sum.
- The BMC measures the differences among contracted capacity and Actual available Capacity/Actual demand(MW) and clears the differences at a price.

Types of Supply Contracts

- Participation in the BME/BMC depends on the type of contract
- Three types of Supply contracts are discussed here
  - Generation Following Supply Contracts
  - Load Following Supply Contracts
  - Financial Contracts with fixed quantities
  - Capacity & Associated Energy Supply Contracts
  - Capacity only Supply Contracts.

New Market Model – Features

New PPAs

Existing PPAs

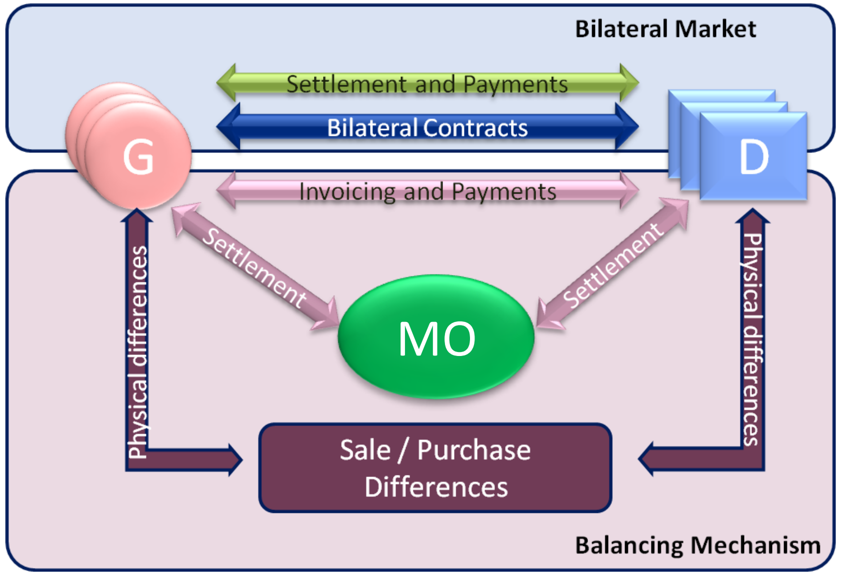
Service Providers

Capacity Obligations

Centralized New Capacity Procurement

Grid Code Commercial Code, others

Competition for and in the Market



Non Payment Risks

Low Performing Discos

Agent separated from MO

Credit Cover (collateral)

Market Participants

K Electric

Centralized Economic Dispatch

Balancing Mechanism

Contract Registrar

Integrated Electricity Market Simulation Model (IE-MSM)

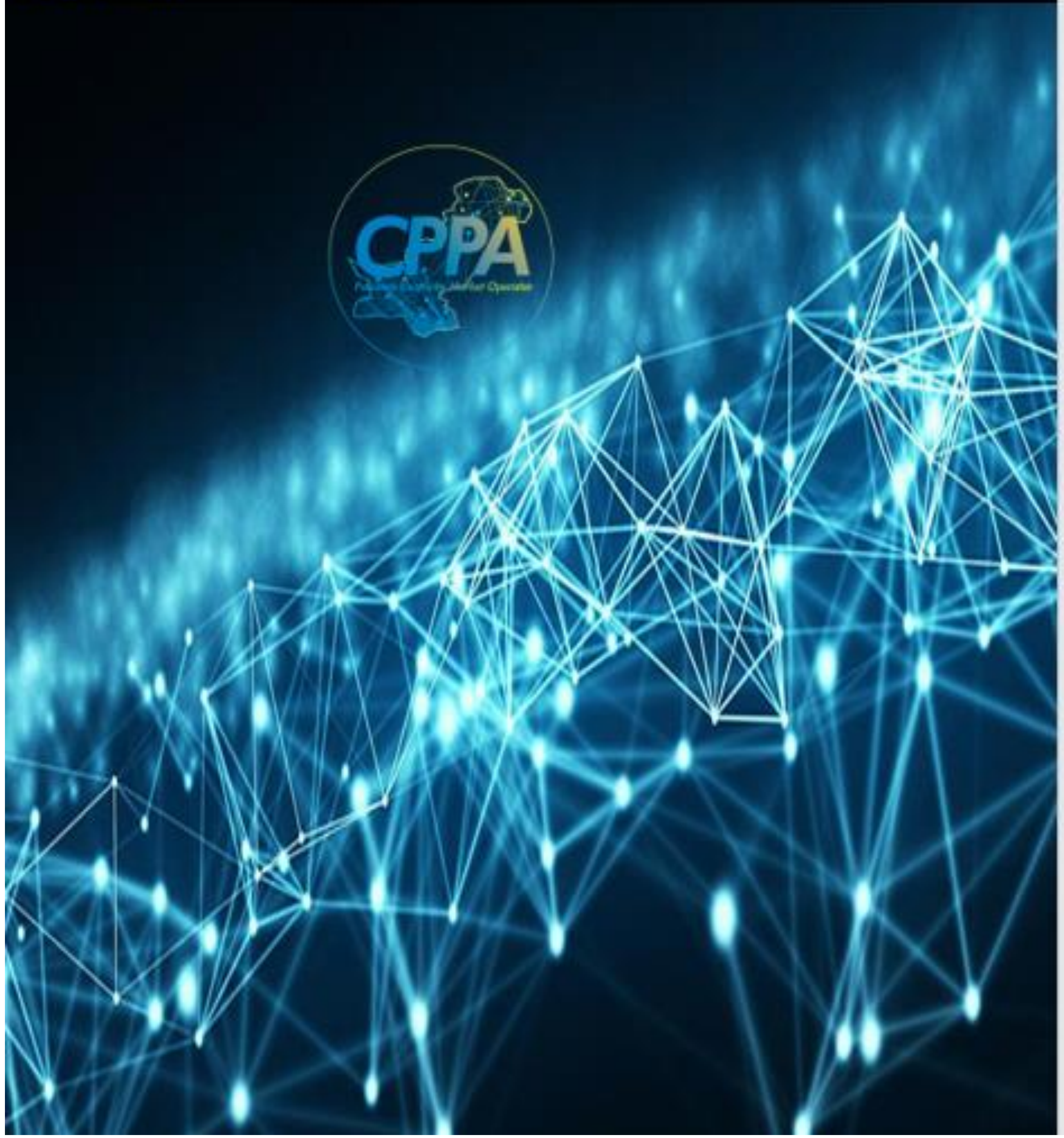
- CPPA-G has been working on the state of the art tool to simulate the future operation of the power system
- Detailed modelling has been completed and marginal cost and indicative total costs of the market calculated
- **Simulation of Contracts:** An inhouse tool developed for simulation of the future contracts based on the results of the simulation tool

INTEGRATED ELECTRICITY MARKET SIMULATION MODEL (IEMM)

Simulation Model for Competitive Wholesale Electricity Market of Pakistan

PERIOD (2019 – 2030)

1st Report 2019



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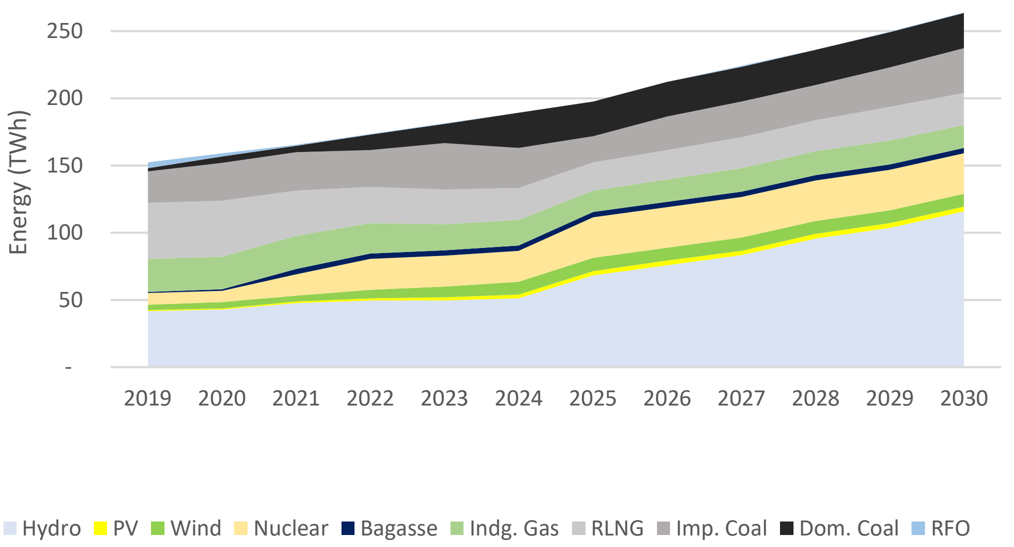
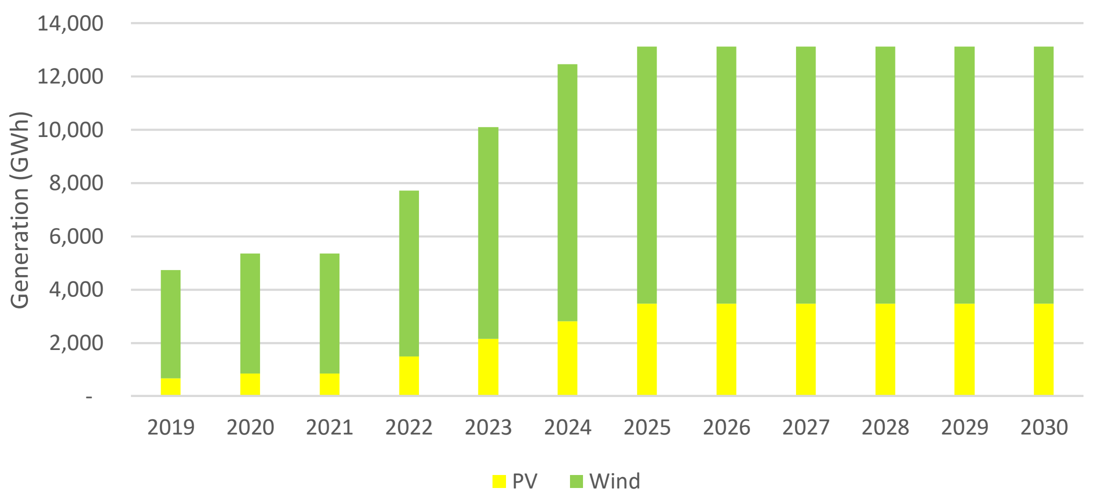
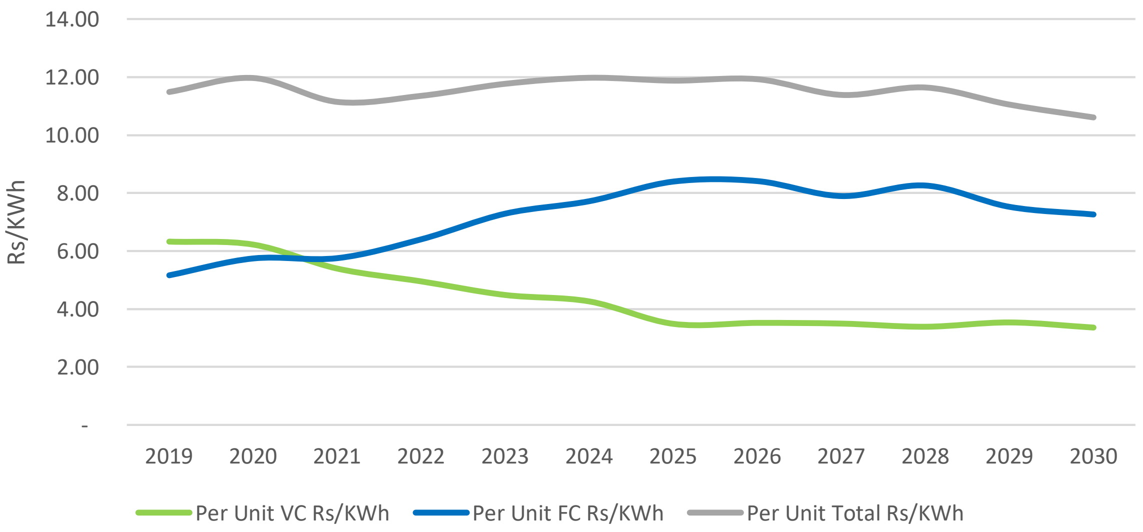


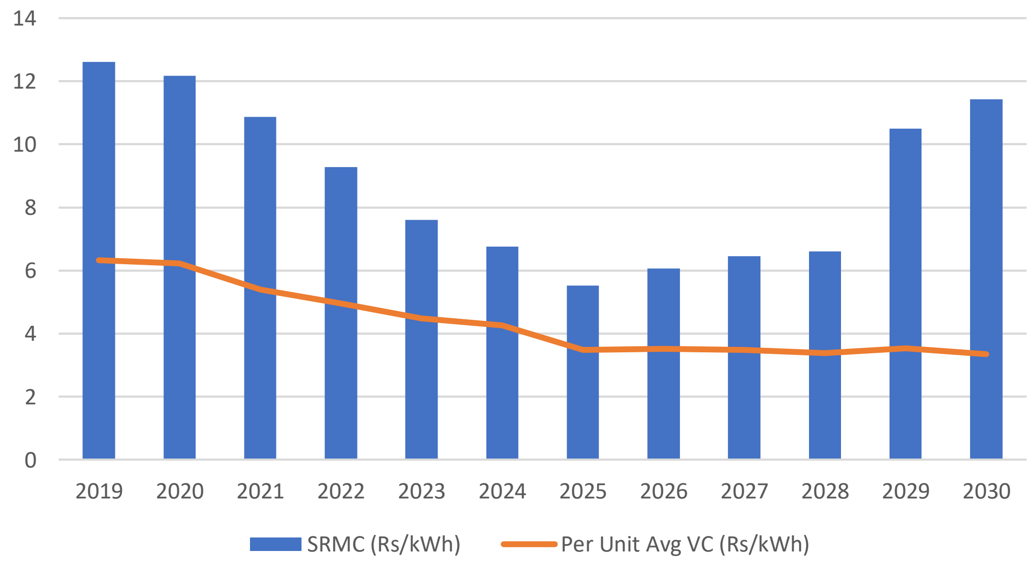
250
200
150
100
50
-
Energy (TWh)
2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
Hydro PV Wind Nuclear Bagasse Indg. Gas RLNG Imp. Coal Dom. Coal RFO



14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
Generation (GWh)
2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
PV Wind

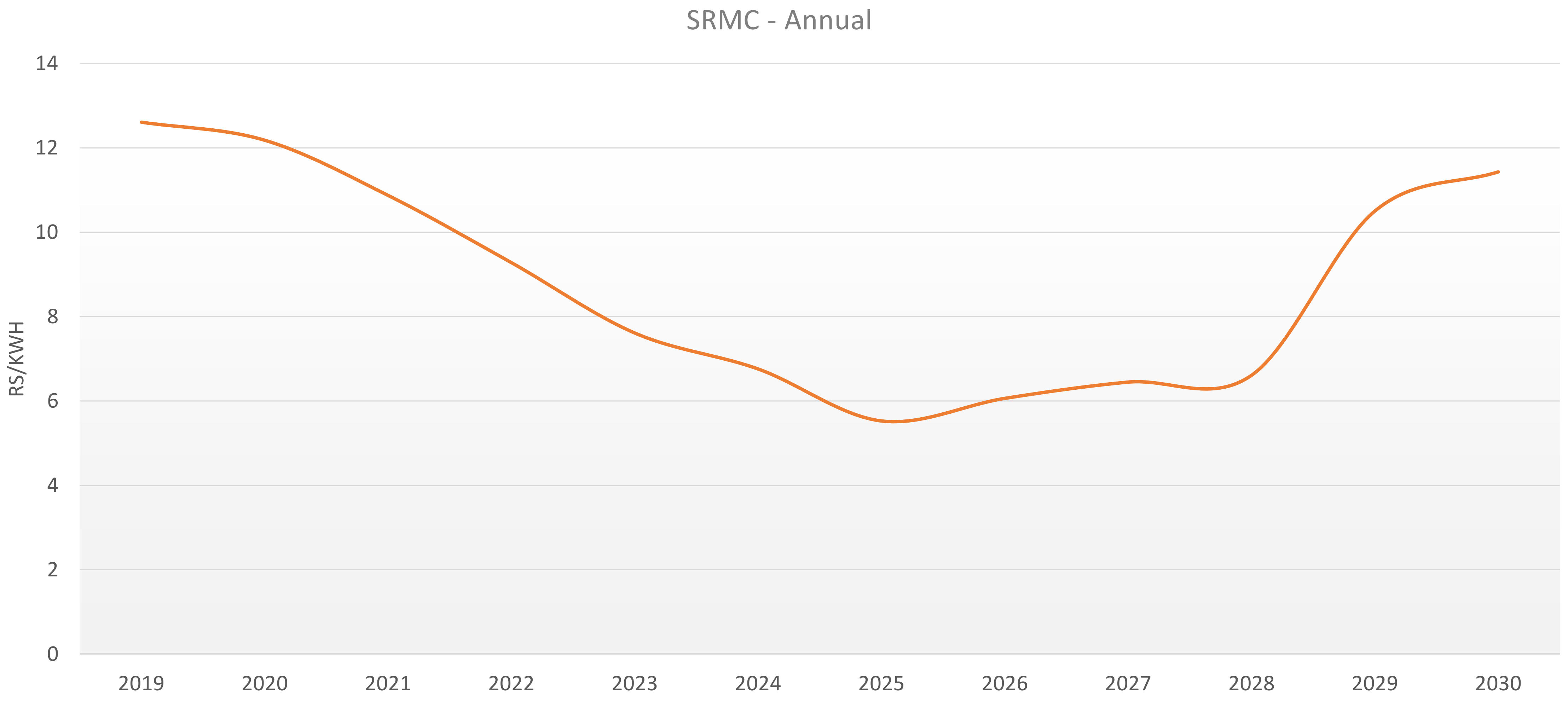


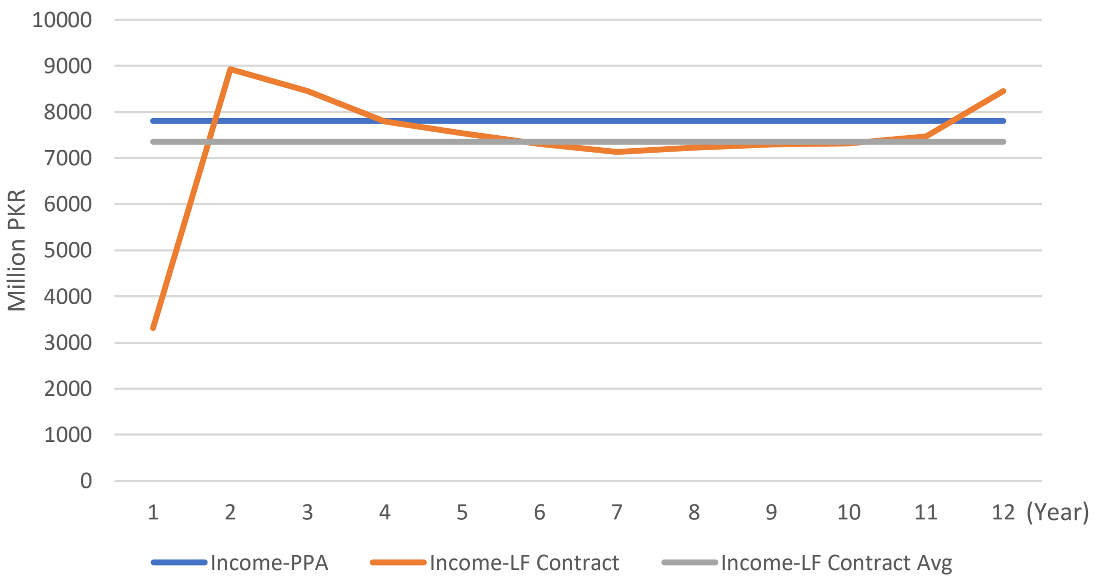
14.00
12.00
10.00
8.00
6.00
4.00
2.00
-
Rs/KWh
2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
Per Unit VC Rs/KWh
Per Unit FC Rs/KWh
Per Unit Total Rs/KWh

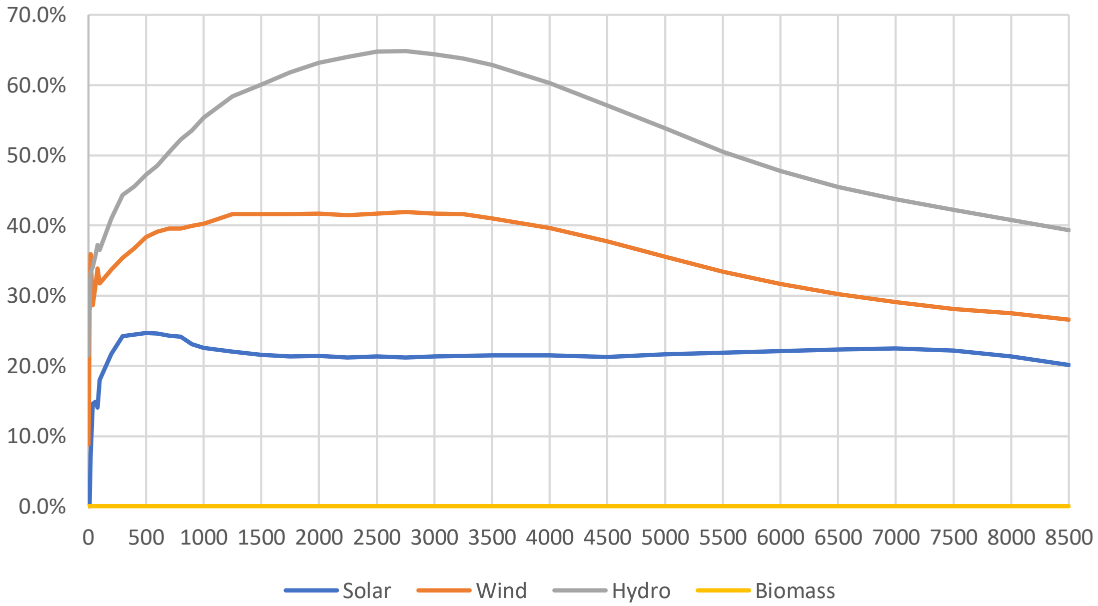


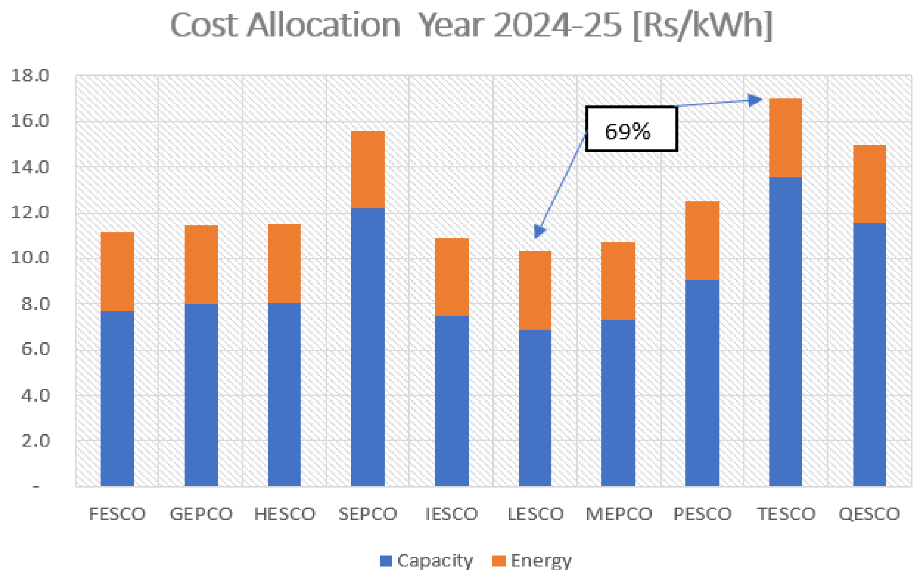
14
12
10
8
6
4
2
0
2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030
SRMC (Rs/kWh)
Per Unit Avg VC (Rs/kWh)

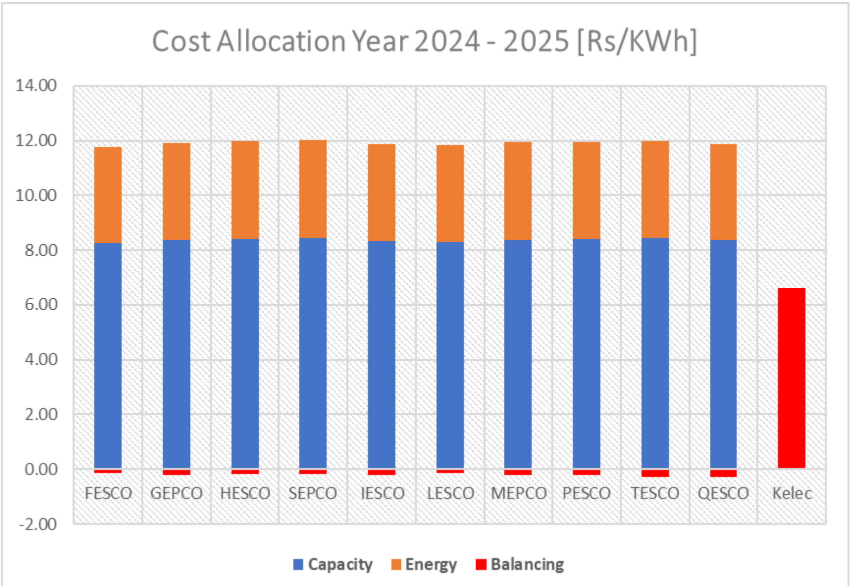
Marginal Cost




Million PKR
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1 2 3 4 5 6 7 8 9 10 11 12 (Year)
Income-PPA
Income-LF Contract
Income-LF Contract Avg


70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500
Solar
Wind
Hydro
Biomass


Cost Allocation Year 2024-25 [Rs/kWh]
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
-
69%
FESCO GEPCO HESCO SEPCO IESCO LESCO MEPCO PESCO TESCO QESCO
Capacity
Energy


Cost Allocation Year 2024 - 2025 [Rs/KWh]
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
FESCO GEPCO HESCO SEPCO IESCO LESCO MEPCO PESCO TESCO QESCO Kelec
Capacity
Energy
Balancing

ROADMAP FOR IMPLEMENTATION

Group of actions – Stakeholders - timetable

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

PART – 5

Take-aways/Recommendations

Competitive Market will not solve all Issues

- **Market will not solve all the issues**
- **Will create pressure to improve business across the supply chain to improve on:**
  - Demand forecasts
  - Generation Planning
  - Optimized Dispatch
  - Data Institutionalization & Publishing
  - Improved Transmission Network (publishing prices with and without constraints)
  - Re-structuring MO
  - Aligned and predictable legal and regulatory framework
  - Market contracts & Transparency
  - Strengthening SO, DISCOs etc…..

Market Transition Key Lessons

- First the objectives of transition must be very clear
- Alternatives must be deliberated in detail before moving forward
- The model must be selected based on local conditions and learnings from international experiences to solve existing problems and meet objectives
- Speed of transition must match readiness of people, process and technology
- Need to have a clear transition model and roadmap or plan
- The model and roadmap or plan should be prepared and approved in consultation with stakeholders (especially who will implement it) taking their inputs
- There should be a competent and central facilitator for implementation of this plan (a huge change effort)

Market Transition Key Lessons

- People part of any big change effort is most important and yet most neglected part. Thus, a change management plan must be prepared and followed to ensure developing a common vision, structured thinking and a strong coalition for supporting change resulting in "change by the people" not "change to the people"
- The central facilitator should not only help stakeholders to implement their part of actions but also build their capacities to enable them in their new roles
- In centrally dispatched markets ISO model can be considered while de-bundling

Market Transition Key Lessons

- Vision of "Good Neighbors, Good Partners, and Good Prospects."
- There should be win-win for cooperating countries (individually and as a whole)
- Building an open and inclusive platform is important for cooperation
- Aligning with national strategies and supporting the new international development agenda
- Deepening policy dialogue is also very important

Thanks


Approval of Wholesale Market Design
Competition for the Market
Competition in the Market
Alignment of Framework (Regulations)

Gradual Markets Transition Comparison

Gradual Implementation								
	Stage-1	**Stage-2**	**Stage-3**	**Stage-4**	**Stage-5**	**Stage-6**	**Stage-7**	**Remarks**
Turkey	**2001** • Elect. Market Law • Single-Buyer/Seller	**2003** • Financial Settlement Communiqu e • Energy Imbalance Settlement • Eligible consumers almost none	**2006** • Transient Balancing & Sett Regulation • Bilateral Contracts with Balancing Market • Eligible consumers almost none	**2009** • Final Balancing & Settlement Reg • Day Ahead Planning • Balancing Power Market • Hourly Settlement • Eligible Consumer almost none with 480 MWh/year limit	**2011** •Final Bal & Sett Reg. (Phase2) •Day Ahead Market •Balancing Power Market •Hourly Settlement •Eligible Consumer couple of thousands with 30 MWh/year limit	**2015** •Day-Ahead Market •Intra-Day Market •Balancing Power Market •Eligible Consumer around 1.5 million with 4 MWh/year limit	**2017** •Capacity Markets Initiated	•Energy Only Marke now starting capacit mechanism •36% in Exchange, rest bilateral GDP:
India	**1996** •Balancing / Unscheduled Interchange / ABT	**2003** •Electricity Act	**2005** •National Electricity Policy (15% of new generation can be sold outside PPA)	**2006** •Staff Paper on Power Exchange •Competitive Bidding Guidelines	**2007** •Guidelines on setting up Power Exchange	**2008** •Regulations for Power Exchange Transactions •IEX went Live	**2016** •DEEP E-Platform for Reverse Auctions	•Huge Over Cap. 90% in Long-Term Contracts •3% in Power Exchange •Surcharges Levied

Gradual Markets Transition Comparison Contd...

	Gradual Implementation							
	Stage-1	Stage-2	Stage-3	Stage-4	Stage-5	Stage-6	Stage-7	Remarks
Pakistan	**2017** •Act Amendments •Proposed High-level Wholesale Market Model	**2018-2020** •Market Detailed Design	**Mid 2020** •Balancing Mechanism with Bilateral Contracts •Physical Market with BM Price serving as 'Index' or 'Market Price' •From dispatch perspective it is like a Gross Pool, with commercial settlement based on the contracts •Competitive Bidding through IAA only ending with market based PPAs •Centrally dispatched market	**2020 Onwards** •Market Based Agreements in Future • Initially the BM will used to clear difference and later for Merchant Selling •Merchant Generation & even demand can later sell to BM •Free Power will be paid only BM Prices •Different types of Contracts will exist: (1) Gen. following, (2) Load following, (3) Supply Contracts with Obligation to supply and pay and (4) Contracts for Differences will come a bit later	**Around 2023-25** •Electronic Trading Platform may start •Around the same time Reverse E-auctions can also be started			• Long- Term PPAs •Adequate capacity for next up-coming years •Inadequate Transmission system capacities •Strengthening of SO, Planner and MO and different power entities

Completive Power Market Stages Planned

2017

New NEPRA Act, including Market Law

2018-2020

- **Wheeling arrangements** under NEPRA 2016 Regulations make operational
- **Roadmap** for developing **wholesale market implemented**

2020

- **Competitive Wholesale Market** starts with a Balancing Mechanism
- Provides the **Market Price**
- **Retail Competition for BPC** can also commence

2020 -2023

- **Market based contracts** are implemented
- **BPC threshold reduced** that enhances retail competition
- A separate roadmap to **bifurcate DISCOs licenses** implemented
- The **capacity in long-term PPAs** will also come in balance

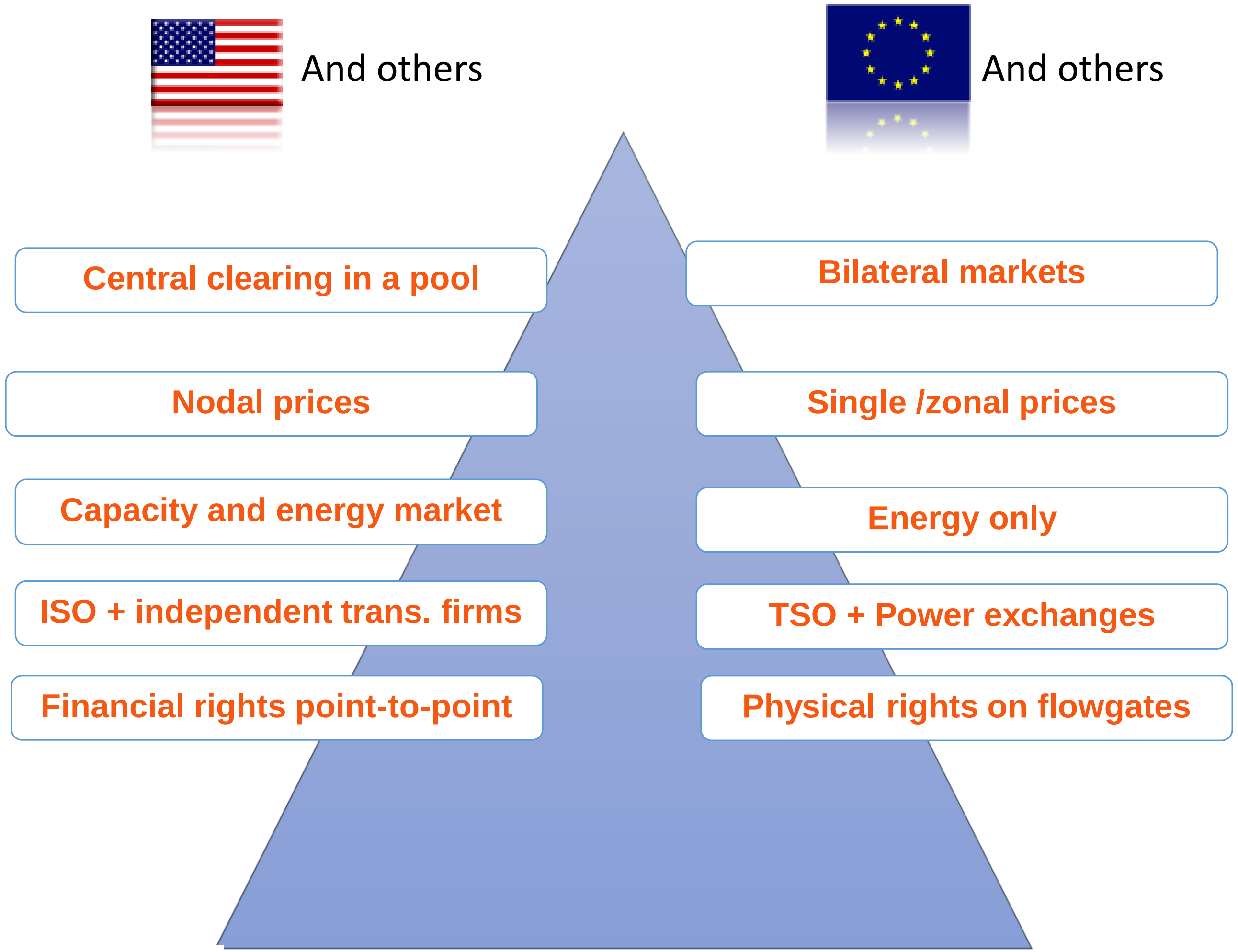
2023-2025

- **Electronic Trading Platform** for Bilateral Trading may start
- At the same time **Reverse E-auctions** may commence

2026 onwards

- Evolution in to **Spot Market**

Lack of an agreed "best practice" design of the markets



Progress Update on Market Development

People

Most Important & Most Difficult to Build a Common Vision and Recruit People:

- Collaboration with LUMS
- International Trainers Engaged
- International Collaboration
- Numerous consultations
- Communication through media

Technology

Computer & Communication Monster (C&C):

- Wholesale smart metering project underway
- Automation of SO and MO process 80% complete
- SCADA upgrade underway
- Dispatch optimization & simulation tools implemented
- DISCOs IT roadmap also prepared

Process

Transition requires alignment of whole legal, policy, regulatory and institutional alignment:

- Act amended and provide legal basis
- Market Model and Roadmap under approval
- Market Development Policy proposed
- Regulations are under review
- Institutional re-structuring underway

Central Lead Role

Market Operator is leading the design and implementation program:

- Central facilitation and lead role
- Market Implementation Support Committee
- PMO office in CPPA
- Electricity Market Team (EMT)

New Market: Challenges

New Culture

New Capacities

New Technologies

New HR Approach

New Accountability

New Efficiency

NEPRA - CPPA

Key role

- Promoting
- Monitoring
- Coordinating
- Training
- Disseminating

Recommendations / Next Steps/ Take-aways

- **Work together moving forward on professional level**. Proposal is to have week(s) long discussion sessions with core NEPRA team.
- **Approval of Market Design for Wholesale first** and then market opening
- **Alignment of Legal & Regulatory Framework and roles** of institutions to be aligned (a comprehensive and big job)
- **Market Opening is a gradual process** and depends on the People, Processes and Technology maturity among many other factors
- **Capacity Building and Consultations** on Market Model must continue with full force
- There no market model in the world that we **can copy and paste** here, must be based on learnings, their application on design and considering local conditions
- **Information sharing** and publishing culture must be promoted
- **Market will create pressure through structural reforms** to solve many issues but not all

Recommendations / Next Steps/ Take-aways

New NEPRA ACT Amendments : Important Timelines and Sequencing

1a April 2018 — **Enactment of NEPRA ACT** 1997 (Amended vide 2018)

1b April 2018 — CTBCM Model Approval

2 **Section 14A.2b: Policy and plan** on efficient and liquid power market design

3 2019 — **Section 50(2): Rules and regulations shall be brought into conformity** within 01 year

4 **Market Operator Licensee**
Considering 23 A & B can come into force within 05 years & then there is one years for licensing
(Maximum: 5+1 = 6 years)

5a 2021 — **CTBCM** Commercial Operations Date, providing an **Enabling Environment** for Trading

5b

Electric Power Trader Licensee 23 C &D	Electric Power Supplier Licensee 23 E & F

Can only operate within an Enabling Environment i.e. (a) a competitive market model is in place and **(b)** the rules, regulations, codes, procedures and standards etc. are amended or created

6 **System Operator Licensee**
Considering 23G & H can come into force within 05 years & then there are 02 years for licensing
(Maximum: 5+ 2= 7 years)

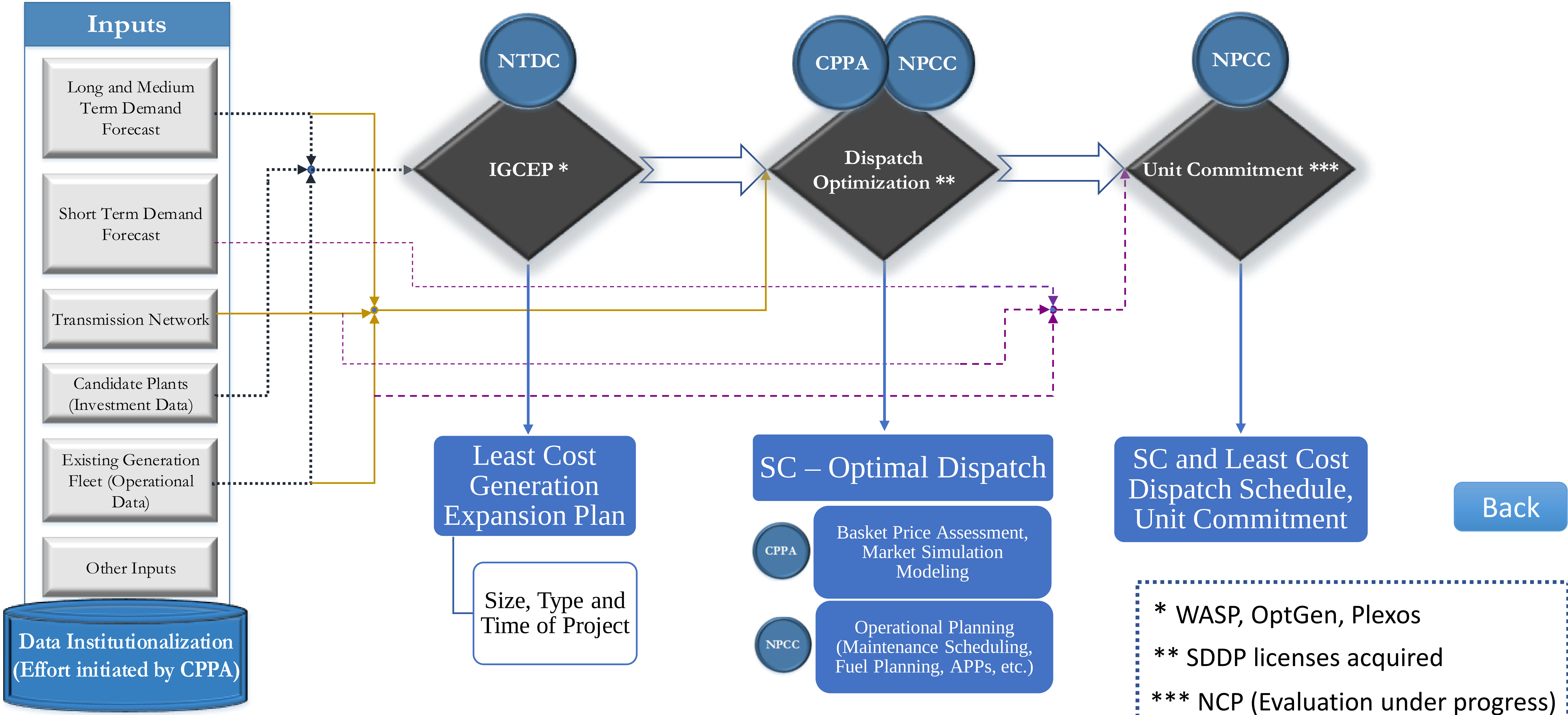
7 2023 — **Separation of Supplier and Distribution Licenses 23 E**

8 2023 — **Delicensing of Generation Companies 14 B**

April 2018 | 2019 | 2021 | 2023 | 2024 | 2025

Optimization Tools and Coordination

Long, Medium and Short Term Tools

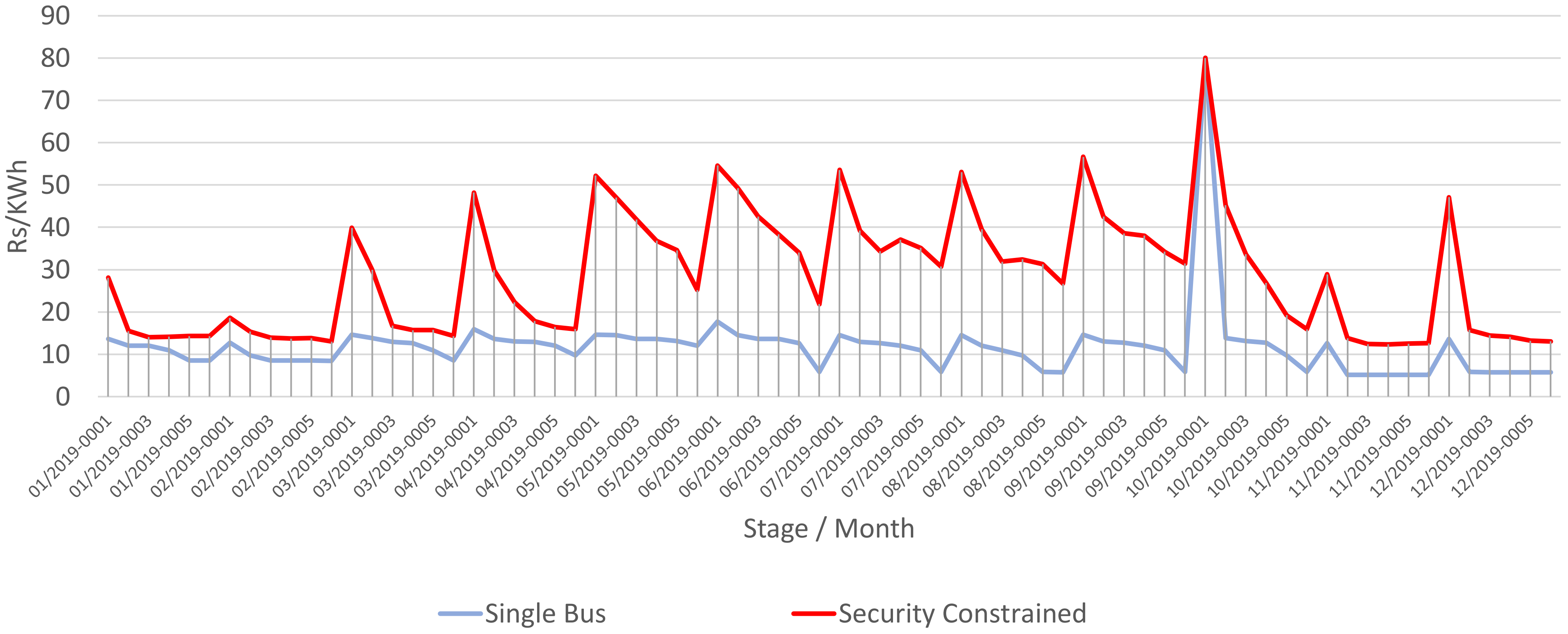


* WASP, OptGen, Plexos

** SDDP licenses acquired

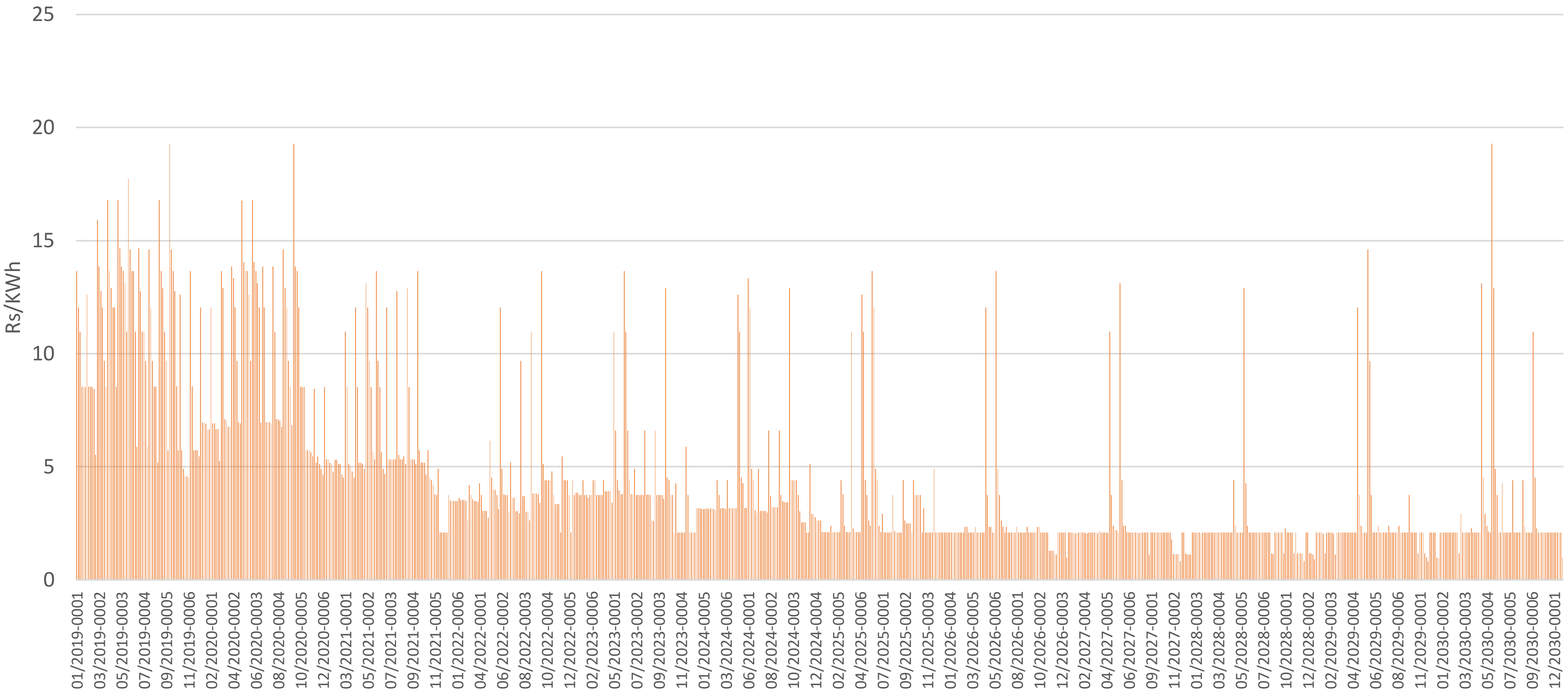
*** NCP (Evaluation under progress)

Modeling Exercise Results – Marginal Costs*



* @ Deficit Cost of Rs 80/KWh

Simulation Results - Marginal Costs / Block*



*Without Consideration of deficit Cost

Gist of Functions under CTBCM

Market Operator under CTBCM

- Admission of Participants and registration
- Balancing agreement with Participants
- Credit cover administration for transactions in the Balancing Mechanism
- Balancing Mechanism price, calculation and settlement
- Calculation of UoS charges & market fee;
- Complaints resolution to settlement
- Registration of all contracts to settle imbalances
- Reporting on market results, website
- Provide support for market further development

SPS under CTBCM

- Purchase from PPAs/EPAs that have not been assigned yet or cannot be assigned to the Discos
- Verify invoices sent by Generators for those PPAs/EPAs and will pay them
- Back-to-back bilateral Supply Contracts with all the Discos to resell the energy and capacity bought from non assigned PPAs/ EPAs
- Assist the Discos with the verification on the invoices In the bilateral contracts
- SPS will not be allowed to sign any new contracts for any Disco

Legal & Regulatory Framework w.r.t Market Development

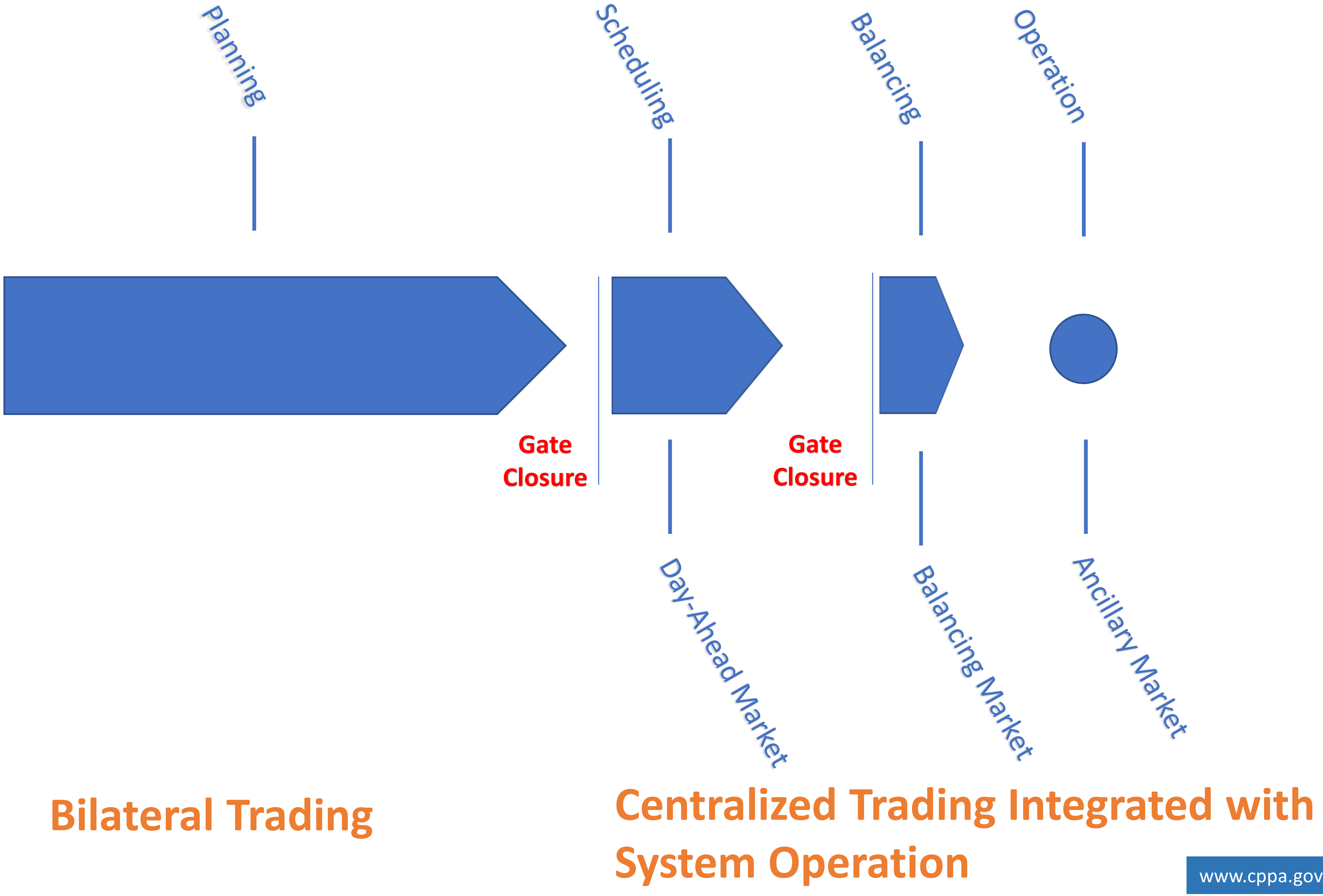
- **CTBCM in NTDCs** License 2002.
- Important features of **NTDC's license** PEX & CR function w.r.t Market Dev:
  - Balancing services
  - Dispatch Central except SPPs
  - CTBCM operational by 2008
- The **Grid Code** w.r.t competitive market or bilateral trading:
  - Balancing Code
  - PSODA for generators with bilateral agreements & except 11 kV all generation on central dispatch
  - Scheduling & Dispatch Code
- The **Generation licensing rules** (dispatch and second tier authorization)

Wholesale Market Development Mandate

- **NEPRA Act Amended in April 2018**
  - Market Operator is responsible for **organization** and **administration** of trade in Electricity Market
  - Provides legal basis for creation of competitive markets
    - Calls for promotion of competitive markets
    - New Licensees (Traders, suppliers, Market Operator, System Operator)
    - Mandates the GoP to issues policies on efficient and liquid power market design
- **CPPA's Authorization in Nov 2018;** with directions inter alia:
  - To re-structure CPPA for removing conflict of interest
  - Several time-bound actions most of them are related to market development

The Electricity Market

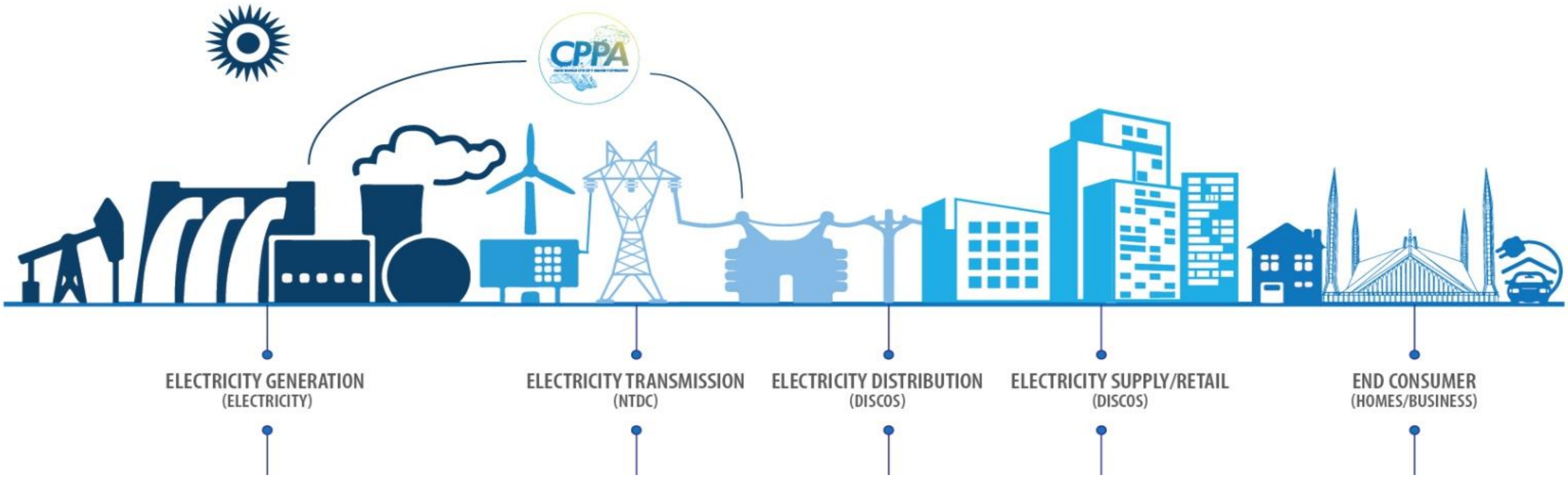
- A trading environment where **multiple sellers trade with multiple buyers**, market products under **specific rules**.
- Service providers. What do they do?. Restrictions?
- Competition may apply in certain segments of the market. Which ones? Why?
- Why regulation still is necessary?



Planning
Scheduling
Balancing
Operation
Gate Closure
Gate Closure
Day-Ahead Market
Balancing Market
Ancillary Market
Bilateral Trading
Centralized Trading Integrated with System Operation

Pakistan's Electricity Sector

Wholesale Electricity Market Operator



Generators as Market Participants

Transmission Service Provider NTDC

- **DISCOs**: Wire Business & Supplier
- **Participants** as Retail Suppliers 10 DISCOs and KE
- **Service Provider** for wire business/distribution

- **BPC** > 1MW
- Others non-eligible customer

Market Design Objectives - CTBCM

(i) providing **open access to all market participants** on a non-discriminatory basis;

(ii) creating an **environment to attract investment**;

(iii) ensuring further **evolution** of wholesale market to advanced phases;

(iv) promoting **competitive arrangements**, both for and in the market;

(v) promoting **payment discipline** among market participants;

(vi) eliminating **sovereign guarantees over time**;

(vii) ensuring **compatibility** of principles for operation of retail market; and

(viii) creating an environment for compatibility / participation of regional electricity market.

Review of existing Legal and Regulatory Framework

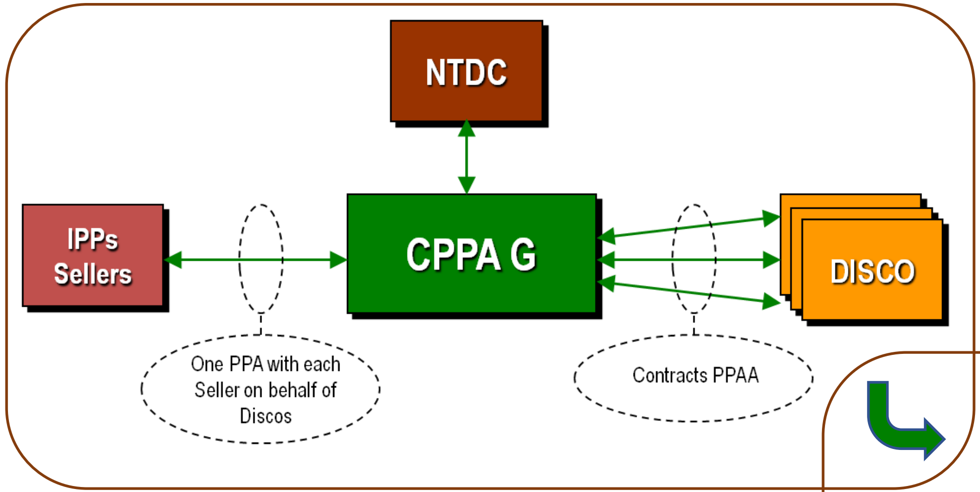
- Before proposing any model:
  - A thorough review of the existing legal and regulatory framework was undertaken
  - Peculiarities identified and discussed in detail
  - Various option analyzed to address different aspects of the model
- Review of the carved-in-stone PPAs and their integration with the market.
  - Forced market integration
  - Forced contract negotiation
  - Voluntary renegotiation
  - Adaptation of market rules
  - **Virtual Generation / Managed Contracts**
  - Contractual Buy-Outs
- Adaptation of Market Design and Virtual Generation option seemed more feasible
  - Also implemented in Alberta, Mexico etc.

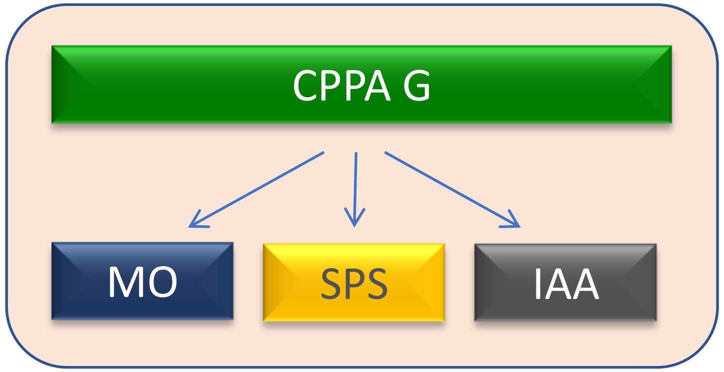
Products

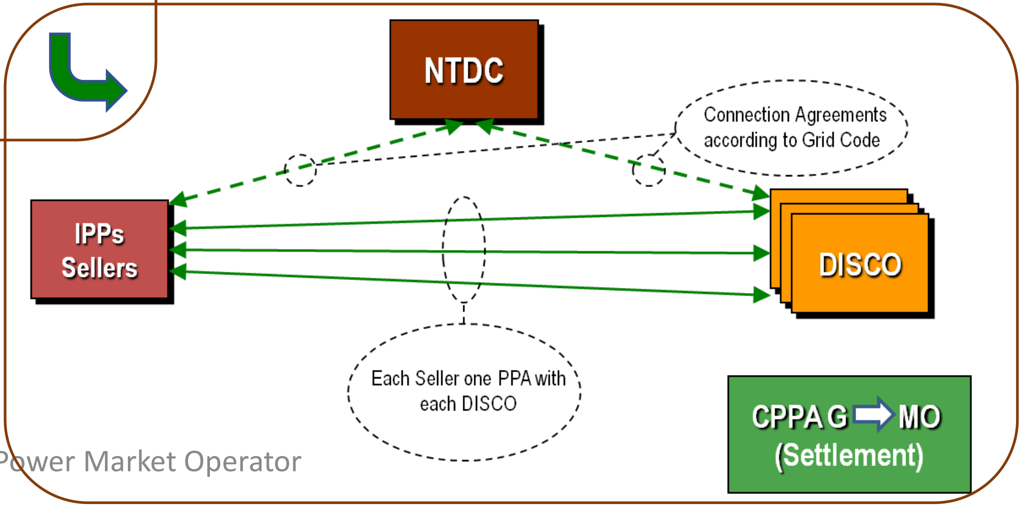
- Energy
- Firm Capacity

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







Plus a Balancing Mechanism to settle contract deviations

CPPA G Transition to the CTBCM

CPPA G

1. Settlement and Invoicing
2. Procurement from PPAs (Agent)
3. New Capacity Procurement

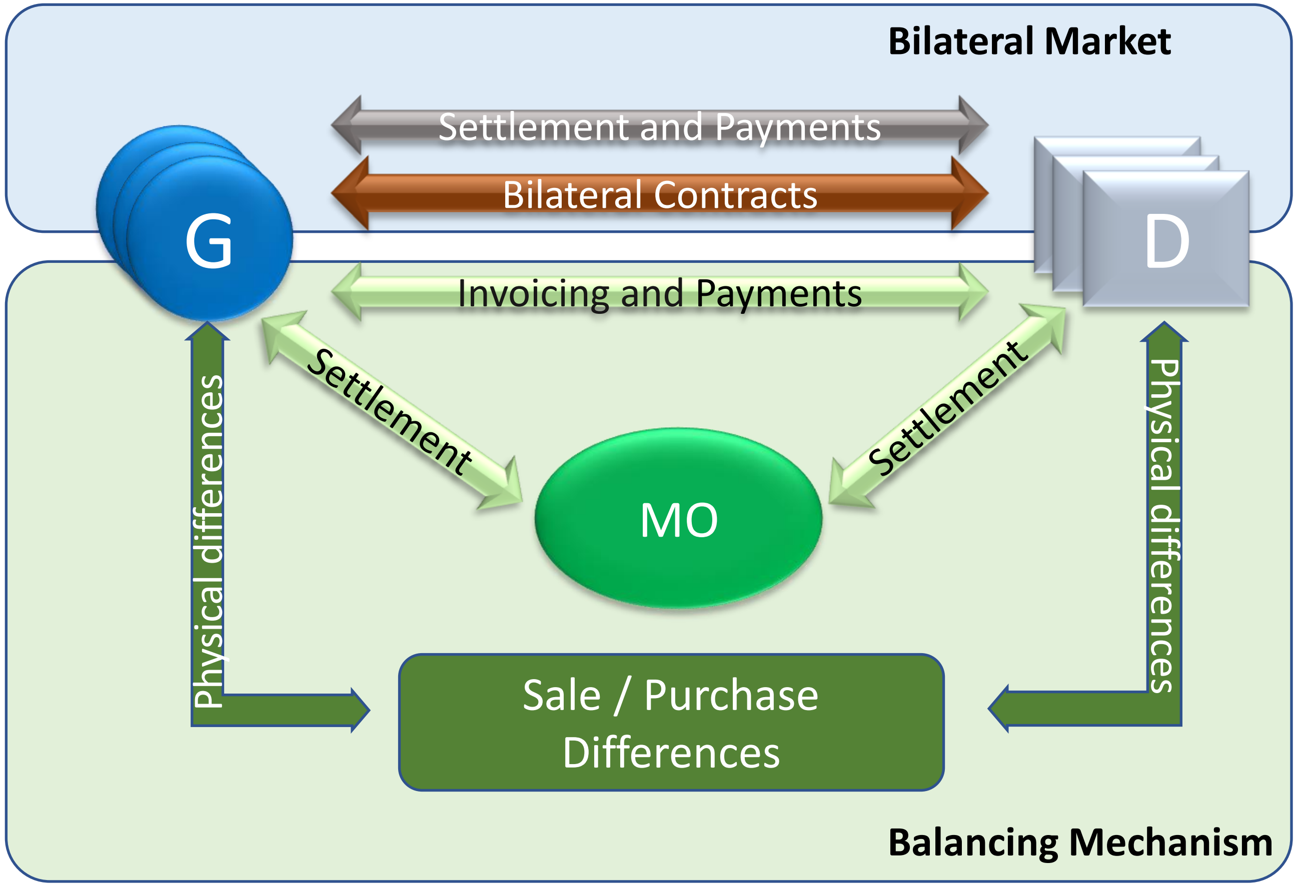
Ring fence → Legal

Market Operator: centralized market services

Special Purpose Suplier: non “bilateralized “PPAs procurement

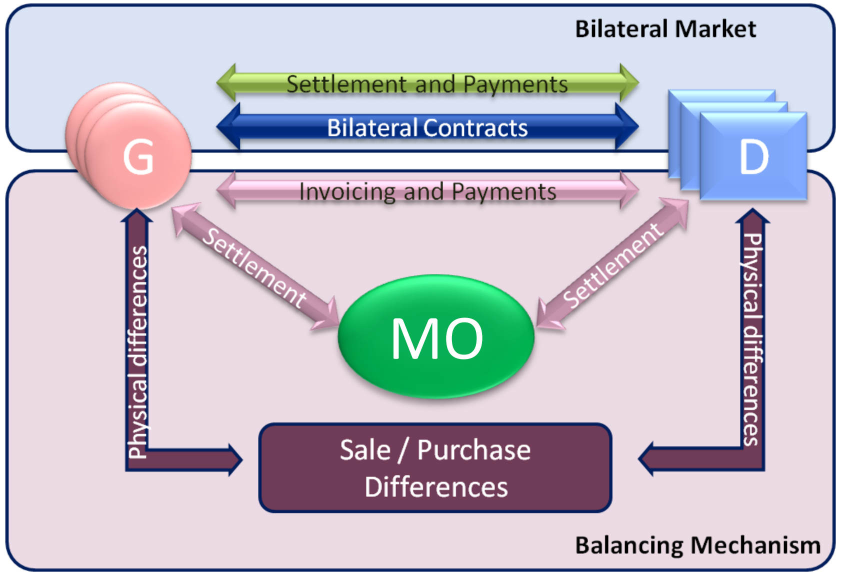
Independent Auctions Administrator: new capacity procurement facilitator

Bilateral Contract Market with Balancing Mechanism



New Market Model – Features

- Agent separated from MO
- Market Participants
- K Electric
- Service Providers
- **Grid Code Commercial Code, others**
- Existing PPAs
- Capacity Obligations
- **New PPAs**
- Non Payment Risks
- **Competition for and in the Market**
- **Credit Cover (collateral)**
- New Capacity Procureme
- Centralized Economic Dispatch
- **Low Performing Discos**
- BME & BMC
- Contract Registrar



Moving from Single Buyer towards Bilateral Contracts

- In an Electricity Market, whenever there is more than one buyer, there will be imbalances
- These imbalances are settled through Balancing Mechanism

Market Price Discovery and Projection

Long, Medium and Short Term Tools

Inputs

- Long and Medium Term Demand Forecast
- Short Term Demand Forecast
- Transmission Network
- Candidate Plants (Investment Data)
- Existing Generation Fleet (Operational Data)
- Other Inputs

Outputs

Long Term

NTDC

IGCEP*

Medium Term

CPPA

Price Projections*

NPCC

Dispatch Optimization*

Short Term

NPCC

Unit Commitment***

* WASP, OptGen, Plexos

** SDDP licenses acquired

*** NCP