Orientation Session for Honorable Brothers from Afghanistan
SAARC Training for Professionals of Afghanistan
20th Sept, 2019
PART – 1

Legal / Regulatory Framework
An Overview
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).

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.
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.

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.

CPPA was separated from NTDC and formed as an 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

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.
CPPA G in the Power Market

Government of Pakistan

Power Division

Pakistan Atomic Energy Commission

NEPRA (Regulator)

Ownership

WAPDA
AEDB
PEPCO
PPIB
CHASHN UPP
KANUPP

Ownership

Mega Dams
Water Projects

Ownership

GENCOs
DISCOs

NTDC (TNO+SO)

IPP
SPPs/CPPs
K-Electric

Licensees

MO

Service Providers

Market Participant
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

www.cppa.gov.pk
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
Distribution Companies (DISCO’s)

- **Highest density service area**: Well-run DISCO with steel industry and cottage industry as consumer base.
- **Administrative issues, 80% of load is tube-wells, rural delivery issues**: Relatively new DISCO, inherited highest loss areas of HESCO.
- **High loss DISCO with serious recovery and collection issues. Feeds TESCO area, law and order issues**: Best run DISCO, many industrial textile factories as consumer base.
- **Large % of government consumers, collection issue with feeding Kashmir**: Highest density service area.
- **Largest number of consumers (5 mill), 25% of all tube-wells in Pakistan**: Best run DISCO, many industrial textile factories as consumer base.
- **High losses**: Relatively new DISCO, inherited highest loss areas of HESCO.

**Power Sector Overview**

[www.cppa.gov.pk](http://www.cppa.gov.pk)
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

All other plants according to economic merit dispatch order

- RLNG Plants
- Local Coal Plants
- Imported Coal Plants

- Nuclear
- Solar
- Wind
- Bagasse
- Hydel

Gets priority in the merit dispatch order due to contractual set-up

Out of merit order, must run
Power & Commercial Flows

Generation Portfolio

- 2002 & onward IPPs
- GENCOs
- WAPDA (Hydel)
- 1994 IPPs
- Renewables

NTDC
1. System Operation
2. Transmission Network Operator

Grid Code

(EPP & CPP) + UoSC

K Electric
650 MW

IESCO
LESCO
FESCO
GEPCO
MEPCO
SEPCO
HESCO
QESCO
PESCO
TESCO

CPPA-G

Market Rules
1. Market Operator
2. Market Operations

Commercial Code
1. Meter Reading Verification
2. Billing
3. Settlements
4. Payments

(EPP & CPP) + UoSC + MOF

(EPP & CPP) + UoSC + MOF + DM

Power Flow

Financial Flows
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”
CPPA Strategic Plan
2018-2020

Core Values

1. Transparency

2. Teamwork

2. Excellence

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

**Corporate Culture**
<table>
<thead>
<tr>
<th>Transparency</th>
<th>Excellence</th>
<th>Teamwork</th>
<th>Be-respectful</th>
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Aligning the Seven Elements in CPPA-G's Way of Working
## Functional Transition: In Past, At Present, For Future

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<th>Legacy</th>
<th>Existing</th>
<th>Getting Prepared For</th>
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<td>Billing and Settlement</td>
<td>Billing and Settlement</td>
<td>Billing and Settlement</td>
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<tr>
<td>Treasury</td>
<td>Treasury</td>
<td>Treasury</td>
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<tr>
<td>Agent for Power Procurement</td>
<td>Agent for Power Procurement</td>
<td>Agent for Power Procurement</td>
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<tr>
<td>Market Development</td>
<td>Market Development</td>
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<tr>
<td>Taxation</td>
<td>Taxation</td>
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</tr>
<tr>
<td>PG &amp; Corporate</td>
<td>Corporate Planning</td>
<td>Corporate Planning</td>
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<td>Information Tech.</td>
<td>Information Tech.</td>
<td>Information Tech.</td>
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<tr>
<td>HR and Corp. Govern.</td>
<td>HR and Corp. Govern.</td>
<td>HR and Corp. Govern.</td>
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<tr>
<td>Contract Registrar</td>
<td>Contract Registrar</td>
<td>Contract Registrar</td>
</tr>
<tr>
<td>Competitive Wholesale Market</td>
<td>SPS, MO and IAA</td>
<td>SPS, MO and IAA</td>
</tr>
</tbody>
</table>

### Timeline
- **2015**: Initial stages, focus on transition.
- **2015-2018**: Ongoing development and adaptation.
- **2018-2020**: Final stages, preparation for future changes.

**CPPA**

**Marketeering Development Corporation**

**HR and Corporate Governance**

**Government**

**Competitive Wholesale Market**
## Composition of CPPA-G Board of Directors

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

**Rules**
- Market Rules 2015

**Regulations**
- IPPR 2005

**Grid Code**
- NTDC Indicative Capacity Expansion Plan (IGCEP)
- NTDC Demand Forecasting

**Guidelines**
- NEPRA Renewable Guidelines
- CPPA-G Procurement Guidelines

Power Procurement Agency Agreement (PPAA) with DISCOs

CPPA-G

- Procurement of Power
- Calculate Power Pool Price through Transfer Price Mechanism

DISCOs

Commercial Code
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
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:

<table>
<thead>
<tr>
<th>• Recruitment &amp; Selection</th>
<th>• Employee Engagement Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Onboarding &amp; Placement</td>
<td>• Fleet Management and Logistics Support</td>
</tr>
<tr>
<td>• Training &amp; Development</td>
<td>• Health and Safety</td>
</tr>
<tr>
<td>• Payroll Processing &amp; Disbursement</td>
<td>• Organizational Restructuring</td>
</tr>
<tr>
<td>• Employee Daily Attendance Record</td>
<td>• Handling of Disciplinary Cases</td>
</tr>
<tr>
<td>• Employee Terminal Benefits</td>
<td>• Building maintenance, Office Premises Safety &amp; Security</td>
</tr>
<tr>
<td>(EOBI, Life, Health, Gratuity, PF)</td>
<td></td>
</tr>
</tbody>
</table>
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
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
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
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.
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
• (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

- 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
NTDC was granted Transmission License to perform five functions:
1) TNO
2) SO
3) Planner
4) Metering Service Provider
5) Contract Registrar/

Per licensing requirement, NTDC was mandated to develop the whole sale market (CTBCM) by 2008

Historical on Market Development

- **2002**
  - National Power Policy 2013
    - “... Innovative business and regulatory models will be deployed to weaken the monopolies, increase efficiencies, and decrease costs through competition. Wheeling charges and whole sale markets may be introduced to introduce multiple buyers and sellers in the market place.”

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

- **2013**
  - 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

- **2015**
  - 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

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Competitive 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 5: CTBCM - Market Modelling /Simulations based on SDDP
  - 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 14: PMS Report – All DISCO x 2
  - Report 15: NTDC Regression Report
  - Report 17: Integrated Generation and Capacity Expansion Plan (IGCEP)
  - Report 18: NPCC Annual Production Plan based on SDDP
Mandatory Power Pool

All generators must sell their entire production to the pool.
All suppliers must purchase their entire demand from the pool.

Contracts for Difference (Financial)

Centralized scheduling, unit based
Decentralized scheduling, company based
Technical and Commercial Transaction in CTBCM

Contract = Actual

PPA/EPA

CPPA-G

Power Purchaser (DISCO’s Agent)

Market Operator

PPAA

Settlement

Central Dispatch
(NEPRA Act Sec.14D and 23G)

Self Dispatch
(Grid Code)

Power Flow

Transmission System

Distribution System

Consumers

Non-Eligible Consumer (<1 MW)

Eligible Consumer (>=1 MW)

PPP = EPP + CPPP

UoSC + MoF

DM

PPP + UoSC + MoF + DM

Balancing Mechanism
BME + BMC

T

S

(NEPRA Act Sec.23C)

(NEPRA Act Sec.23E)

(NEPRA Act Sec.22)

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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

Single Buyer Model

Power Purchaser (DISCO’s Agent)
Market Operator

Central Dispatch
Self Dispatch

PPAA

PPA/EPA

ERP
SFS
CDXP
Forecasting Tools
Cost Opt. Tools
Data Inst.
Monit. Portal

Competitive Market Model

Traders
Balancing Mechanism (BME + BMC)
Suppliers

Eligible Consumers

IT Applications

Non-Eligible Consumer
Eligible Consumer
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
- Centralized New Capacity Procurement
- Grid Code
  - Commercial Code, others
- Non Payment Risks
- Agent separated from MO
- Market Participants
- Centralized Economic Dispatch
- Balancing Mechanism
- Contract Registrar
- K Electric
- Bilateral Market
  - Settlement and Payments
  - Bilateral Contracts
- Invoicing and Payments
- Sale / Purchase Differences
- Balancing Mechanism
- MO
- G
- D
- Competition for and in the Market
- Low Performing Discos
- Credit Cover (collateral)
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
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ROADMAP FOR IMPLEMENTATION

Group of actions – Stakeholders - timetable
<table>
<thead>
<tr>
<th>No.</th>
<th>GROUP OF ACTIONS</th>
<th>Stakeholders directly involved</th>
<th>No.</th>
<th>GROUP OF ACTIONS</th>
<th>Stakeholders directly involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Implementation Process Start; Overall Decision and Actions; Coordination</td>
<td>MWP NEPRA CPPA G</td>
<td>10.1</td>
<td>Codes: New Market Commercial Code</td>
<td>CPPA G draft and consultation, NEPRA review and approval.</td>
</tr>
<tr>
<td>1</td>
<td>Policy on market development; White Paper describing the market conceptual design</td>
<td>NEPRA; CPPA G (draft); MWP public consultation and with other institutions.</td>
<td>10.2</td>
<td>Codes: Update Grid Code</td>
<td>NTDC and Grid Code Review Panel. NEPRA review and approval.</td>
</tr>
<tr>
<td>2</td>
<td>Amendment to legal framework</td>
<td>MWP with CPPA G support</td>
<td>11</td>
<td>Strengthening of System Operator, enforce rights and obligations</td>
<td>NTDC and NPCC</td>
</tr>
<tr>
<td>3</td>
<td>Modifications to adapt or replace energy policies to be consistent with the market development policy</td>
<td>MWP</td>
<td>12</td>
<td>Strengthening Discos credit worthiness and readiness as market participants</td>
<td>Discos &amp; MWP as the owner of Discos and SPS</td>
</tr>
<tr>
<td>4</td>
<td>Modifications to power sector regulatory framework to be consistent with the market development policy</td>
<td>NEPRA.</td>
<td>13</td>
<td>Open access to transmission services: formalize transmission services rights and obligations</td>
<td>NTDC as Transmission Network Owner NPCC as System Operator.</td>
</tr>
<tr>
<td>5</td>
<td>Assignment of pre-existing PPAs/EPAs signed or administered by CPPA G among Discos</td>
<td>MWP and CPPA G, IPPs and Gencos Imports Discos</td>
<td>14</td>
<td>NTDC as Planner (Least cost expansion plan) and Metering Services Provider (adequate revenue settlement meters)</td>
<td>NTDC, NEPRA review and approval of plan CPPA G (as observer of</td>
</tr>
<tr>
<td>6</td>
<td>Separation of CPPA G into Market Operator and Special Wholesale Supplier Functions</td>
<td>CPPA G</td>
<td>15</td>
<td>Measures to enhance wholesale payment culture: credit cover mechanisms and payment system</td>
<td>CPPA G/Market Operator Discos MWP IAA</td>
</tr>
<tr>
<td>7</td>
<td>Creation of the Market Operator as a separate company</td>
<td>CPPA G in particular Market Operator Business Unit</td>
<td>16</td>
<td>Readiness for commercial operation of electricity market:</td>
<td>Lead by CPPA G, includes all market participants; CPPA G reporting of readiness tests and results</td>
</tr>
<tr>
<td>8</td>
<td>Creation of the SPS as purchaser of not yet not assigned PPA/EPA</td>
<td>CPPA G in particular SPS Business Unit; Discos</td>
<td>17</td>
<td>Declaration of date to start commercial operation of the market</td>
<td>MWP</td>
</tr>
<tr>
<td>9</td>
<td>Creation of the Independent Auction Administrator (IAA) and scheme for credit cover / guarantees for low performing Discos</td>
<td>MWP (PPIB); CPPA G Discos</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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)
<table>
<thead>
<tr>
<th>Turkey</th>
<th>Stage-1</th>
<th>Stage-2</th>
<th>Stage-3</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single-Buyer/Seller</td>
<td></td>
<td>Energy Imbalance Settlement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eligible consumers almost none</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Final Balancing &amp; Settlement Reg</td>
<td>2006</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Day Ahead Planning</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Balancing Power Market</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Hourly Settlement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eligible Consumer almost none with 480 MWh/year limit</td>
<td>2011</td>
<td></td>
<td></td>
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<tr>
<td>2017</td>
<td>Energy Only Market now starting capacity mechanism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36% in Exchange, rest bilateral GDP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>India</th>
<th>Stage-1</th>
<th>Stage-2</th>
<th>Stage-3</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>Balancing / Unscheduled Interchange / ABT</td>
<td>2003</td>
<td>Electricity Act</td>
<td>2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2006</td>
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<td></td>
<td></td>
<td>2007</td>
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<td></td>
<td></td>
<td></td>
<td>2008</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>DEEP E-Platform for Reverse Auctions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Huge Over Cap. 90% in Long-Term Contracts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3% in Power Exchange</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Surcharges Levied</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Gradual Markets Transition Comparison

### Gradual Implementation

<table>
<thead>
<tr>
<th>Pakistan</th>
<th>Stage-1</th>
<th>Stage-2</th>
<th>Stage-3</th>
<th>Stage-4</th>
<th>Stage-5</th>
<th>Stage-6</th>
<th>Stage-7</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2017</td>
<td>2018-2020</td>
<td>Mid 2020</td>
<td>2020 Onwards</td>
<td>Around 2023-25</td>
<td></td>
<td></td>
<td>• Long-Term PPAs</td>
</tr>
<tr>
<td></td>
<td>Act Amendments</td>
<td>Market Detailed Design</td>
<td>Balancing Mechanism with Bilateral Contracts</td>
<td>Market Based Agreements in Future</td>
<td>Electronic Trading Platform may start</td>
<td></td>
<td></td>
<td>• Adequate capacity for next up-coming years</td>
</tr>
<tr>
<td></td>
<td>Proposed High-level Wholesale Market Model</td>
<td></td>
<td>Physical Market with BM Price serving as ‘Index’ or ‘Market Price’</td>
<td>Initially the BM will be used to clear difference and later for Merchant Selling</td>
<td>Around the same time Reverse E-auctions can also be started</td>
<td></td>
<td></td>
<td>• Inadequate Transmission system capacities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>From dispatch perspective it is like a Gross Pool, with commercial settlement based on the contracts</td>
<td>Merchant Generation &amp; even demand can later sell to BM</td>
<td>• Free Power will be paid only BM Prices</td>
<td></td>
<td></td>
<td>• Strengthening of SO, Planner and MO and different power entities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Competitive Bidding through IAA only ending with market based PPAs</td>
<td>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</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
New NEPRA Act, including Market Law

2017

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

2018-2020

• 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

2020

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

2020-2023

• Evolution in to Spot Market

2023-2025

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

2026 onwards
Lack of an agreed “best practice” design of the markets

- Central clearing in a pool
- Nodal prices
- Capacity and energy market
- ISO + independent trans. firms
- Financial rights point-to-point
- And others

- Bilateral markets
- Single /zonal prices
- Energy only
- TSO + Power exchanges
- Physical rights on flowgates
- And others
## 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 Enactment of NEPRA ACT 1997 (Amended vide 2018)

1b CTBCM Model Approval

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

3 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 CTBCM Commercial Operations Date, providing an Enabling Environment for Trading

5b 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

5b Electric Power Trader Licensee
   23 C & D

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 Separation of Supplier and Distribution Licenses
   23 E

8 Delicensing of Generation Companies 14 B

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Optimization Tools and Coordination

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

Data Institutionalization (Effort initiated by CPPA)

NTDC
- IGCEP *
- Least Cost Generation Expansion Plan
  - Size, Type and Time of Project

CPPA
- Dispatch Optimization **
- Basket Price Assessment, Market Simulation Modeling

NPCC
- Unit Commitment ***
- SC and Least Cost Dispatch Schedule, Unit Commitment

SC – Optimal Dispatch
- Operational Planning (Maintenance Scheduling, Fuel Planning, APPs, etc.)

* 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?
Bilateral Trading

Centralized Trading Integrated with System Operation
Pakistan’s Electricity Sector

Wholesale Electricity Market Operator

- ELECTRICITY GENERATION (ELECTRICITY)
- ELECTRICITY TRANSMISSION (NTDC)
- ELECTRICITY DISTRIBUTION (DISCOs)
- ELECTRICITY SUPPLY/RETAIL (DISCOs)
- END CONSUMER (HOMES/BUSINESS)

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

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

- One PPA with each Seller on behalf of Discos
- Contracts PPAs

Plus a Balancing Mechanism to settle contract deviations

CPPA-G Power Market Operator
CPPA G Transition to the CTBCM

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

- **Market Operator:** centralized market services
- **Special Purpose Supplier:** non “bilateralized” PPAs procurement
- **Independent Auctions Administrator:** new capacity procurement facilitator

Ring fence

Legal
Bilateral Contract Market with Balancing Mechanism
New Market Model – Features

- Agent separated from MO
- Existing PPAs
- New PPAs
- Competition for and in the Market
- New Capacity Procurement
- Market Participants
- K Electric
- Service Providers
- Grid Code Commercial Code, others
- Capacity Obligations
- Non Payment Risks
- Credit Cover (collateral)
- Centralized Economic Dispatch
- Low Performing Discos
- BME & BMC
- Contract Registrar
- Balancing Mechanism
- Bilateral Market
- Settlement and Payments
- Bilateral Contracts
- Invoicing and Payments
- Sale / Purchase Differences
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*
  - Dispatch Optimization*
- Short Term
  - NPCC
  - Unit Commitment***

* WASP, OptGen, Plexos
** SDDP licenses acquired
*** NCP