



Energy for Peace & Prosperity

**SAARC  
ENERGY  
CENTRE**

# On-line Training of SAARC Professionals on Power Purchase Agreements of Renewable Energy Projects



## **PANEL DISCUSSION: ELECTRICITY MARKET TRANSFORMATION IN PAKISTAN : CHALLENGES & WAY FORWARD**



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GOVERNMENT OF PAKISTAN**

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# FLOW

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graph LR; A((Overview of Pakistan Power Sector (PPS))) --> B((Key Parameters of Future Power Market)); B --> C((Future Demand Supply Projections)); C --> D((Challenges & Way Forward));
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**Overview of  
Pakistan  
Power Sector  
(PPS)**

**Key  
Parameters  
of Future  
Power  
Market**

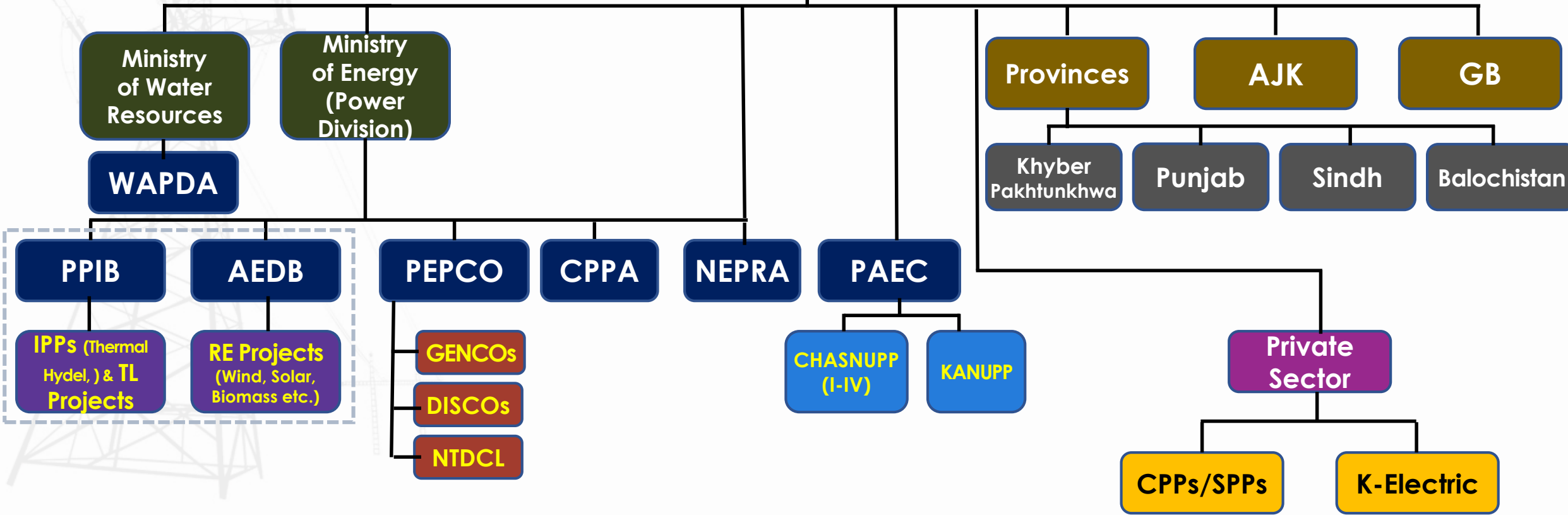
**Future  
Demand  
Supply  
Projections**

**Challenges  
& Way  
Forward**

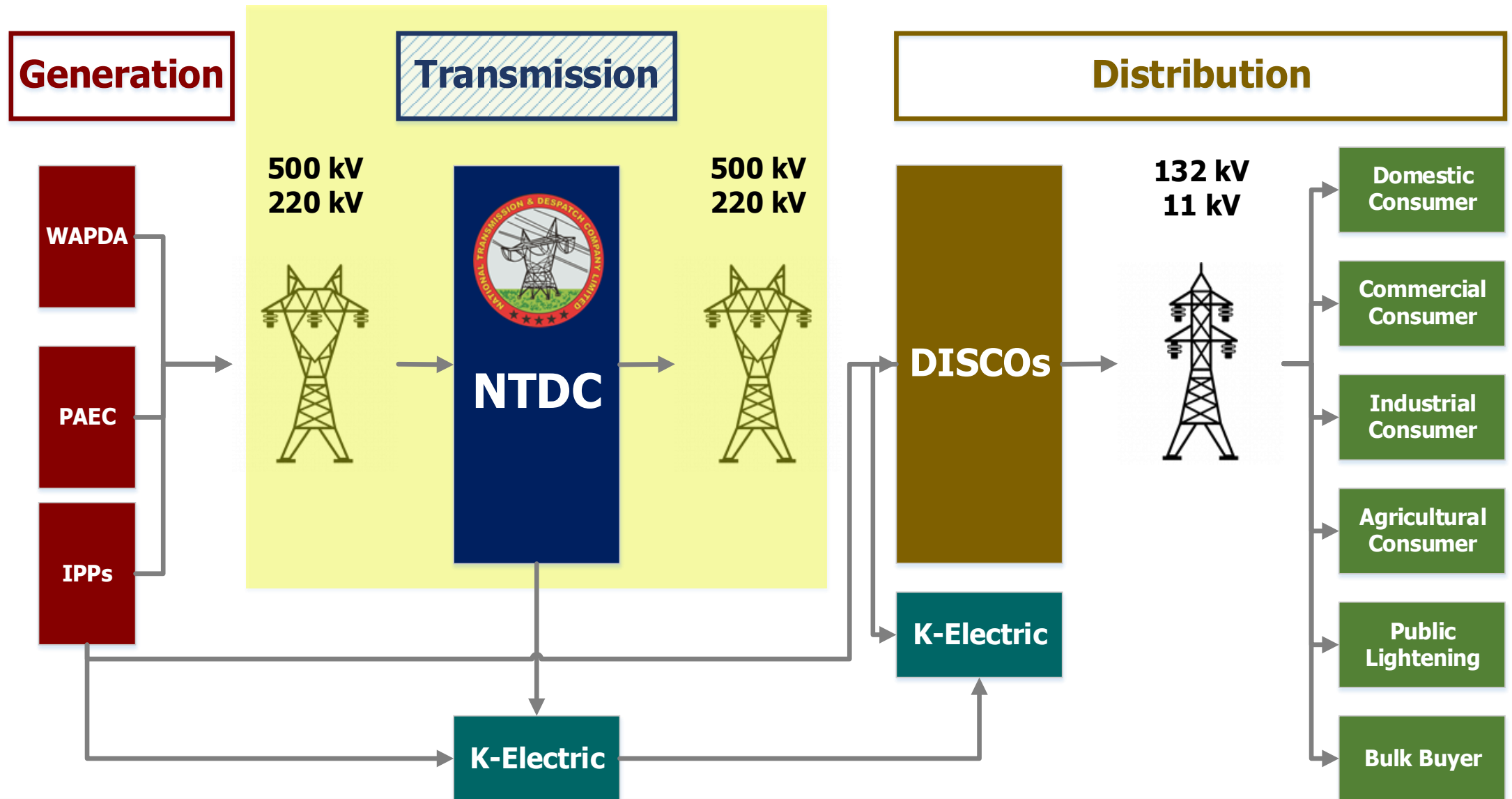
# PAKISTAN POWER SECTOR'S (PPS) STRUCTURE



Government of Pakistan



# PPS VALUE CHAIN



# TOTAL INSTALLED CAPACITY

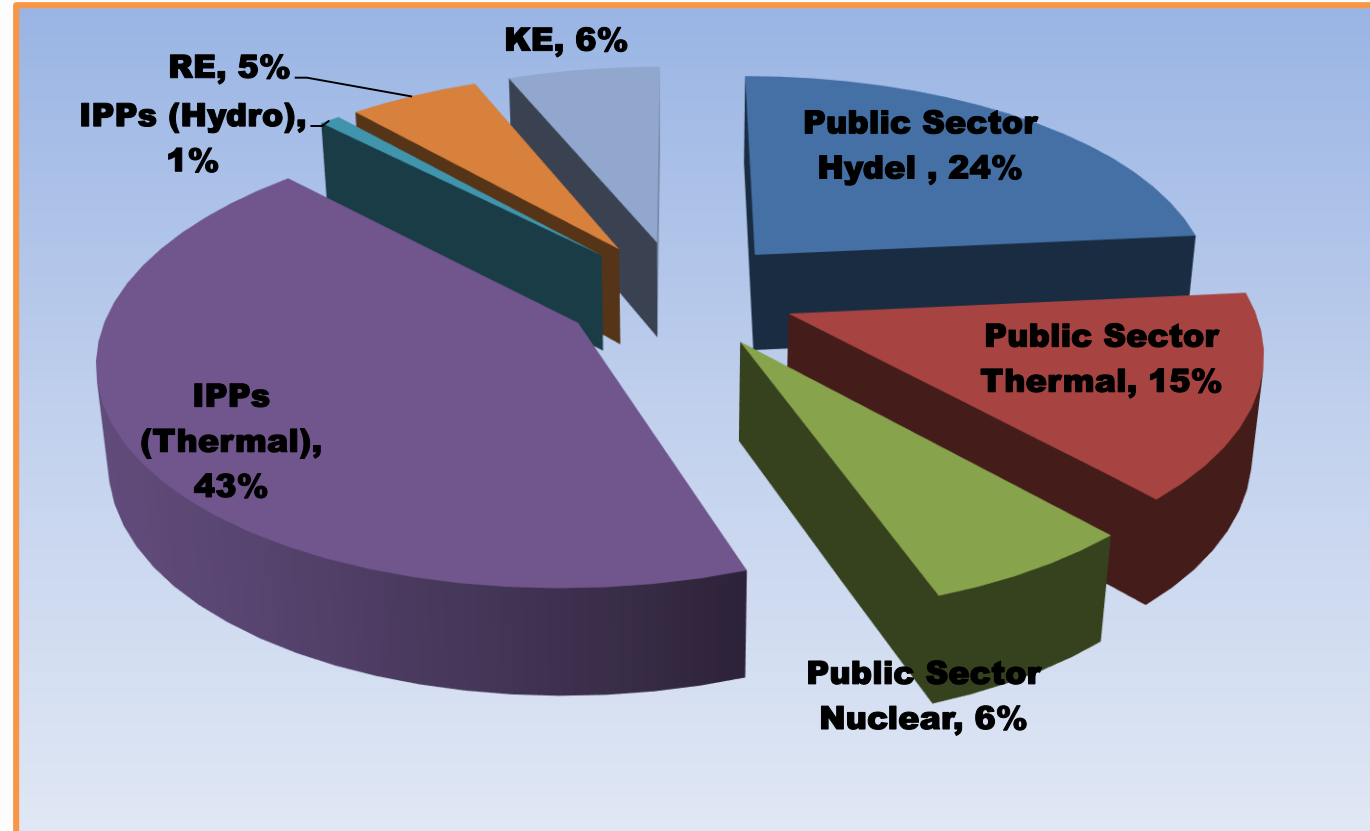
## Public Sector

Hydel	9,389 MW	(24%)
Thermal	5,782 MW *	(14%)
Nuclear	2,445 MW	(6%)
<b>Total</b>	<b><u>17,616 MW</u></b>	<b><u>(44%)</u></b>

## Private Sector

IPPs (Thermal)	17,218 MW	(43%)
IPPs (Hydel)	333 MW	(1%)
IPPs (RE)	2,151 MW	(5%)
KE	2,579 MW	(6%)
<b>Total</b>	<b><u>22,281 MW</u></b>	<b><u>(56%)</u></b>

IPPs (RE) includes (Wind 1235MW, Solar 400 MW, Biomass 364MW and SHPP 152 MW )



**Total Installed Capacity**

**39,897 MW**

**NTDC System Capacity**

**37,318 MW**

**NTDC System Dependable Capacity**

**33,816 MW**

# EVOLUTION OF PAKISTAN POWER SECTOR

- Earlier Pakistan Power Sector was dominated by two Vertical Integrated Utilities i.e. [WAPDA and KESC \(now K-Electric\)](#)
- WAPDA's Strategic Plan 1992 - WAPDA unbundled into [One TRANSCO \(NTDC\), Ten DISCOs and Four GENCOs](#)
- PPIB as GoP's One-window facilitator was created in 1994 to promote, encourage, and safeguard private sector investments in power sector
- Regulatory regime was introduced in 1997 through creation of National Electric Power Authority.
- The ultimate objective of reforms was to liberalize and open market to bring efficiency, competition and transparency in electricity sector

# PPIB ROLE IN ATTRACTING INVESTMENT

- PPIB's facilitated GOP in development and Implementation of various Policies - 1994, 1995, 2002 and 2015 Generation Policies and 2015 Transmission Line Policy
- World leading investors, lenders and companies participated and supported sector's development and country's economic growth
- Inducted 40 IPPs of 17,551 MW with investment of US\$ 20 billion and one 900 KM Long, 4,000 MW capacity, +-660 kV, HVDC, TL Project
- Upto 70% electricity is supplied to the National Grid by these IPPs
- Currently PPIB is processing new portfolio of 22 IPPs of 12,000 MW

# SECURITY PACKAGE DOCUMENTS FOR IPPs

- Standard Security Package includes; IA, PPA, FSA/CSA/GSA/WUA and DIA
- Term of PPA - 30 Years , Thermal Projects on BOO basis, Hydel on BOOT basis
- Governing Law for IA & PPA - Pakistani Law
- English Law for DIA where Foreign Lenders are Involved
- Three tier dispute resolution mechanism;
  - Mutual discussions between parties
  - Determination by Expert:
  - Arbitration under LCIA/UNCITRAL Rules;
    - ✓ Venue: Pakistan if Dispute amount < 10 Million US\$ and London if amount > 10 Million US\$
- Assurances and GoP Support including compensation in case of termination of Project



# STRENGTHS OF PPS

- Presence of Renowned International Players - Project Developers, Technology Giants, Equity Partners, Financial Institutions etc.
- Large Participation of Private Sector including leading Domestic and International Groups
- Diversified Technology Mix in Power Generation and Transmission Sector
- Diversified Fuel Mix - Hydro, Indigenous High & Low Btu Gas, RLNG, Local and Imported Coal, Oil, Renewables (Wind, Solar, Biomass etc.)
- Environmental Sustainability – Low Contribution towards Carbon Emissions (356 gCO<sub>2</sub>/kWh) in comparison to world average of (475 gCO<sub>2</sub>/kWh)
- Presence of huge Indigenous and Renewable Energy Potential
- Transparent and Simplified Policy & Regulatory Frameworks
- Institutional Reputation and Credibility & Human Capital

# FUTURE ELECTRICITY MARKET - CTBCM

- Approval of development of Wholesale Electricity Market by GoP, April 2015
- Preparation of Conceptual Design of CTBCM by CPPA-G, March 2018
- Approval of CTBCM's Conceptual Design by NEPRA, December 2019
- Approval of Detailed Design by NEPRA, November 2020
- Targeted COD of Market, 2<sup>nd</sup> Quarter 2022
- Transition from 'Single Buyer Model' towards Multiple Buyers 'Competitive Bilateral Contract Market' with following key characteristics:
  - Contracts covering volatility of generation prices / cost for Buyer and Ensuring cash flow for Seller
  - Security of supply for Buyer through purchase of generation capacity
  - Mechanism for explicit allocation of T&D losses
  - Balancing Mechanisms for Energy and Capacity

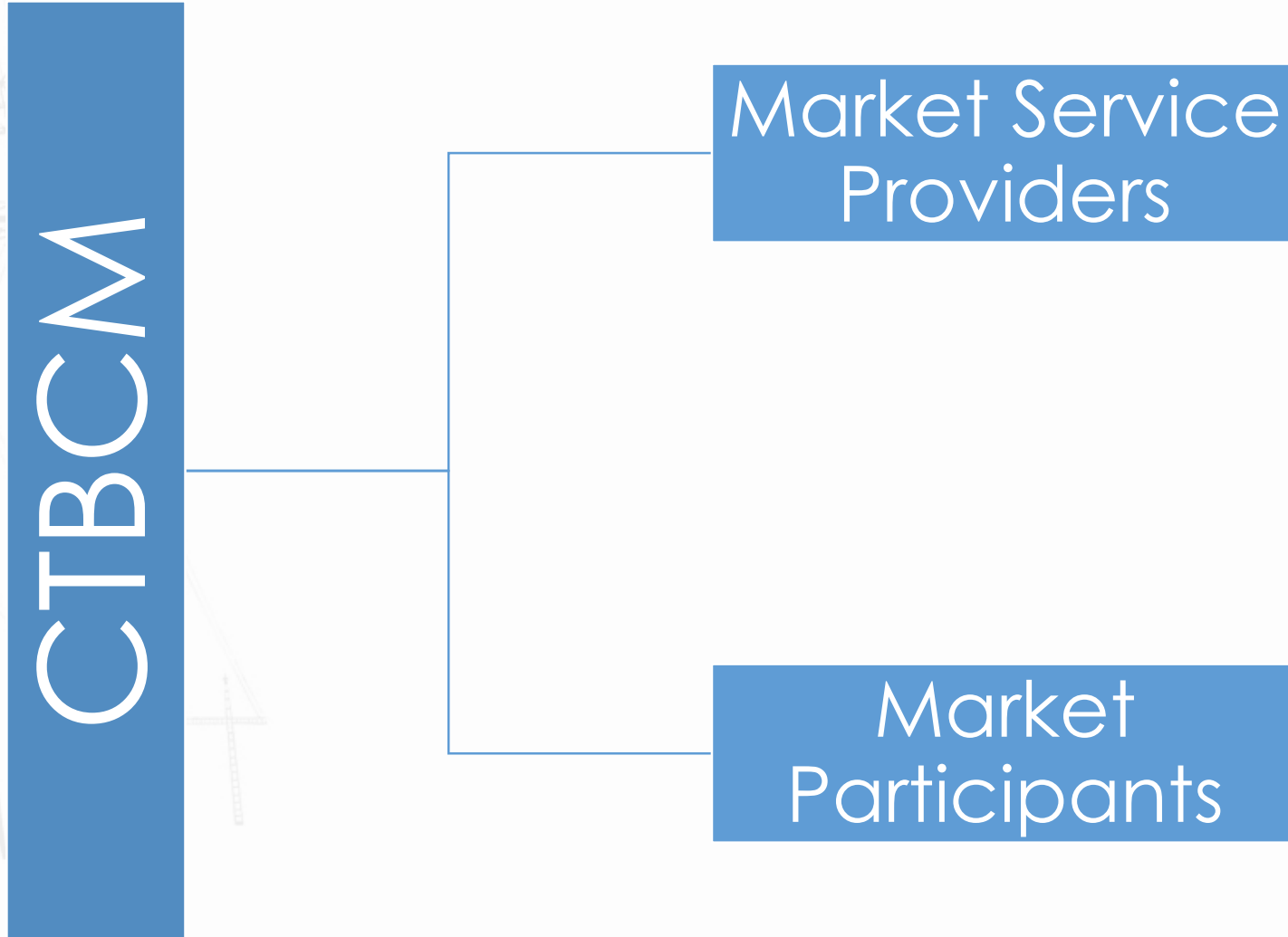
# CTBCM DESIGN PARAMETERS (1/2)

Parameter	Adopted for CTBCM
<a href="#"><u>Gross Pool</u></a>	CTBCM is <b>Gross Pool</b> with Security Constrained Economic Dispatch ( <b>SCED</b> )
<a href="#"><u>Market Architecture</u></a>	<b>Real Time Market</b> with ex-post settlement
<a href="#"><u>Products</u></a>	Energy and Capacity with Balancing Mechanisms
<a href="#"><u>Resource Adequacy</u></a>	Ensured through Capacity Obligations, & centralized Auctions
<a href="#"><u>Basis of Market Price</u></a>	Variable Cost Based
<a href="#"><u>Market Price Formation</u></a>	Single Price (System Marginal Cost)
<a href="#"><u>Market Clearing</u></a>	MO Clears the imbalances only in Pool

# CTBCM DESIGN PARAMETERS (2/2)

Parameter	Adopted for CTBCM
<a href="#"><u>Procurement for Base Supplier - Regulated Tariff</u></a>	Centralized procurement for all DISCOs, Contracts signed individually proportional to their demand
<a href="#"><u>Procurement by Competitive Suppliers for BPCs</u></a>	Mutually negotiated bilateral contracts
<a href="#"><u>Contracts Types</u></a>	Forward Supply Contracts with SCED: <ul style="list-style-type: none"><li>• Load following</li><li>• Generation following</li><li>• Fixed quantities</li><li>• Capacity associated Energy</li><li>• Energy Only</li><li>• Capacity only</li></ul>
<a href="#"><u>Types of Consumers</u></a> & Provision of Network Services	<ul style="list-style-type: none"><li>• Eligible Consumers (BPC <math>\geq</math> 1MW)</li><li>• Non-Eligible Consumers (&lt; 1MW)</li></ul>

# CTBCM KEY PLAYERS



# MARKET SERVICE PROVIDERS

<b>Market Operator</b>	Organization and Administration of Market and Payment Settlements amongst Market Participants
<b>System Operator</b>	Transmission and Dispatch System Administration
<b>Metering Service Provider</b>	Providing Metering Services
<b>Transmission Service Provider</b>	Providing Transmission Infrastructure and Network Operation
<b>Distribution Network Service Providers</b>	DISCOs and K-Electric
<b>Independent Auction Administrator</b>	<ul style="list-style-type: none"><li>• To procure Capacity for DISCOs through Auctions</li><li>• Arrange Guarantees for weak DISCOs</li><li>• Procurement Planning for DISCOs</li></ul>

# MARKET PARTICIPANTS

## **Generators**

Generation and Selling of Electricity

## **Bulk Power Consumers**

Procurement of Electricity in Bulk Quantities

## **Suppliers**

Selling of Electricity to end Consumers

- Competitive Suppliers
- Last Resort Suppliers

## **Traders**

Buying and Selling of Electricity

# FUTURE DEMAND SUPPLY PROJECTIONS

- NTDC's Indicative Generation Capacity Expansion Plan (IGCEP) 2021- 30
- Demand & Supply Projection under Base Case Scenario - GDP 3.94% to 5.7%

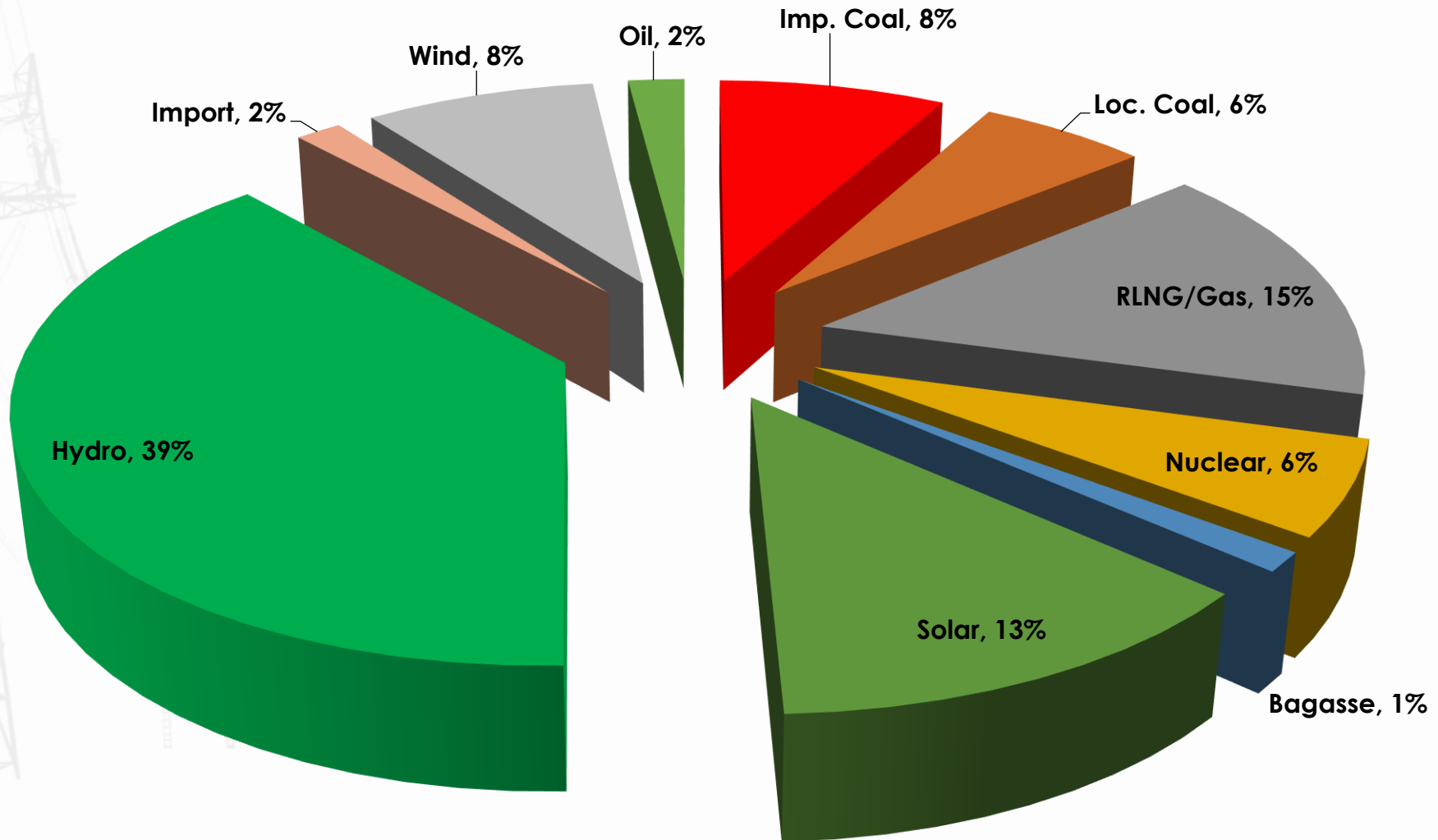
YEAR	Generation GWh	PEAK DEMAND (MW)	GENERATION CAPACITY (MW)
2022	136,151	24,574	40,119
2025	174,102	30,814	48,521
2030	207,418	37,129	61,112

- NPV Investment requirements of 39.2 billion US\$ against CAPEX and OPEX, in addition to existing capacity payments and CAPEX of committed projects.

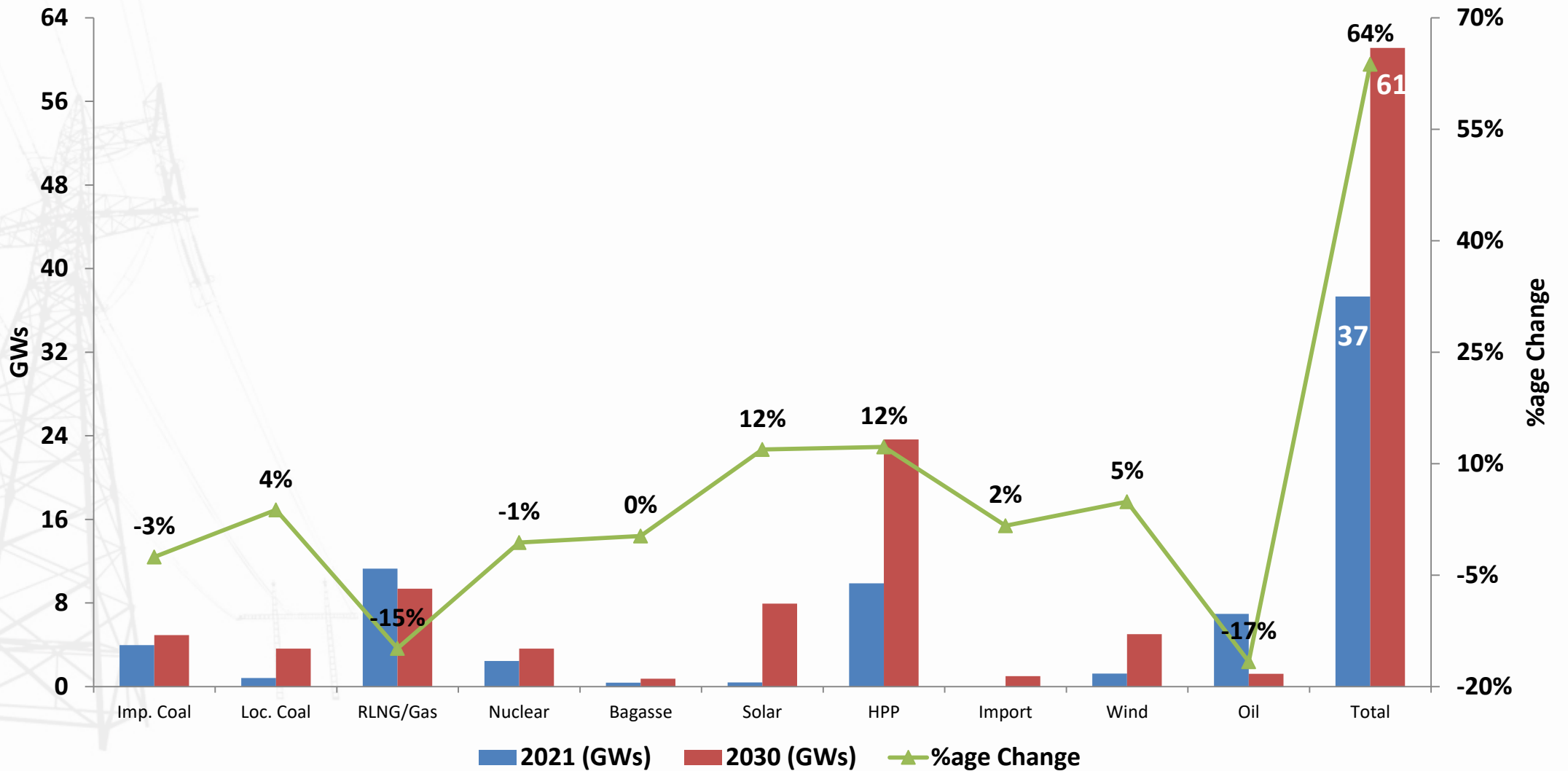


# GENERATION CAPACITY 2030 - FUEL MIX

Installed Capacity 2030 (61 GW) - Fuel Mix



# GENERATION CAPACITY 2021 vs 2030 - FUEL MIX



# PAKISTAN'S NDCs AND GREEN POLICIES

## PAKISTAN UPDATED NDCs 2021

Voluntary Contribution of Overall  
**50%**  
reduction of Pakistan's Projected emissions by **2030**  
**15% unconditional**  
**35% conditional**



Initiatives take by Government of Pakistan contributed to reduction of  
**8.7%**  
emissions between **2016** and **2018**



  
**New sectors:**  
Blue carbon ecosystems, health, waste, carbon markets and air pollution

**Ten Billion Tree Tsunami**  
TBTP will sequester **148.76 MtCO<sub>2</sub>e** emissions over the next 10 years

**Inclusive Youth**  
**Gender**


### High Priority Actions

**Mitigation**  
Renewable Energy  
**60%** by 2030



Moratorium on new coal power plants  
No generation of power through imported coal



Electric Vehicles  
**30%** by 2030



Continued investments in NbS



**Adaptation**  
Indus Basin- flood risk mitigation and enhanced water recharge



Enhancing PROTECTED AREAS cover from **12% to 15%** by 2023



# CHALLENGES

- Long-term PPAs and Committed Projects – Limit Competition on Capacity Procurement for next five to ten years
- Contractual obligations “Min Take or Pay” under existing PPAs – Restrict Competition on Energy Purchase
- Attracting Investment under New Market Dynamics
- Achieving target of 60% share of clean and renewable energy by 2030
- Grid Stability / T& D Network Augmentation to integrate VRE large %age
- Multi-billion dollars investment requirements in grid infrastructure
- Financial Sustainability – Circular Debt

# WAY FORWARD

- National Electricity Policy (NEP) 2021 - Indigenization & Environment
- Finalization of IGCEP - Demand Supply Projections on Least Cost Basis
- Formulation of Transmission System Expansion Plan
- Sectoral Policy Frameworks to be prepared – New Market Dynamics
- New PPAs Structure - Balanced Risk Sharing Mechanism
- Smart Technologies Intervention - Distribution Losses & Theft Control
- Distributed Generation and DSM
- Capacity Building of key organizations



***THANK YOU***

# Sources

- 1) <http://www.ppib.gov.pk/>
- 2) <https://www.nepra.org.pk/>
- 3) <https://ntdc.gov.pk/>
- 4) <https://www.aedb.org/>
- 5) <https://www.cppa.gov.pk/>
- 6) [https://legacy-assets.eenews.net/open\\_files/assets/2019/03/26/document\\_cw\\_01.pdf](https://legacy-assets.eenews.net/open_files/assets/2019/03/26/document_cw_01.pdf)
- 7) <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf>
- 8) [http://www.finance.gov.pk/survey\\_2021.html](http://www.finance.gov.pk/survey_2021.html)

# POWER GENERATION POLICY 2015 (1/2)

## SALIENT FEATURES

- **Exemption** - Corporate Income Tax, Turnover Tax, Withholding Tax and Sales Tax
- **Only 5% concessionary Import Duty** on plant & equipment not manufactured locally
- **GOP Guarantees obligations of Power Purchaser & Provinces**
- **Protection against Political Force Majeure and Change in Law**
- **Hydro Projects** - Hydrological risk on Power Purchaser & WUC to concerned province
- **Attractive ROE (IRR based) determined by the Regulator (NEPRA)**
- **Tariff re-openers for Hydropower Projects:** (i) Cost Escalation in Civil and E&M works (ii) Resettlement Cost (iii) Cost variation due to Geological Conditions in Tunnels
- **Tariff indexation** - inflation (US CPI & Pak WPI), foreign costs US \$/Rupee parity
- **GoP assures** conversion of Pak Rupee & remittance of foreign exchange for projects
- **Tripartite Letter of Support (LOS) Regime**



## MODES OF PROJECTS AWARD

### Hydropower Projects

- **ICB** – Bankable Feasibility Study and Detailed Engineering Design Available
- **Raw Site Projects** – Solicitation of Project Proposal and award to highest ranked applicant
- **Small Hydropower Projects** - under Upfront Tariff announced by NEPRA

### Thermal Power Projects

#### A. Solicited Projects

- ICB on levelized tariff or discount on upfront /benchmark tariff by NEPRA
- Invitation of proposals in response to EOI where NEPRA has announced Upfront Tariff

#### B. Projects Awarded/Recommended by Provincial/AJK/GB Government

#### C. Alternate Modes, include inter alia the following;

- Proposals submitted by Sponsors pursuant to Upfront Tariff announced by NEPRA
- Dedicated Gas Field Projects, low Heating Value: E&P Companies right of first refusal
- Projects through PPP Mode where private partner selected by a public sector entity
- Projects under bilateral agreements with the GOP

# POLICY FRAMEWORK FOR TRANSMISSION LINE PROJECTS 2015

- **Award of Projects - Through ICB and Upfront Tariff**
- **Transmission Line & Grid Station / Converter Station- 220 kV and above (HVAC & HVDC)**
- **Acquisition of Land & Right of Way to be provided by NTDC**
- **Project Term: 25 years on BOOT basis**
- **NTDC to pay a fixed Transmission Service Charge, regardless of the quantum of energy**
- **Exemption for first 10 Years - Income Tax, Turnover Tax, Withholding Tax and Sales Tax**
- **Only 5% concessionary Import Duty - Plant and Equipment not manufactured locally**
- **GOP to provide Guarantee for securing payment obligations of NTDCCL**
- **Protection against Political Force Majeure risk and changes in certain taxes and duties**
- **Tariff indexation - inflation (US CPI & Pak WPI), foreign costs US \$/Rupee Exchange rate**