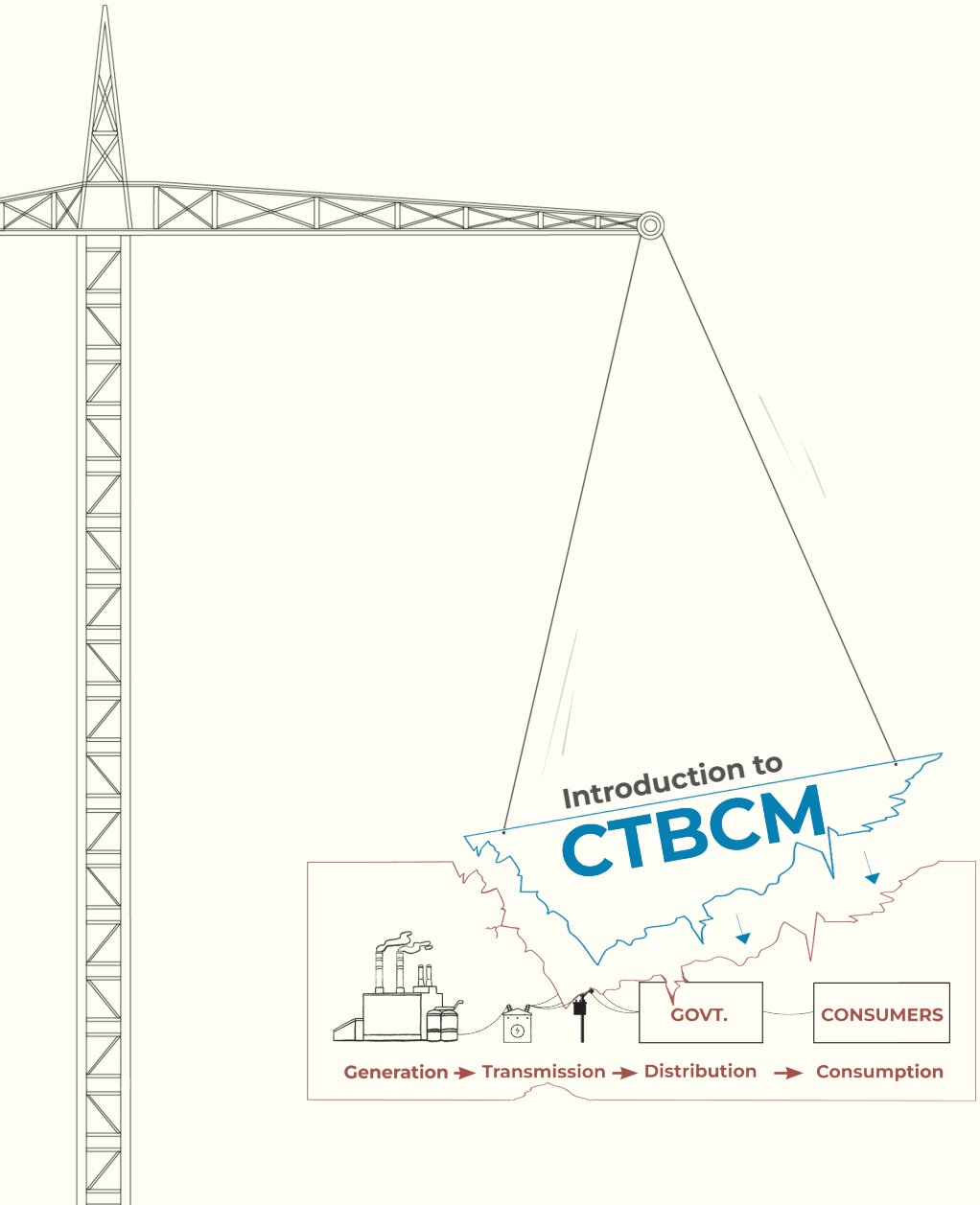
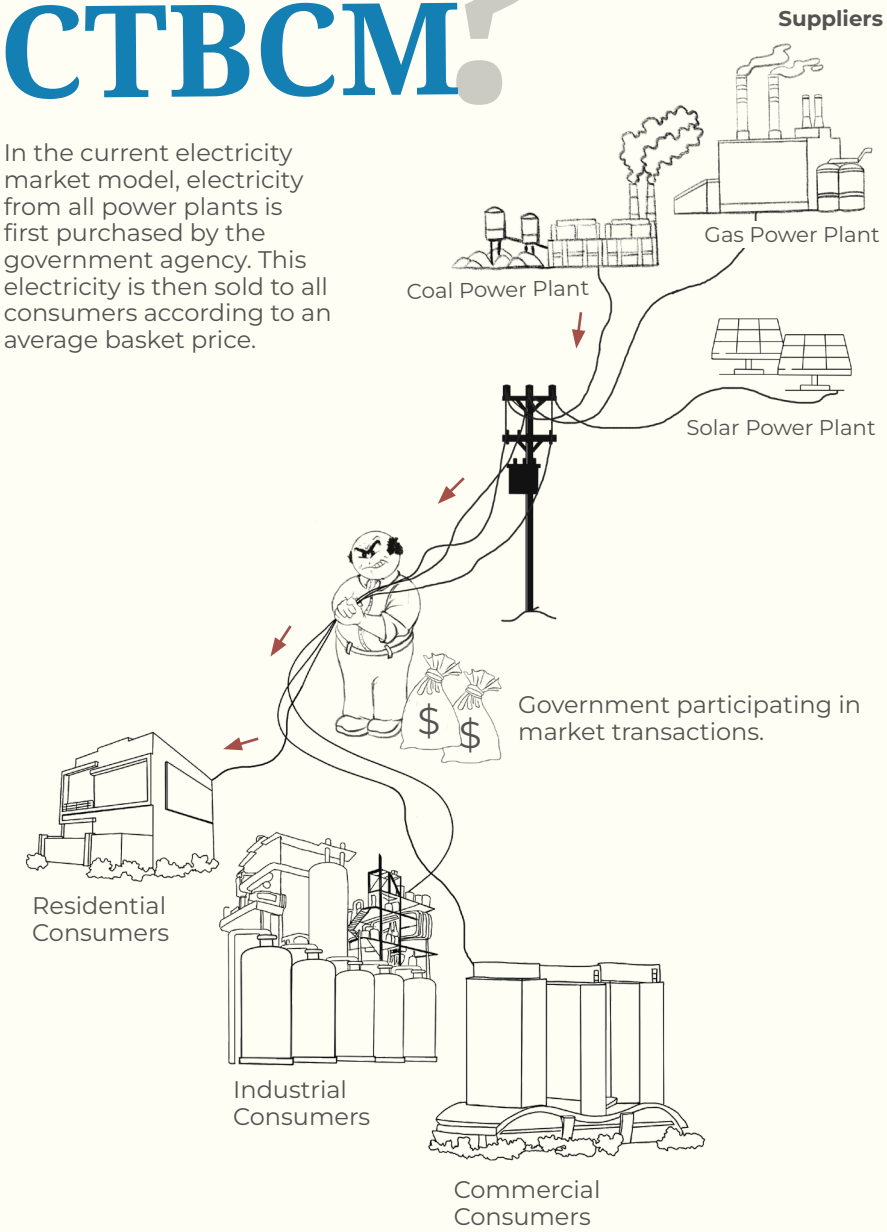
RENEWABLES FIRST



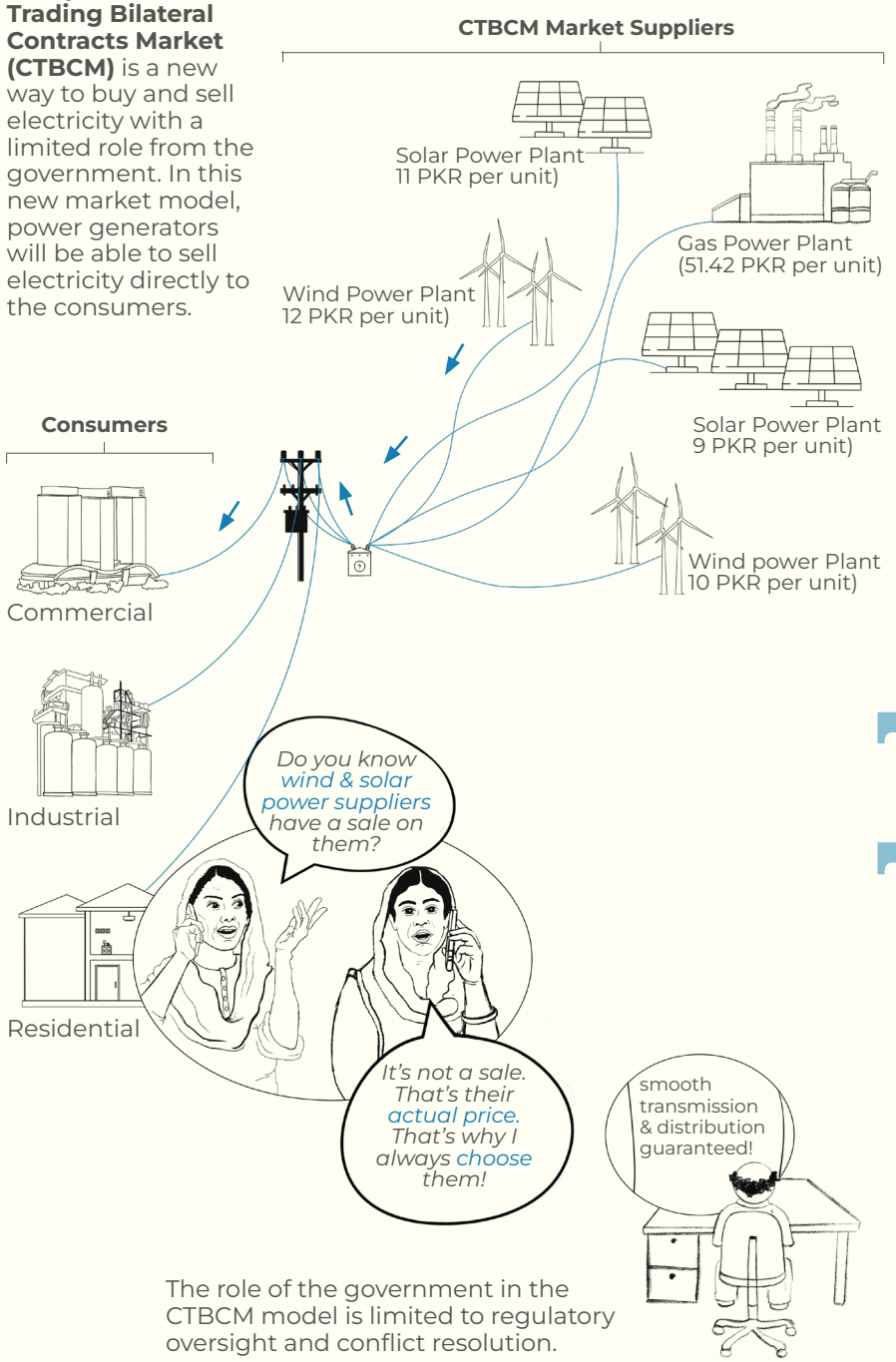
What is CTBCM?

In the current electricity market model, electricity from all power plants is first purchased by the government agency. This electricity is then sold to all consumers according to an average basket price.



old model

Competitive Trading Bilateral Contracts Market (CTBCM) is a new way to buy and sell electricity with a limited role from the government. In this new market model, power generators will be able to sell electricity directly to the consumers.



The role of the government in the CTBCM model is limited to regulatory oversight and conflict resolution.

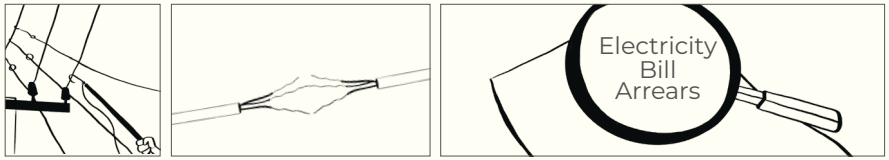
new model

Why is CTBCM important?

Demerits of the Existing System

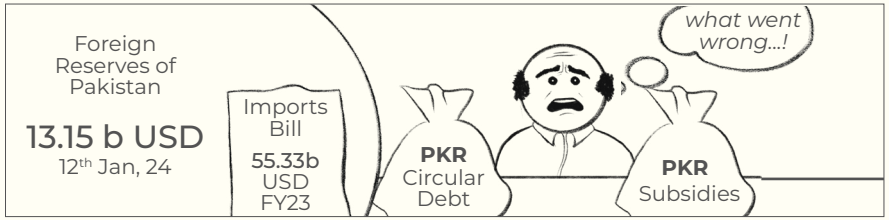
1. Inefficiencies

- Electricity theft
- Transmission & distribution losses
- Delays in payments
- Poor cost recovery



2. Govt. Liabilities

- Circular debt
- Forex drain
- Subsidies



3. Lack of Competition

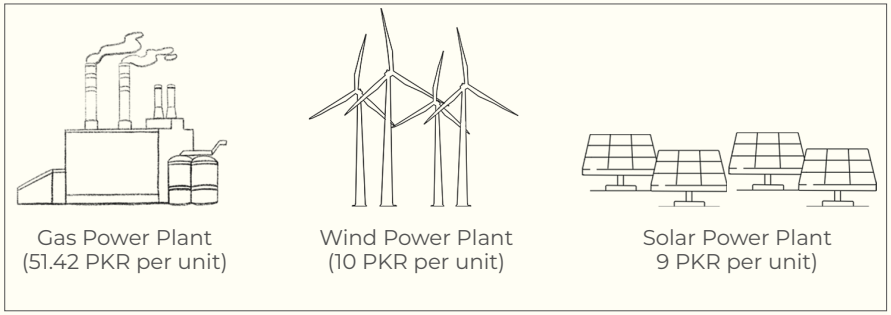
- Higher costs & limited choices for consumers
- Reduces service quality
- Limited innovation & technological advancements

old model

Merits of the CTBCM Model

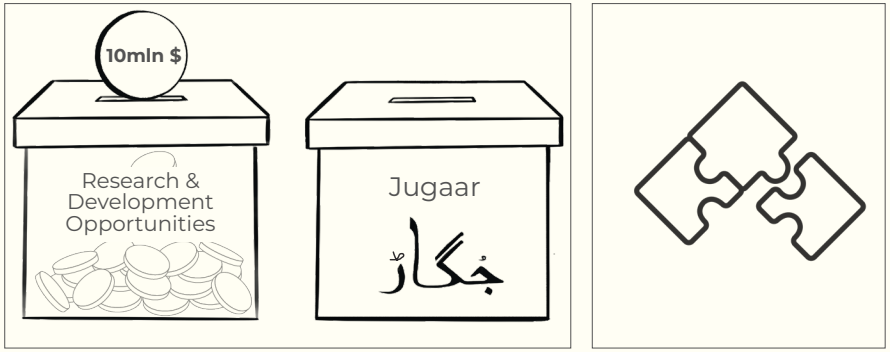
1. Competition & Choices

- Increases competition among suppliers & results in lowers prices
- Provides flexible negotiable terms & more choices to the consumers
- Attracts more investments



2. Innovation & Technological Advancements

- Increases investment in research & development
- Creates opportunities for integration of innovative energy solutions
- Encourages entrepreneurial initiatives & partnerships



new model

How will the market shift to CTBCM?

The idea of a bilateral market was first proposed in 1992 in the WAPDA Strategic Plan. Since then, Pakistan has come a long way on its journey of progress towards a competitive electricity market, with multiple reforms shaping its path over the last 30 years.

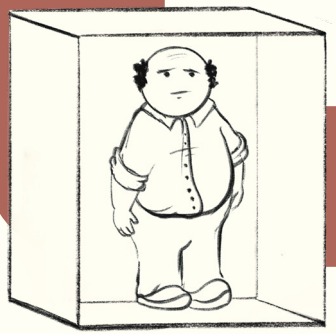
The success of this initiative, however, depends upon free and fair competition, transparency and grid accessibility to foster market participation.

WAPDA Strategic Plan 1992

From FY-1997 to FY-2017, political instability, policy inconsistencies, and challenges in implementing reforms disrupted the continuity needed for establishing a bilateral market.

NEPRA Act 1997

The NEPRA Act of 1997 established NEPRA as an independent power regulator to grant licenses, monitor electricity tariffs, ensure transparency, and bolster investor confidence.



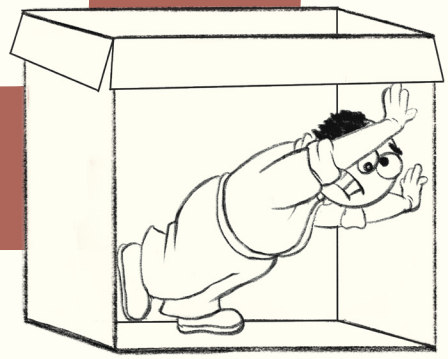
Market Operator Formed, CTBCM Model Prepared 2017

NEPRA amendment act 2018 enabled the regulatory framework for CTBCM

CTBCM Model Approved 2020

Trial Run of CTBCM 2022

Fair Settlement of Grid-Use (Wheeling) Charges 2024

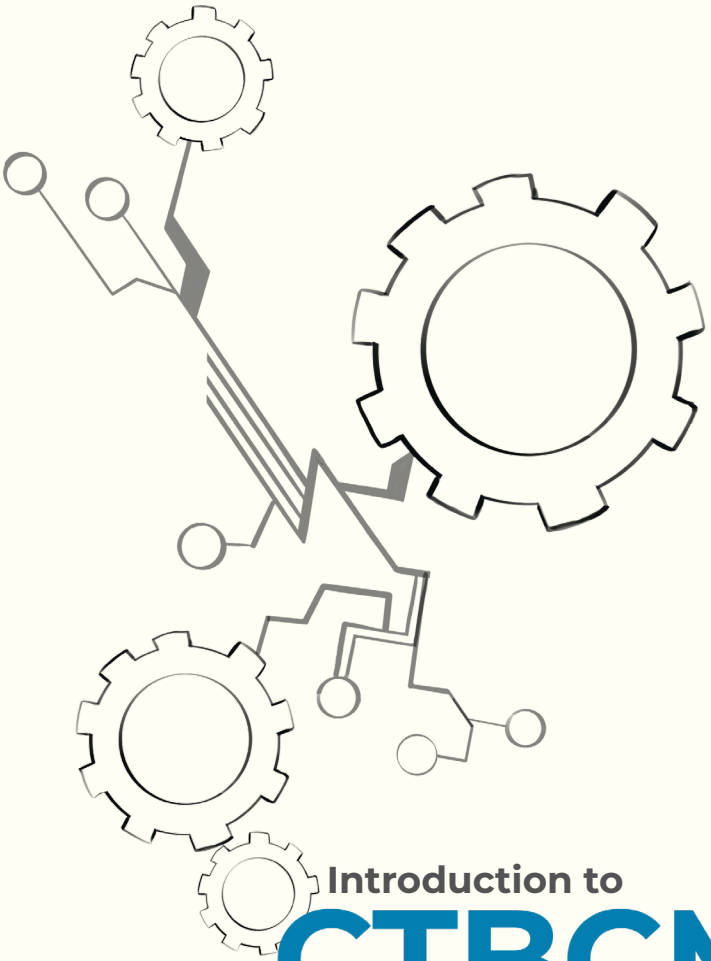


The operational success of CTBCM will depend upon:

- ◊ Consistency in policies
- ◊ Stakeholder confidence
- ◊ Transparency & fairness
- ◊ Accessibility & inclusivity
- ◊ Low cost of participation
- ◊ Long-term economic & political stability

The CTBCM initiative has great potential to solve the long-standing problems of Pakistan's electricity sector. Through an inclusive, well-coordinated, consistent, and interference-free implementation, CTBCM can make Pakistan competitive in the world through affordable energy availability. In the long run, it can act as a catalyst of change towards sustainable energy systems.

RENEWABLES FIRST



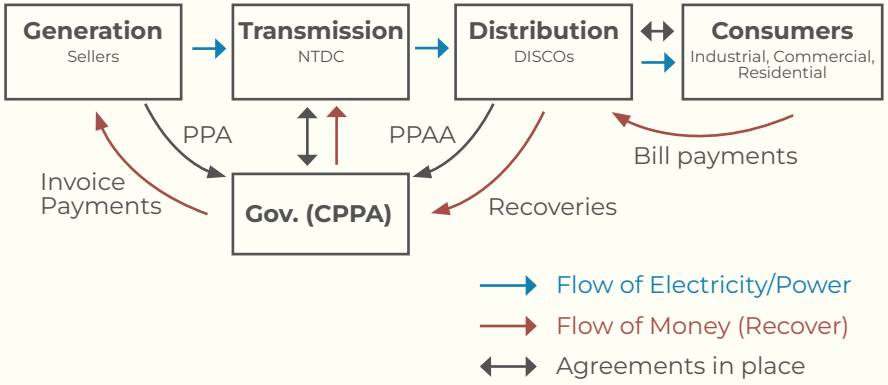
Introduction to CTBCM (Advanced)

What is CTBCM?

The Current Electricity Market of Pakistan

The existing power market structure in Pakistan follows a single-buyer model, where the CPPA-G (or government) functions as the sole power purchaser.

The government also manages contractual agreements through Central Power Purchasing Agency (CPPA-G), facilitating the commercial transactions between all the departments of the electricity sector (generation, transmission, distribution etc.).



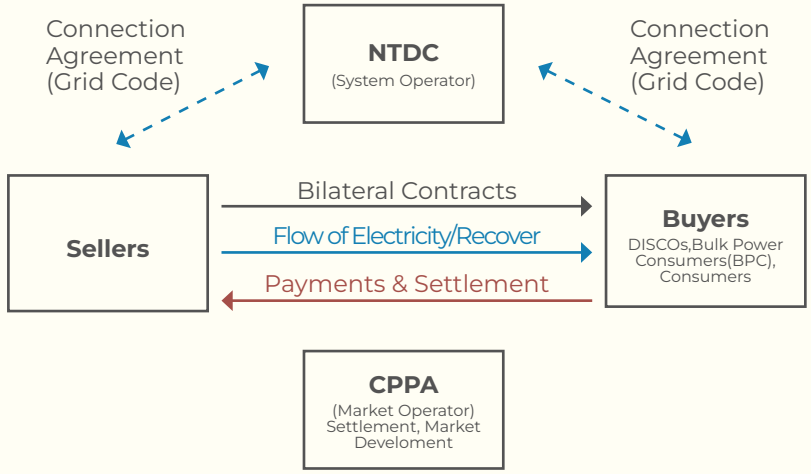
- PPA is the agreement between CPPA-G and the generation companies to buy their power on behalf of distribution companies (DISCOs)
- PPAA is the agreement CPPA-G does with the distribution companies on behalf of the generation companies to collect the payments for the power purchased by the DISCOs

old model

Competitive Trading Bilateral Contracts Market (CTBCM)

The Competitive Trading Bilateral Contracts Market (CTBCM) is the new model proposed by NEPRA to allow trading of electricity units between buyers and sellers through bilateral contracts in a competitive environment.

The CTBCM is a market model which aims to introduce competition and efficiency into the power sector by allowing market forces to determine prices and quantities of electricity traded through bilateral agreements.



- A bilateral contract is an agreement between a seller and a buyer for the purchase and sale of electricity at agreed-upon terms, including price, quantity, and duration.
- The government cannot participate in commercial transactions. Instead, its role will be limited to regulatory oversight, market development & monitoring, and grid management (to ensure fairness, prevent market abuse, and maintain grid stability).

new model

Why is CTBCM important?

Demerits of the Existing Electricity Market Structure:

- **Generation Capacity Issues:** Mismatch between seasonal electricity demand results in both excess capacity in winter, as well as insufficient generation capacity in summer (which leads to frequent power outages and load shedding). As a result, stranded costs increase in the form of capacity payments which has a direct impact on national economic growth.
- **Reliance on Fossil Fuels:** Heavy dependence on fossil fuels such as oil and gas for power generation contributes to price volatility and environmental concerns.
- **Forex Drain:** The power sector fuel imports have a major share in the total energy import bill of the country.
- **Lack of Competition:** The current power market operates as a single-buyer system where the CPPA holds exclusive purchasing authority and acts as the sole seller of electricity. This absence of competition deprives consumers of alternate choices, establishing a monopoly within the electricity market.
- **Circular Debt Problem:** Circular debt (CD) is also termed as the power sector payables. It is a chain of unsettled invoices / unpaid bills, unpaid subsidies, and poor recoveries, where receivables of one segment of the power sector value chain become payable to others. CD reached PKR 2.6 trillion by the end of October 2023, witnessing a 13% increase from the previous fiscal year when it was PKR 2.3 trillion. CD is approximately ~45% of annual tax GDP, growing at 10% of tax revenue per annum .
- **Lack of Auctions:** A significant drawback of the current power market structure lies in the government's inability to conduct auctions for cost-effective Category-III renewable energy projects and delayed payments to the existing ones. This inability hinders the integration of potentially affordable renewable energy sources into the market. As a result, despite the presence of viable projects awaiting tariff, the absence of auctions prevents their inclusion, hindering the diversification of the energy mix and potentially denying consumers access to more affordable and sustainable energy options.

old model

Merits of the CTBCM:

- **Market Competition and Efficiency:** A competitive market will lead to more efficient resource allocation, increased innovation, and better service quality in the power sector. Market forces could incentivize the adoption of cleaner and cost-effective technologies.
- **Attracting Private Investment:** CTBCM's competitive market structure, profit incentives, reduced regulatory barriers, diverse energy portfolio, stability, and supportive government policies collectively make it an appealing prospect for private investment in the power sector.
- **Enhanced Generation Capacity:** By attracting private investments, CTBCM will foster the development of diverse and increased power generation capacity. This will lead to an increase of renewable energy sources in the energy-mix due to their competitiveness, potentially reducing reliance on fossil fuels.
- **Energy Security and Stability:** A well-functioning CTBCM could enhance energy security by diversifying energy sources, reducing dependency on specific fuels or regions for power generation.
- **Consumer Choice and Affordability:** A competitive market offers consumers choices in selecting their power providers, potentially leading to competitive pricing and improved services.
- **Regulatory Reforms:** Introduction of robust regulatory frameworks and policies supporting market competition, will ensure fair practices leading to economic viability .

Additional Benefits:

Avoiding Stranded Costs: CTBCM is expected to mitigate stranded costs resulting from the government's poor planning decisions, offering a path to free buyers and sellers from these burdens.

Enhanced DISCO Performance: Competition in the market will drive DISCOs to elevate their efficiency and services to retain customers, compelling them to improve their performance.

Renewable Energy Advantage: With renewables boasting low costs (below 4 cents per unit), a competitive market will favor their prominence, leveraging their cost advantage.

Reduced Dependence on Government Generation Planning: CTBCM will diminish reliance on NTDC and government decisions, which historically showcased poor judgment, ensuring the power sector's future expansion aligns with cost-effective principles.

Merit-Based Operation: Operating plants on merit will become imperative within CTBCM, compelling the system operator to avoid penalties by prioritizing efficient plant operations.

new model

How will the market **shift** to CTBCM?

Market History and Future Transition

The following is a brief history of the development of power sector reforms in the country:

In **1992**, the "Power Sector Strategic Plan for Restructuring and Reform" was issued with the aim of unbundling, regulating, and privatizing the existing generation and distribution components, to attract private sector investment and improve sector efficiency.

In **1994**, the National Power Policy was formulated which introduced "Policy Framework and Package of Incentives for Private Power Generation Projects in Pakistan" aimed to attract private capital to the sector and to standardize the conditions for investment for IPPS. This policy laid the groundwork for a more liberalized market by encouraging private investment and breaking the monopoly of the public sector in power generation.

In **1997**, under the "Regulation of Generation, Transmission and Distribution of Electric Power Act", the National Electric Power Regulatory Authority (NEPRA) was established to develop a regulatory framework to ensure "safe, reliable, efficient and affordable electric power to the electricity consumers of Pakistan" and to "facilitate the transition from a protected monopoly service structure to a competitive environment".

2002

NTDC was granted Transmission License to perform five functions:

- ◊ Transmission Network Operator
- ◊ System Operator
- ◊ Planner
- ◊ Metering Service Provider
- ◊ 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

-"... Innovative business and regulatory models will be deployed to weaken the monopolies, increase efficiencies, and decrease costs through competition. Wheeling charges and whole sale marketsmay be introduced to introduce multiple buyersand sellers in the marketplace.

2015

CPPA Operationalized

- ◊ ECC Decision April
- ◊ CPPA through consultation prepare CTBCM Model & Plan by June 2017
- ◊ CTBCM is for wholesale market
- ◊ Will be approved by NEPRA
- ◊ Commercial operations date: June 2020

2017

CPPA prepared & submitted the Model & Plan to Board;

- ◊ The board formed a special committee for evaluation of the Plan.
- ◊ Consultations with SECP

2018

- ◊ CTBCM Model & Plan submitted to NEPRA for review
- ◊ Enactment of NEPRA Amendment Act 2018

2020

- ◊ CTBCM Model & Plan approved by NEPRA

2021

- ◊ National Electricity Policy 2021 formed
- ◊ Policy directions for development of efficient & liquid power market design as er clause 14b(2b) of NEPRA Amendment Act

2022

- ◊ NEPRA formulated the market regulations, and granted licenses to various institutions (market operator, market participants, and service providers)
- ◊ Test / trial run of CTBCM for six months

2023

- ◊ National Electricity Plan 2023-27 developed as per clause 14A (2b) of NEPRA Amendment Act
- ◊ CPPA (MO) has submitted the final test run (FTR) report to NEPRA for review
- ◊ Delicensing of generation companies as per clause 14B of the Act
- ◊ Separation of distribution and supplier licenses as per clause 23E of the Act

2024

- ◊ PPIB licensed as the Independent Auction Administrator (IAA) under Section 25A of the NEPRA Act
- ◊ Hearing held by NEPRA for Wheeling/ Use of System Charges(UoSC)

Way Forward:

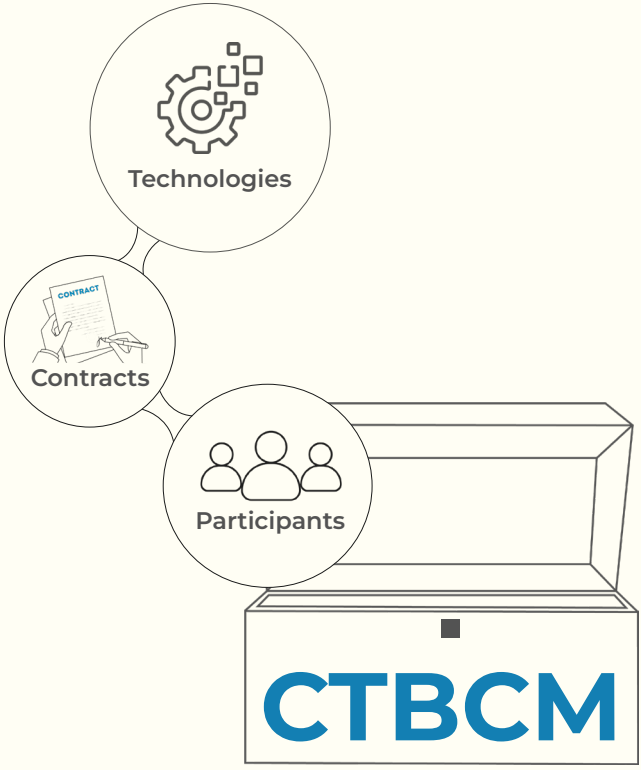
- ◊ Declaration of the Commercial Operation Date (COD) of CTBCM by MoE(PD)

The CTBCM initiative has tremendous potential to solve the long-standing problems of Pakistan's electricity sector. To ensure this however, several crucial steps need to be taken which include but are not limited to:

- ◊ Provide durable estimations of the marginal price to reduce uncertainty in the market and boost the investor confidence,
- ◊ Finalization of an attractive UoSC (Wheeling/Use of System Charge) by NEPRA with a high degree of clarity regarding its structure and estimates,
- ◊ Develop a UoSC methodology encouraging the DISCOs to improve their performance and penalizing the underperformers,
- ◊ Reassess the firm capacity calculation methodology to give a fair treatment and equitably accommodate the RE projects in the energy mix,
- ◊ Establish a clear framework for disciplining the demand side in the transitioning market evolving consumers of electricity to prosumers.

Furthermore, successful implementation of the CTBCM in Pakistan's power sector would require political stability, financial sustainability, a strong regulatory framework, infrastructure investment, stakeholder engagement, technological innovation, adaptability, and risk mitigation strategies. Integrating these elements effectively while learning from the past challenges is key to addressing the sector's challenges and ensuring the CTBCM's success.

RENEWABLES FIRST



Types of entities involved in the CTBCM

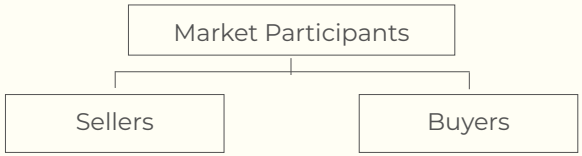
The different entities involved in CTBCM can be broadly categorized as the market participants and the service providers.

1. The Market Participants:

Market Participants are entities or individuals who engage in commercial transactions in the market and perform sale and purchase of electricity within the market. The market participants can be classified into two categories: the sellers and the buyers.

Sellers: These are entities or individuals who generate electricity and offer it for sale in the market. Sellers can include power generation companies, independent power producers, renewable energy project owners, electric power traders, and other entities capable of supplying electricity to meet demand.

Buyers: Buyers are entities or individuals who purchase electricity from sellers to meet their consumption needs. Buyers can include distribution companies, BPCs, industrial, commercial, and other entities requiring electricity for various purposes.



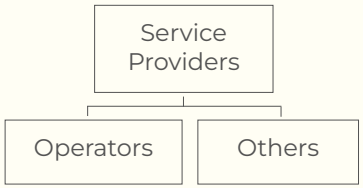
- A **Generation Company** is an entity that installs a generation unit or plant to produce and sell electric power.
- An **Electric Power Trader** is an entity which trades electric power at a wholesale level.
- An **Electric Power Supplier** is an entity which procures electric power and sells it to the end-consumers.
- A **Bulk Power Consumer** is a consumer which has a minimum load of 1 MW and purchases electric power from the wholesale market or an electric power supplier through a bilateral contract.

2. The Service Providers:

Service Providers are the entities which provide various regulated services necessary for proper market or system functioning. Examples include transmission network service provider, distribution network service provider, metering service provider, system operator, market operator, independent auction administrator etc.

a. The Operators:

The Market Operator (CPPA) oversees the functioning of wholesale electricity market, including matching buyers and sellers, calculating prices, settling payments, managing market clearing processes, and ensuring the efficient operation of the market as per regulatory requirements and market rules.



The System Operator (NPCC) is responsible for balancing electricity supply and demand in real-time, maintaining grid stability, managing transmission constraints, and responding to emergencies or contingencies to ensure the uninterrupted flow of electricity to consumers.

b. Transmission Service Providers (NTDC as TNO) provides transmission infrastructure and services to enable wholesale competition and the buying & selling of electric power.

c. Distribution Network Service Providers develop and operate distribution network infrastructure to enable distribution-level market participants to enter and participate in the market.

d. Metering Service Providers (NTDC & DISCOs) collect, assess, and transfer the metering information to the market operator for settlement function.

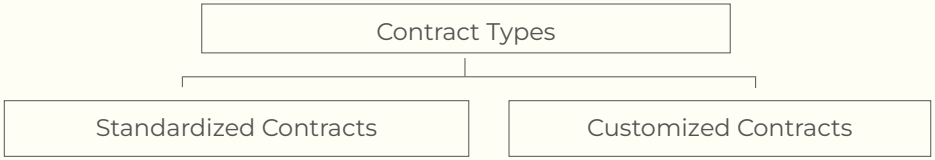
e. Independent Auction Administrator (PPIB) is responsible for facilitating XW-DISCOs or Suppliers of Last Resort (SoLR) in meeting their capacity obligations through capacity and energy procurement.f.

f. The Special Purpose Agent (CPPA-G) acts as an agent of the distribution licensees (XW-DISCOs and K-Electric) and administers the legacy contracts.

- **Competitive supplier** is an entity that sells electricity to consumers in a deregulated market where multiple suppliers compete for customers
- **Supplier of Last Resort (SoLR)** refers to a licensed provider of electricity at regulated prices to customers who do not have a competitive supplier, either because they have not chosen one or their chosen supplier has failed.

Types of contracts in the CTBCM

In CTBCM, a contract is a bilateral agreement between a seller and a buyer. This bilateral contract can be for energy and/or capacity and it also specifies other details such as quantities, transactions, trading periods, pricings, and other applicable charges. Contracts in CTBCM are classified into the following two main categories:



a. Standardized Contracts: an agreement in which the sale and purchase of energy and/or capacity occurs based on predefined terms and conditions. The market participants are not required to disclose their bilateral agreement to the market operator when a standardized contract is signed between them. Under the Market Commercial Code, the following types of contracts are considered as standardized contracts:

i. **Generation following supply contract:** In this contract, the seller sells a defined share of the energy or the capacity (associated with the physical asset, or a group of physical assets) to the buyer. The payment to the seller is based on the amount of energy it generated and injected into the grid.

ii. **Load following supply contract:** In this contract, the seller sells the contracted energy and capacity which is withdrawn by the buyer at certain pre-defined trading points. The payment to the seller is based on the actual measured energy consumed by the buyer. Such a contract is suitable for the consumers that want to avoid the costs or risks that arise due to imbalances.

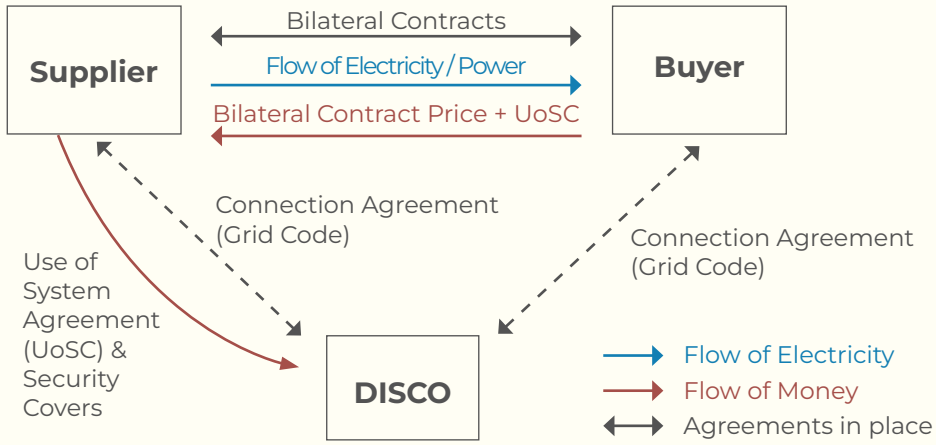
iii. **Capacity and associated energy supply contract:** This contract follows the design of a load following supply contract, but it is tailored to enable buyers to fulfill their capacity requirements (capacity obligation). Such a contract is suitable for a buyer, especially XW-DISCOs / SoLR, that wants a supplier to assume its capacity obligation and guarantee the supply of contracted energy or capacity.

iv. **Financial supply contract with fixed quantities:** In this contract, the buyer and the seller pre-agree on fixed amounts of energy and capacity, regardless of actual generation and consumption. The contract also establishes an energy schedule beforehand with predefined energy quantities for each energy balancing period (e.g., one hour). The contract is designed to share risks between market participants, as it is primarily financial, with the seller obligated to supply (not generate), and the buyer obligated to pay (not consume).

The duration of all these contracts is set to a minimum of two years from the effective date of agreement in the Market Commercial Code.

b. Customized Contracts: refers to a bilateral agreement between the market participants (seller and buyer) transaction as per their mutually agreed terms and conditions (tailored to their specific requirements or preferences). Such an agreement does not fit the classification of a standardized contract. If such a contract is in place, the market participants may be required by the market operator to provide any relevant information for ensuring proper and accurate settlement within the balancing mechanism for the contracted energy and/or capacity.

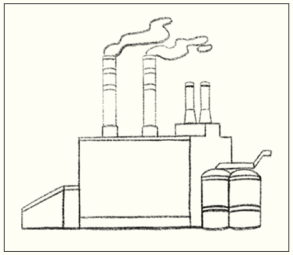
Contractual Arrangements

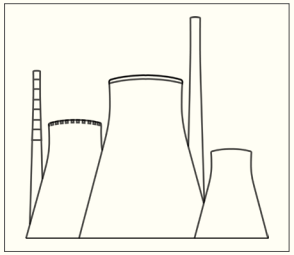


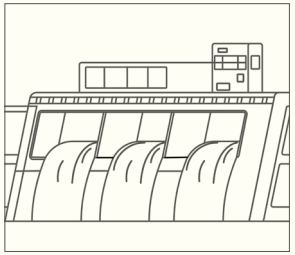
Types of technologies in the CTBCM

The Market Commercial Code categorizes different generation technologies as follows:

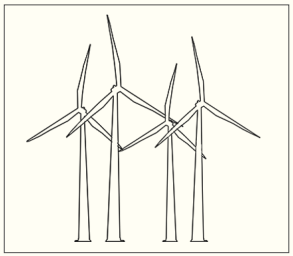
i. **Dispatchable:** The output of generation technologies in this category can be increased or decreased based on manual or automatic instructions issued by the operator to meet varying demand of the system. In CTBCM, following technologies are categorized as dispatchable

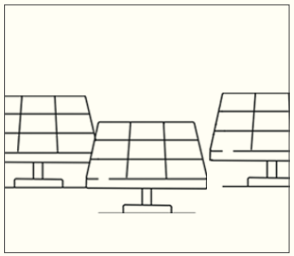

Thermal

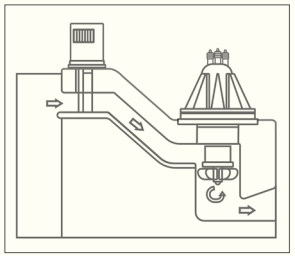

Nuclear


Large hydro with storage

ii. **Non-dispatchable:** Unlike dispatchable generation technologies, non-dispatchable technologies cannot change their output as and when required to meet varying system needs (e.g., demand). In CTBCM, following technologies are categorized as non-dispatchable:


Wind

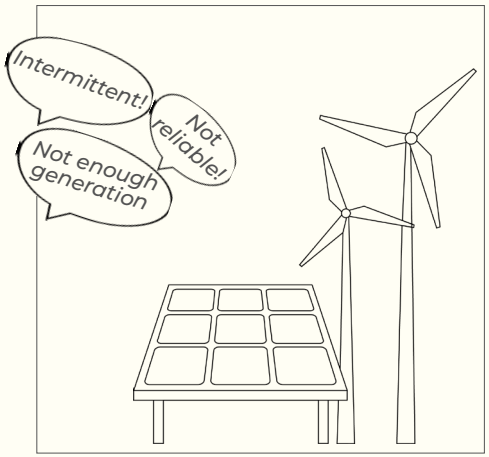

Solar

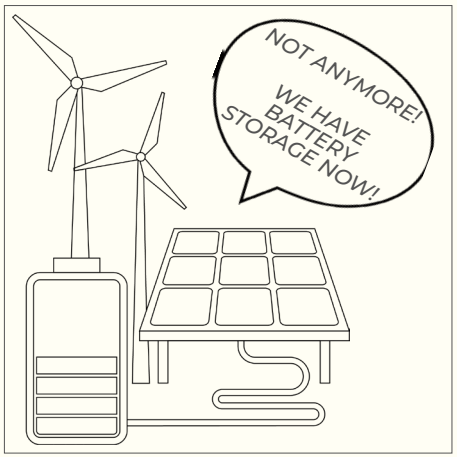

Minihydel

Some comments on the categorization scheme of technologies:

Categorizing wind and solar energy technologies as non-dispatchable overlooks their evolving capabilities in today's advancing energy landscape. While traditionally seen as intermittent sources, both wind and solar are now increasingly being integrated with battery energy storage systems, enabling them to provide reliable and secure power supply for varying system demands. Even without battery backups, solar and wind technologies offer some of the highest ramping rates available to the grid operator.

By coupling wind and solar with battery storage, their output can be effectively managed to meet varying system demands. They also offer a cost-effective solution for addressing system constraints, grid management challenges, providing backup power and resolving curtailment issues of renewable energy sources (REs).





Using terms such as "non-dispatchable" stigmatizes renewable energy sources and conveys a false impression regarding the nature of these technologies. Better naming conventions may be adopted to accurately reflect the capabilities and operational characteristics of these technologies. An alternative categorization is recommended as follows:

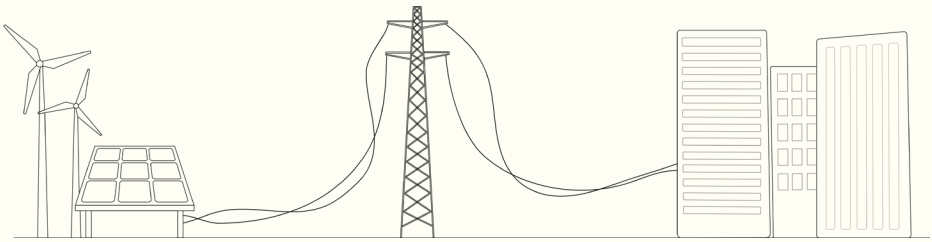
Firm Dispatch: For technologies such as nuclear, thermal (coal, gas, RLNG etc.) and large hydro the term "Firm Dispatch" may be used

Forecast-Based Dispatch: For technologies such as wind and solar, the term "Forecast-Based Dispatch" may be used.

The above classification acknowledges the reliance of RE on weather forecasts as well as the many ways in which the grid operators may schedule and manage their deployment more effectively.

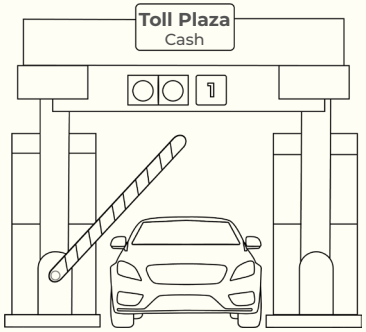
RENEWABLES FIRST

UoSC



Use of System Charge

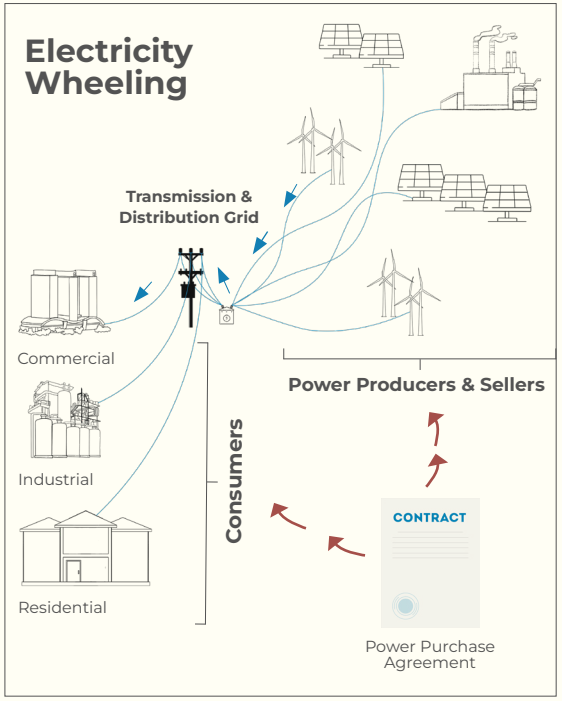
What is the Use of System Charge?



Consider you are driving on a motorway, where you come across toll booths along the route. To use the motorway and benefit from its convenience, safety, and efficiency, you are required to pay a toll fee set by the motorway authority. This fee helps cover the costs of maintaining, repairing, and expanding the motorway infrastructure, ensuring it remains operational and safe for all users.

Similarly, in electricity markets, the **Use of System Charges (UoSC)** refers to the fees or charges imposed on market participants for utilizing the transmission system to transport electricity. Similar to the toll fee on the motorway, these charges are levied to cover the costs associated with operating, maintaining, and expanding the transmission infrastructure. UoSC can vary based on factors such as the distance of transmission, the level of congestion on the grid, and the time of day, among others.

Alternatively, this charge is also referred to as the **wheeling charge** or **open access charge.**



The importance of 'Open Access'

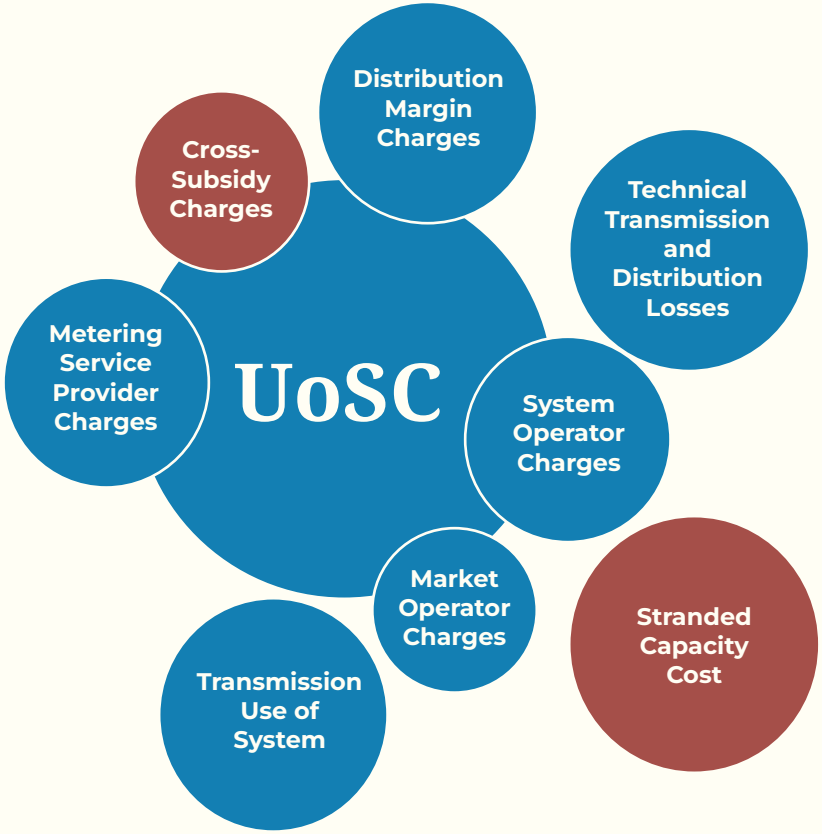
A competitive electricity market enables the market participants (buyers and sellers) to enter into bilateral contracts. However, the success of an open market hinges on the provision of a level playing field for all participants and fairness for both existing market players and future entrants.

◊ Level playing field is a state in which the set of rules or conditions are same (fair) for everyone in a competition or a situation. This, however, does not mean that everyone will have an equal chance to succeed. chosen supplier has failed.

Charging a fair and equitable amount of cost for the usage of transmission and distribution network is an essential element in providing the market participants with a level playing field. For this reason, Use of System Charge is one of the most important elements of the CTBCM design.

What are the different components of the Use of System Charge?

Following are the different components of UoSC (in the context of CTBCM) identified from the petition documents on NEPRA's website:



Why so much concern around the Use of System Charge?

The issue of transporting electricity from one place to another is one of the most important elements of open competitive markets. While defining how much the participants may be charged for this transportation, it is important that the needs of all participants are kept in check. However, participants may have different views regarding what types of cost may or may not be included under this head

Should stranded costs be a part of the Use of System Charge?

Stranded costs are those investments in power generation, transmission, or distribution assets that have become unrecoverable due to various reasons such as changing market conditions, non-availability of fuels, or lack of need in the grid. In Pakistan's context, this primarily amounts to the capacity payments which have to paid regardless of power off-take.

If the stranded asset costs are not considered within the UoSC, they will become a huge burden for the ordinary regulated consumers. On the other hand, the spirit of fair competition requires that market participants must not end up paying costs whose responsibility and onus does not belong to them.

The Market Says No

Market participants argue that they should only be charged for using the grid and not for the imprudent planning decisions of the government related to investments in electricity generation.

The Government Says Yes

The government argues that if the stranded costs are not charged to the market participants under the head of using the transmission network, these costs will become an additional burden on the ordinary users.

A recommended middle approach:

A five-year settlement plan may be set up for participants who opt to leave the regulated electricity grid. For the first five years, these participants may be charged a specific amount towards recovery of the stranded cost. However, after the stated period has elapsed, the participants are not obligated to pay the stranded costs anymore. This would not only provide a way for bulk buyers and sellers to be eventually relieved of the burden of stranded costs and provide them with long-term clarity on costing, it would also put pressure on the government to be more cautious with future planning and investment.

Should 'Cross-Subsidization' be a part of the Use of System Charge?

Cross-subsidization refers to the practice of charging higher electricity prices to certain groups of consumers in order to subsidize the costs for other groups. This is typically done to ensure that electricity remains affordable for vulnerable or low-income segments of the population, while the financial burden is shifted to other consumers who can afford to pay more.

Currently, certain consumer classes, such as domestic (protected) and agricultural, benefit from certain inter-class or government subsidies, while others, like industries and BPCs bear the burden of substantial cross-subsidies. Fostering a robust and successful wholesale (and later retail) power market is crucial for minimizing, if not eliminating, cross-subsidies.

The National Electricity Plan (2023-27) of Pakistan has set a target to limit the exposure of cross-subsidies to reduce strain on country's fiscal resources, and to transition towards cost-of-service tariffs. However, this poses a challenge for the government in terms of tariff rationalization. Under this proposal, the industrial or large consumers will no longer be obligated to bear the additional charges of cross-subsidization once they exit the regulated market.

Targeted subsidies: An alternative

A better alternative to cross-subsidization may be found in targeted subsidy schemes. By directing financial assistance specifically to low-income households and vulnerable populations, targeted subsidies can ensure that essential services remain affordable for those who need them most. This approach prevents the wastage of government resources and reduces the fiscal burden associated with broad, untargeted subsidies. Additionally, targeted subsidies also encourage energy efficiency and responsible consumption, as they often come with measures to promote energy-saving practices.

How much should the Use of System Charge be?

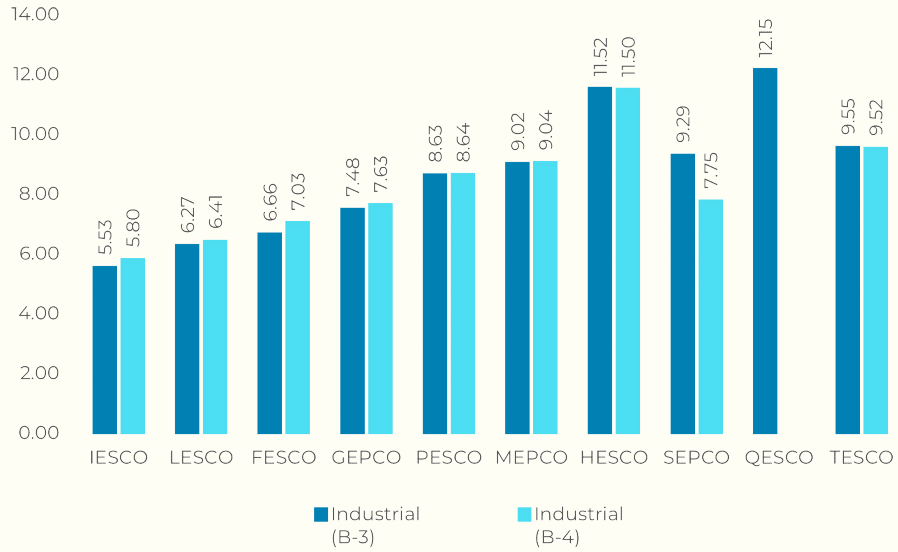
The latest proposed use of system charge of over **9 US¢/kWh** has been deemed highly unrealistic and counterproductive by the industrial participants. Notably, it surpasses the power tariffs for export-oriented consumers in neighboring economies such as Bangladesh (8.6 US¢/kWh), India (6 US¢/kWh), and Vietnam (7.2 US¢/kWh)

.

The industrial sector, especially the export industry, has persistently advocated for a fair and equitable use of system charge for business-to-business (B2B) power contracts. As per an analysis by All Pakistan Textile Mills Association (APTMA), Pakistan's textile and apparel exports surged by 54% in two years during 2020-2022, with the provision of regionally competitive power tariff of 9 US¢/kWh. However, discontinuation of this competitive tariff had detrimental effect on export volumes as well as profitability of export industry, citing a significant decline in power consumption and de-industrialization across the economy.

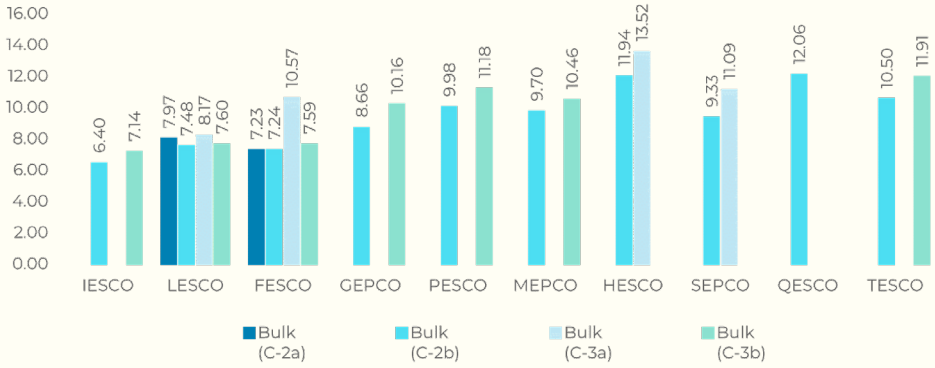
An equitable use of system charge that reflects the true costs of utilizing the transmission system is crucial for providing a level playing field for all market participants and promoting transparency, efficiency, and competition in the electricity market.

Use of System Charge Proposed by the DISCOs for Industrial Consumers - US¢/kWh



For industrial consumers of B-3 and B-4 categories, the proposed UoSC ranges from 5.53-12.15 US¢/kWh with an average of 8.39 US¢/kWh.

Use of System Charge Proposed by the DISCOs for Bulk Power Consumers - US¢/kWh



For the bulk power consumers of various categories, the proposed UoSC ranges from 6.40-13.52 US¢/kWh with an average of 9.47 US¢/kWh.

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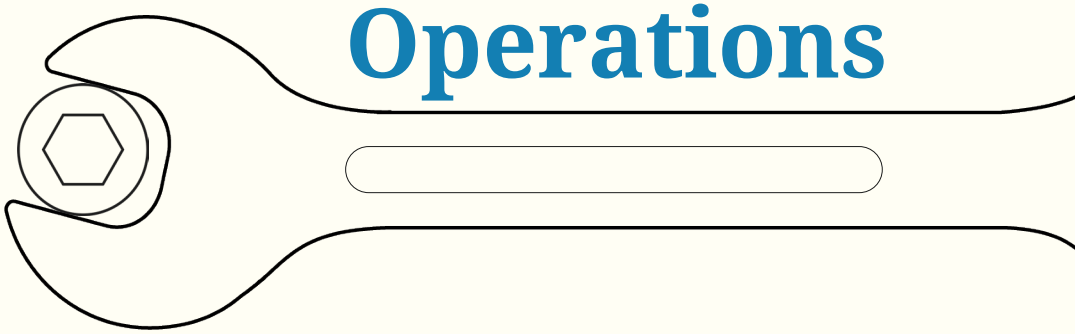


Operations

Operations

The electricity market is transitioning towards a competitive market model. The key drivers of this transition are the need for revival of the power sector, improving efficiency, increasing demand for reliable and affordable electricity, and policy shifts towards sustainability. Central to this transition are the concepts of market operations and system operations. These operations collectively ensure that electricity is produced, traded, and delivered in a manner that meets the economic, environmental, and reliability needs of modern societies.

First, let's try to understand what an operator does. Some familiar examples of different types of operators in everyday life include:

A telephone operator manages and connects phone calls between callers, ensuring the communication lines are properly connected and clear.

An air traffic controller coordinates the movement of airplanes, ensuring they take off, fly, and land safely by managing their routes and schedules.

An event coordinator organizes and manages events, ensuring all participants are registered, schedules are maintained, and the event runs smoothly.

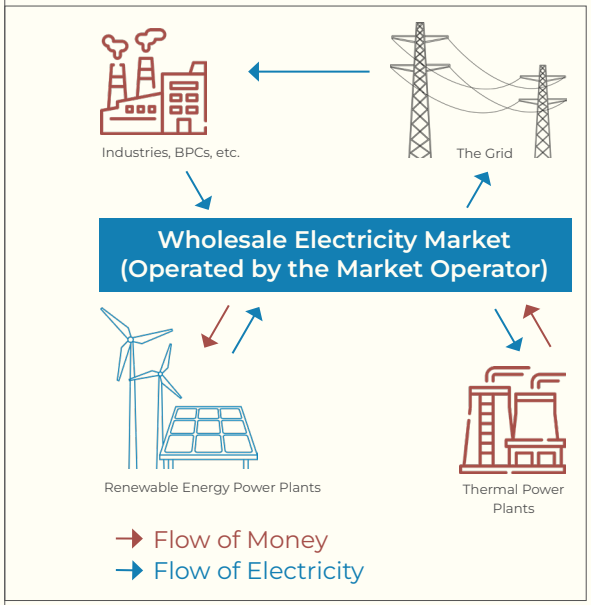
Operator in electricity sector:

- An operational body responsible for managing and overseeing various aspects of the electricity market and/or electric power system (grid).
- The role of operator involves highly technical functions including short-term decision-making (typically ranging from seconds to weeks), serving as an interface among various market participants, ensuring efficient and reliable operation of the grid etc.

In the new electricity market model (CTBCM), there are the two key types of operations; market operations and system operations, as described below.

1. Market Operations

Market operations involve managing the buying and selling of electricity. This includes enrolling participants and registering their contracts, registering trading and metering points (where transactions take place), calculating capacity obligation and firm capacity of power plants, and handling payments



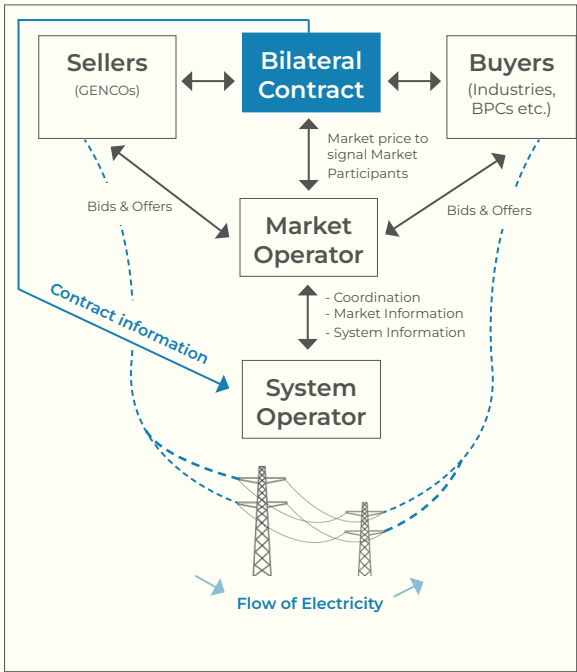
and settlements. The market operator (MO) also ensures that the payments for any differences between the contracted and actual amounts of electricity are taken care of as per their respective contracts. Additionally, the MO monitors the development of the market and suggests improvements.

Under the framework of CTBCM, CPPA-G is licensed as the MO. Whereas, in the current single-buyer market model, CPPA-G's functions include power procurement and the settlement of Power Purchase Agreements (PPAs) and Energy Purchase Agreements (EPAs).

2. System Operations

System operations involve the secure and reliable management of the electricity grid and power system. This includes planning and dispatching all generation in a transpar ent and non-discriminatory manner. These operations are carried out by the system operator (SO).

The SO does not buy or sell electricity in the market. It ensures the system remains stable, reliable, and efficient. Key duties of the SO include long-term system planning, conducting reliable short- and medium-term operational planning, coordinating maintenance outages, calculating hourly system marginal prices, and economic dispatch of generators within system security and reliability constraints. In Pakistan, the National Transmission and Despatch Company (NTDC), through its National Power Control Centre (NPCC), serves as the System Operator as per NEPRA Act 1997.



Operational Components

It is important to explore the key components of the operations for understanding how operators ensure reliable, and efficient functioning of electricity market and power system within the competitive market framework. These are described in the following sections:

1. Balancing and Settlement

Balancing and settlement are critical functions of market operations, to ensure the continuous alignment of electricity supply and demand, smooth operation, stability, and reliability of the electricity market. The market operator is responsible for managing these functions.

Balancing Mechanism means the process or pricing mechanism of determining and clearing any imbalance between the contracted and actual quantities (of energy or capacity) at certain prices.

Settlement is the process of calculating charges to be paid by and to market participants (buyers and sellers) and service providers, and processing the financial transactions based on the imbalances (if any).

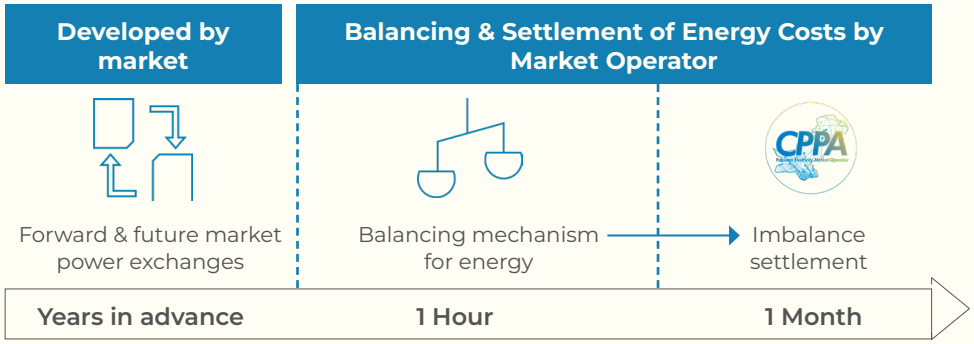
Balancing Period: It is the trading interval in which the imbalance in quantities and prices are determined. In CTBCM, balancing period for energy and capacity are hourly and yearly, respectively.

Settlement Period: In CTBCM, the settlement of the energy imbalances is done on monthly basis.

The market operator uses information such as data for all metering points,

contract quantities of market participants, and hourly system marginal prices to carry out these functions. By efficiently handling these tasks, the market operator maintains market stability and ensures fair financial adjustment among market participants.

The following diagram illustrates the timeline for these processes:



2. Capacity Obligations and Firm Capacity Certificates

In CTBCM, two primary products will be traded in the market:

i. Energy to meet electricity demand, and

ii. Firm Capacity to ensure medium & long-term security of supply through sufficient and adequate capacity.

Firm capacity is the guaranteed ability of a generator (generation unit) to produce electricity at a specific time. It is particularly important to ensure adequate firm capacity for critical conditions in the country, such as periods of high demand, low hydel (dry) season etc.households and vulnerable populations, targeted subsidies can ensure that essential services remain affordable for those who need them most. This approach prevents the wastage of government resources and reduces the fiscal burden associated with broad, untargeted subsidies. Additionally, targeted subsidies also encourage energy efficiency and responsible consumption, as they often come with measures to promote energy-saving practices.

Under CTBCM, Firm Capacity will be a certified product, and there are two types of agreements for capacity transactions:

i. **Guaranteed Capacity:** Where the **seller** is completely responsible for the capacity imbalances. In other words, both energy and firm capacity are being sold.

ii. **Non-guaranteed Capacity:** Where the **buyer** is completely responsible for the capacity imbalances. In other words, only the energy is being sold.

In CTBCM, generators can sell Firm Capacity through contracts and can also offer their any uncontracted available capacity in the Balancing Mechanism for Capacity (BMC) administered by the Market Operator.

On the other hand, each and all demand participants (e.g. competitive suppliers representing demand/consumers, or DISCOs as Supplier of Last Resort) will have capacity obligations. A demand participant can fulfill its capacity obligation by utilizing the firm capacity it owns or has contracted and buying any shortfall in the BMC.

The BMC will complement the capacity obligations of each market participant, providing a mean to settle the eventual differences that may exist between the capacity demanded and actually provided. The purpose of the balancing mechanism for capacity is to conciliate the difference between the capacity obligations of Demand Participants and the available capacity of Generators during critical hours, with the capacity contracted (bought or sold in contracts). Under CTBCM, the trading period for capacity will be 1 day while the BMC will be executed once a year, during the first two months of each fiscal year.

3. Marginal Price

Marginal price (or marginal cost) refers to the cost of producing one additional unit of electricity. It is the price at which the next unit of electricity can be generated and delivered, considering the most efficient and cost-effective means of production available at that time. Under the CTBCM scheme, this translates to the per unit cost of producing electricity from the least expensive idle generator at the time.

Types of marginal cost over different time horizons:

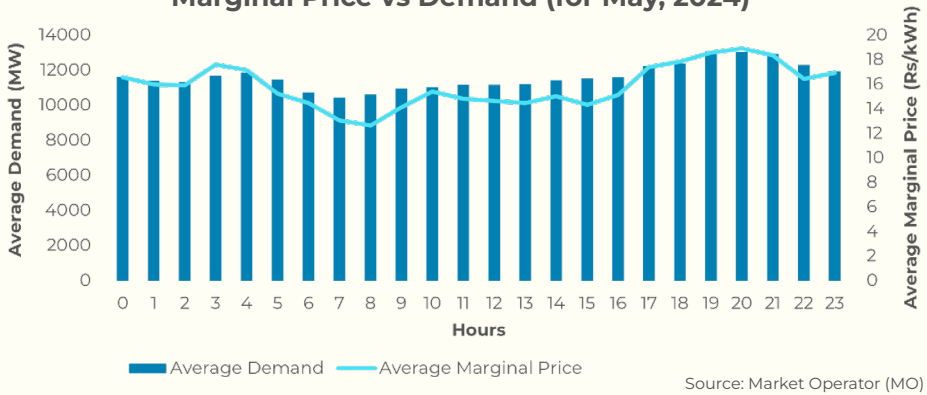
i. SRMC (Short-Run Marginal Cost) is the cost of producing one more unit of electricity considering only the variable costs and assuming the existing capital infrastructure remains unchanged. It primarily includes costs like fuel, variable operations, and maintenance.

ii. LRMC (Long-Run Marginal Cost) is the cost of producing one more unit of electricity when all inputs, including capital infrastructure, can be adjusted. It includes both variable costs and fixed costs associated with investments in new infrastructure.

Responsibility and application: In CTBCM, the calculation of the hourly marginal price is the responsibility of the System Operator. The SO provides this information to the Market Operator to settle any energy or capacity imbalances as part of its responsibility of administering the BME and BMC.

Importance of clarity on marginal cost: Clarity on marginal price is crucial for businesses to model the risk involved in their contracts accurately. If a contracted supplier fails to deliver, businesses will have to buy electricity from the supplier of last resort at the marginal price. This key figure in the CTBCM model is essential for participants to conduct costing and risk calculations. Without this information, potential market participants cannot confidently devise business and risk allocation plans, leading to market uncertainty and low investor confidence.

Marginal Price vs Demand (for May, 2024)

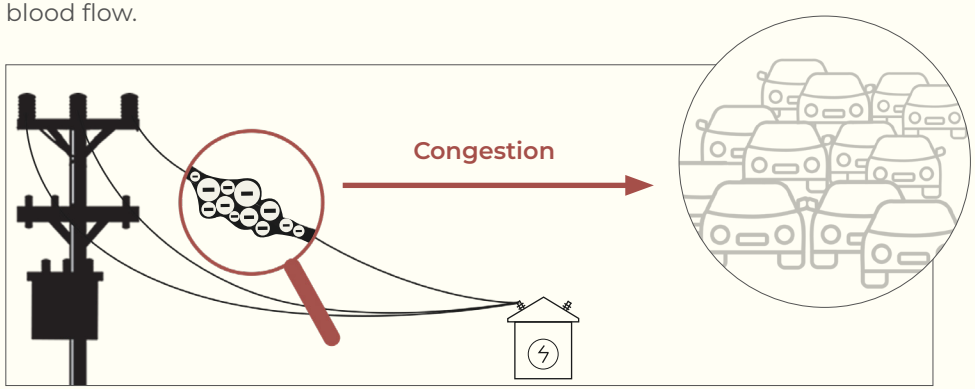


Source: Market Operator (MO)

4. Transmission and Distribution (T&D) Losses

The losses in transmission and distribution infrastructure refer to energy lost to the physical resistance in the T&D lines, as electricity flows from generation to load.

One of the primary reasons for these losses is congestion, just like a traffic jam on a road can delay vehicles, or blockages in the heart/an artery can restrict blood flow.



Congestion in transmission and distribution lines occurs when there is too much demand and not enough capacity to handle it efficiently. In Pakistan, the installed generation capacity is around 45000 MW against an annual peak demand of 28000 MW, whereas the transmission capacity limit of the transmission network is only 26000 MW.

This congestion can slow down or even halt the flow of electricity (causing brownouts/blackouts). These bottlenecks in the grid can lead to increased transmission and distribution system losses, as electricity faces resistance and loses energy while traveling through overburdened lines.

The losses are considered an inherent part of the electricity supply chain and are usually recognized as a component of the total supply cost. The total energy generated in the system is required to be recovered/paid which is equal to the actual load and the losses in the system.

Treatment of Losses in CTBCM:

i. The Metering Service Provider (MSP) will be responsible for determining the quantity of losses in the transmission network for each transmission licensee on hourly basis, as the difference between the energy injected into and withdrawn from its transmission network.

ii. A cap will be imposed on electricity losses in the grid beyond which the transmission and distribution licensees will not be allowed to transfer costs to the consumers.It includes both variable costs and fixed costs associated with investments in new infrastructure.

Renewables First (RF) is a think tank for energy and environment. Our work addresses critical energy and natural resource issues with the aim to make energy and climate transitions just and inclusive.

Author: Hammad Ali

Supervised by: Ammar Qaseem
Designed by: Sana Shahid

RENEWABLES FIRST

10 - 11, 3rd Floor,
Executive Complex,
G-8 Markaz,
Islamabad
+9251 - 8773676
info@renewablesfirst.org