Transition Towards Competitive Trading Bilateral Contract Markets in Power Sector of Pakistan

Policy Brief

National Electric Power Regulatory Authority (NEPRA) has approved the detailed design and implementation roadmap for Competitive Trading Bilateral Contract Market which is aimed to be operational by April 2022 in Pakistan. The prospects of the new market design are projected to ensure competitiveness, transparency, reliability, predictability and creditability. The new market regime undertakes energy to be traded as a commodity. This policy brief ushers the review on transition and transformation, a generic restructuring and requirement of new players to be incorporated.

1. Background and Menace of Circular Debt

The power sector in Pakistan requires transition towards competitiveness of generation, transmission and distribution business amid the proliferation of circular debt and high inefficiencies in distribution network. There is an echo of voices to evolve the power sector towards liberalization of the market so that cheap sources of energy could be integrated. The exigency of competitiveness and deregulation in power market is a compelling exposition for a twofold agenda; to optimize the generation cost of energy, and secondly to improve efficiencies of the power distribution network.

In an overview, the power sector of Pakistan was initiated with the design of bundled and single entity authority. Water and Power Development Authority (WAPDA) was solely responsible for generation, transmission and distribution of power. On the other hand, Karachi Electric Supply Company (KESC) remained a public entity for electrification of the mega urban center of Karachi. The performance of both the entities remained satisfactory till the decade of 1980s, while with the rising demand and deterioration of generation capacity, the "Strategic Plan for Restructuring of Pakistan Power Sector (PPRSP)" was approved to unbundle WAPDA and restructure it into fourteen public limited companies. These companies were then responsible for dedicated functionality of generation, transmission and distribution with the existence of the regulator, National Electric Power Regulatory Authority (NEPRA). With this restructuring, the inclusion of independent power producers (IPPs) was allowed to maintain generation up to the demand of the country.

The IPPs' policies of 1994 and 2002 allowed the reformation of the sector with the private generation facilities under "*take or pay*" arrangement of tariff. The government guarantees were promised to be provided against the un-utilized capacity, which created the problem in circular debt on the whole. The implausible financial management of the capacity payments with these private power producers accumulated the chronic shortfall between cash flows due to which it has risen to Rs. 2.3 trillion. The resolution of this fiscal debt remained at the disposal of the end consumers in context of tariff increase, and on the other side renegotiations on tariff indexations with the independent power producers. The end-consumers' tariff has to incorporate the high generation cost factor as well as capacity payment transfer factor through the Transfer Pricing

Methodology.[1] On the other hand, the billing procedure practiced by the distribution companies fail to collect the targeted amount due to inefficiencies in recovery of the bills. Amid the inadequacy in the cash flows, the government has to influx subsidies to lower the end-consumers' tariff and it also piles up the fiscal deficit between the government and independent power producers.

With regard to structural amendments in the power sector, NEPRA has been vigorously emphasizing deregulated and liberalized power markets in Pakistan. The single-seller and single-buyer model of the market did create complications in maintaining financial adequacy as to immediately cater the shortfall in the country, generation facilities with high generation costs were erected in the past. Besides, the low efficiencies in transmission and distribution network, and very low recovery rate than the benchmark, constituted loss for the distribution companies. All these factors have simultaneously contributed in the high pile of circular debt.

2. Prospects of Competitiveness in Energy Trading

Market competitiveness enables optimal operation of the drivers within the market forces which procure the most competitive and most secure investment options. Globally, the power markets are being reformed with the inclusion of private partnership with the public entities, based on competition and cost optimization. In the case of Pakistan, cost optimization was not focused in enabling the public-private partnership to achieve the targets in context of generation capacity and renewable power. The prospects of the competitiveness have been realized by the governing bodies who have allowed the new projections of generation facilities based on bidding for renewable energy sources. On the other hand, the allowance of renewable energy based net-metering, business-to-business model, power wheeling and independent power purchase agreements are some of the courses the government of Pakistan has achieved in a remarkable progress in widening up the window of liberalized power market. Yet, the model of multiple sellers and multiple buyers would drive more options for the electricity consumers with low cost and more clean energy diffusion into the integrated mix.

3. Concept of Competitive Trading Bilateral Contract Market Structure

The competitive trading and bilateral contracts in the power market allow up thrust of competition between the parties in the respective business of generation, transmission and distribution. The business entities are allowed and provided an enabling environment to make returns on their investments based on the competition between the other market players. The instances of "*oligopoly*"[2] into the market are being minimized where the free market forces would decide the tariff settlements, economic dispatch, demand forecast, and generation costs of the units.

The objectives of the CTBCM model of market should focus on the following significant aspects:

a. Maintaining an improvised efficiency from the competitive players of the market.
b. Enabling attractive investment returns on the business.
c. Creating a fair allocation of risks and benefits between the stakeholders while minimizing the role of government stakes in providing the risk guarantees.
d. Maximizing transparency in cash flows.
e. Enhancing predictability in the market dynamics.
f. Streamlining more robust demand and supply forecast.
g. Power security and adequacy in power generation, transmission and distribution with efficient operations.
h. Attract new emerging technologies to enhance technological competitiveness and advantages.

The consensus has been developed between the major governing bodies in Pakistan to reform the conventional market into bilateral trading based contract markets. In this regards, Central Power Purchasing Authority (CPPA) is developing a roadmap towards the transition. NEPRA has been monitoring the regulations for the "deregulated market structure" where the interventions of the regulators in determination of tariffs, interconnection settlements, benchmarks and indexations would be minimal. On

[1] The Transfer Pricing Methodology for the distribution companies requires the DISCOs to charge capacity payments from the end-users through capacity transfer rates. The common formulation for CTR has been demonstrated in Annexure I.
[2] Oligopoly refers to the abnormality in the market pertaining to the monopoly of sellers in determination of market dynamics. If the market is dominated by small group of large sellers, they are interdependent in their output policies and pricing mechanisms.

other hand, market design and capacity obligations are needed to be restructured.

4. Vertical Integrated Utility Structure of Power Sector

Transiting from the vertically integrated utility (or single buyer model) towards the multiple seller-buyer model of market requires an adequate and robust adjustment of codes, regulations, agreements and procedures. The conventional power system in Pakistan needs to incorporate some potential external players and technological reforms to execute a smooth conversion to competitive operations. To conceptualize how this transition can be developed, this policy issue brief demonstrates some of the potential restructuring of the power sector. Some of the salient features of the conventional power sector of Pakistan has been mentioned and demonstrated as follows:

1. The power generation business administrated by private entities is allowed on two tariff structures; *take or pay* (IPP mode); and *take and pay* (CPP mode[3]). Other than these two, net-metering has been allowed at the utility scale.
2. Central Power Purchasing Agency (CPPA) is the sole market operator which deals with the National Electricity Policy and cash flows between the public-private entities of power sector.
3. IPPs and CPPs, on contractual arrangement with CPPA, provide power to National Transmission and Dispatch Company (NTDC) which acts as the national grid and have the mandate of dispatch and transmission, economic dispatch, developing merit order based on generation tariff and central control of power flow.
4. 10 distribution companies are fed by NTDC and DISCOs distributes the energy to the consumers through their networks.
5. Cash flow in the power sector has the trajectory opposite to power flow, where the DISCOs collect the bills from the consumers and the amount is paid to CPPA amid energy transfer, capacity transfer, distribution margin, and use of system charges (for NTDC). CPPA disperses the funds to the IPPs, CPPs and NTDC according to their tariff settlement.

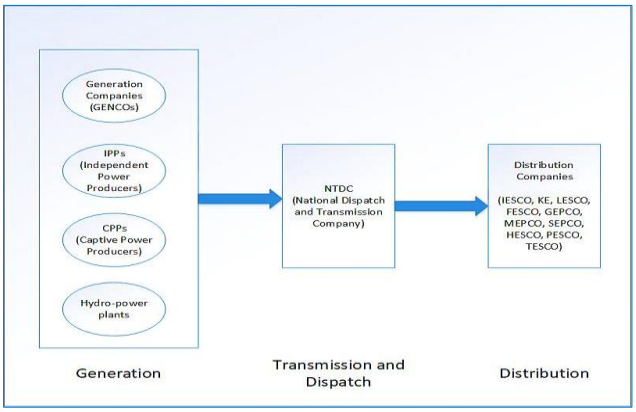

Figure 1: Electric power generation, transmission and distribution network in Pakistan

- **Current Market Operation of CPPA:** The operation of CPPA is concentrated on managing the financial transactions between the distribution companies, NTDC and power generation facilities. The role defined for the CPPA is further elaborated with twofold agenda; to procure power from the generation facilities on behalf of the distribution companies as an *agent*, and settles the power purchase agreements with its guarantee with the generation facilities as a *market operator*. So, CPPA has the mandate for centralized settlement of payments, billing, procurement of power, managing payment system and invoicing to DISCOs and KE, paying for the procured amount to generation facilities, payments to NTDC as per NEPRA's tariff determination, and collecting its market fee as per NEPRA's determination. CPPA settlement for each distribution company as well as KE uses the same methodology of wholesale transfer price.

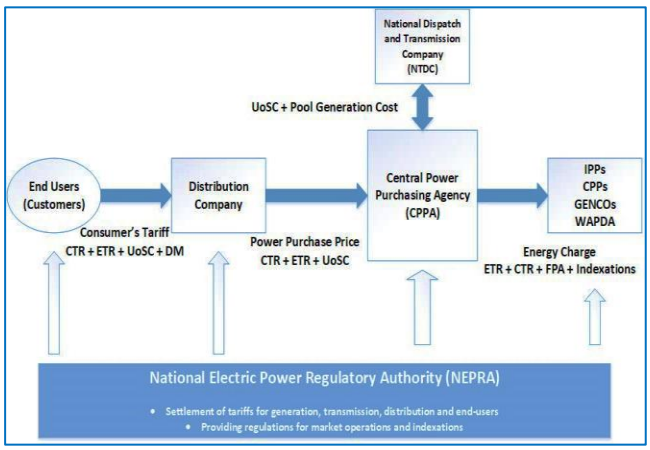

Figure 2: Existing financial flow structure in power sector and market operation of CPPA.

[3] Captive Power Generation facilities have the generation capacity of around 400 MW in Pakistan, and based on bagasse (biomass residue left after crushing of sugar cane in sugar industries).

5. Ingredients for Operations in CTBCM

The CTBCM model incorporates various independent entities which facilitate and administer the operations in the markets. The main objectives of these entities are to wipe out inadequacy in energy and capacity contracts, conflict of interests, to ensure transparency, and to maintain efficiency in market operations based on bilateral contracts. Some of the service operators, who shall be provided with the specific mandate of the operations, can be regarded as:

a. **Market Operators**: The market operators would be licensed to ensure administration and operations of the trade. This entity would be responsible for creating a bridge between the participants and would be administrating the trade, settlement of payments, market design and power procurement without any discrimination and market interests.
b. **System Operators**: The technical constraints within the commercial market associated with dispatch of energy, reliability of operations, planning and coordination, economic dispatch, centralized scheduling and coordination and maintenance of the outrages would be overseen by the system operators. In the current regime, National Power Control Center (NPCC), which is an integral part of NTDC, has the mandate of system operation of the power system and NPCC can be allocated function of system operations.
c. **Independent Auction Operators**: For a complete transition to the bilateral trade market, auction administrators are important to manage the bilateral contracts. Independent auction administrators would facilitate distribution companies based on energy and capacity requirements, demand forecast, energy planning and infrastructure, and to procure the power directly from generation facilities.
d. **Transmission and Distribution Service Providers**: Transmission service providers would incorporate the operations of transmission and dispatch of power according to the bilateral needs. NTDC already has the jurisdiction of transmission system which would be most potentially controlling the transmission service. Meanwhile, distribution services are already being provided by DISCOs.
e. **Metering Service Providers**: To ensure the transparency and reliability of the whole operation in bilateral contract markets, the metering service providers would act to provide information about the trade of energy between the participants.

All these service providers would have to be licensees from the regulators for their specified role in the market. The market operation in the current regime is being administrated by CPPA in terms of power procurement for DISCOs and settling financial transactions between the different stakeholders of power sector. Some of the market oriented responsibilities can be efficiently catered by CPPA and system operation is also being practiced through the existence of NPCC (NTDC) while inclusion of independent auction administrators and special purpose traders in the market operations would look into the contracts and their implications in the registry.

6. Market Participants

The organizations/stakeholders with commercial interests in the market are constituted as the market participants. These entities sell, purchase and trade energy with regulated rules under the CTBCM model. The participants of the CTBCM market are as follows:

a. **Generation Facilities:** The independent power producers (IPPs), state-owned generation plants and captive power producers who sell the energy they generate would be in contract with the suppliers. The power generating facilities, constituting both dispatchable and non-dispatchable, would be selling the energy and capacity to the bulk power consumers and suppliers bound through the contract administrated by market operators. The CTBCM model allows the suppliers and bulk consumers to have direct and bilateral contracts with the generation facilities, which would also proffer the competitiveness in the prices of energy and capacity.
b. **Bulk Power Consumers**: The bulk consumers would be procuring bulk quantities of electricity directly from the generation facilities. Bulk consumers shall be acting as the market participants and under
the regulations of CTBCM, would be bilaterally managing their contracts with the power plants.
c. **Suppliers**: The procurement of power, selling of power to the end consumers and other entities would be the function of retail suppliers in the market. The distribution companies would be acting as the suppliers. The competitiveness in trading would be maintained through providing

the options to the "eligible consumers" to opt for the energy, capacity, or both available within the framework of market. While, the suppliers on behalf of the consumers would be managing and making contracts based on the competitiveness of the prices.

d. **Traders:** The electricity traders, who would be involved in buying and selling of energy, shall not be specified in their territory jurisdiction or operations. The special purpose traders would be operating with composite actions for cross-border and interstate energy trading, supply and demand aggregators, and monitoring and evaluation of the market.

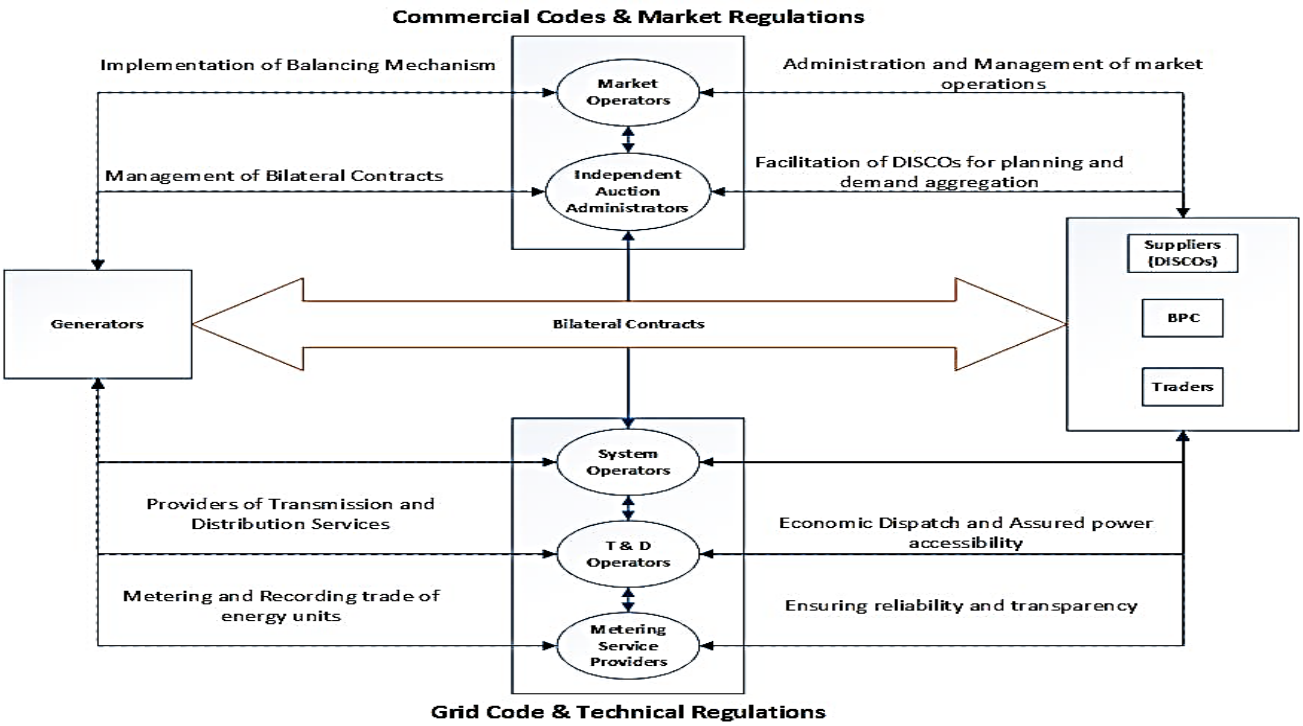

Figure 3: Mapping of market participants and service providers/operators in CTBCM.

All these participants and operators would be licensees under NEPRA in the new regime. The operators would be facilitating the energy trade between the participants, while the commercial interests would be only implied to the participants. The mapping between the operators and participants has been demonstrated for their respective functions in Figure 3, which highlights the role in energy trading and evolution from the conventional utility system of Pakistan as described in Figure 2.

7. Prospects of CTBCM Model

For the problem-ridden energy sector of Pakistan, the intervention is highly important for streamlining the constraints that are minimizing the efficiency that ultimately contributed in piling up of circular debt. The exponential increment of circular debt needs very quick intervention in various aspects of the power sector, otherwise it would result in a financial catastrophe. Against this menace, if the model of competitive markets is taken up and implemented, it could stabilize the exponential increase in circular debt and hence this intervention could boost transparency, reliability and competitiveness in terms of energy provision, capacity obligations, efficiency enhancement and infrastructure development. Some of the prospects related to the CTBCM markets are as follows:

i. Energy and capacity are traded as two different commodities. This implies that the contracts made against energy units would be exempt of capacity payments. Energy payments would require only the actual energy produced, while for the capacity obligations, the capacity for generation facilities would be in reliable framework of certification.

ii. All the trading arrangements are backed by credit cover which minimizes the payments risks.

iii. With the extension of capacity obligations to be met by the suppliers, the planning for demand forecast and infrastructure development shall be more robust and no extra capacity settlement would be required to make.

iv. The end consumers would be required to pay for the capacity procured by their respective supplier under transfer pricing methodology. This would also lower the end-consumers' tariff.

v. The balancing mechanisms of energy in the market operations would be maintained by all the participants. Balancing of energy and capacity would be carried separately which can ensure transparency of the overall operation costs.

vi. The flexibility in adoption of multiple generation facilities according to demand profiles and capacity requirements shall give the market the option of hedging the prices.

vii. The regulations would be prepared on the basis of the market and participated in by all the market participants.

viii. It is also projected that with the expansion and evolution of the market, the PPAs or other various agreements would be shortened in terms of their time of compliance. This would increase competition between the generation facilities.

ix. With CTBCM, the tilt towards the low-cost generation facilities would be evident mostly driven by the market forces.

x. The renewable energy sources can be efficiently incorporated within the energy mix while security of the supply doesn't compromise by their non-dispatch ability and variability. Low-cost renewable sources, such as solar, would be optimally used to dispatch power when it has optimal productivity while high-cost energy can be brought without buying of its capacity.

8. Concluding Remarks

The vertically-integrated utility formation of power sector was escorted towards the electrification based on the central planning and aggregating demand in the country. The regulations had to be intervened strongly as the competition was almost non-existent between the major stakeholders. The Competitive Trading and Bilateral Contract Market has been aimed to be partially implemented by initially allowing wholesale bilateral markets parallel with the evolution towards the formation of independent auction administrators. While for a successful transition, a strong political will and policy interventions are needed to be implemented. One of the overlooked areas in the power sector of Pakistan is the distribution network which has been under the burden of severe technical losses and inadequate billing procedures. Before delving into the new market regime, some intervention based on technological advancement as well as administration reforms should be introduced to achieve a long-term prospective outcome.

On the other hand, careful analysis is needed to delve into the tariff structure in the new regime. A uniform tariff regime is being implemented and regulated in Pakistan. However, with the introduction of CTBCM, where DISCOs would be allowed to procure power directly, the uniformity of tariff for different DISCOs would be compromised, and in this regard it is mandatory to amend the tariff structure with the defined bifurcation of costs pertaining to different operations in the markets. The technological advancement would be emphasized and system automation, system optimization and contingency studies should in focus to be modernized to ensure the best practice of operation.

As per the development of Alternate and Renewable Energy Policy-2019, the inclusion of renewable energy sources can be enhanced based upon the distributed generation. As the DISCOs shall be liable to procure power directly from the generation facilities, this would be the compelling case to boost renewable power intake based on roof-top solar, onshore and off-shore wind, mini-hydro power plants and segregated bio-energy at the grassroots level of the society. With the increased efficiency of the market operations based on competitiveness, ease-of-doing business in energy sector can be promised if adequate action plan is carried out after much cautious analysis.

**In continuation to this policy issue, more briefs have been planned to publish which shall encompass details regarding balancing mechanisms in CTBCM markets, service provisions by market operators, pricing and tariff mechanisms for uniformity, and detailed functions of participants in the CTBCM markets*

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Annexure I

Capacity Transfer Rates

The capacity payments to all generators made is divided by the total capacity demand of the respective DISCO to calculate Capacity Transfer Rate, demonstrated as:

$$CP = \frac{Total\ Payment\ made\ against\ Capacity\ Payments}{Total\ Capacity\ Demand\ of\ DISCO}$$

CTR = Capacity Payment per kWh *x* Total Demand

Annexure II

List of abbreviations mentioned in Figure 2 of this policy brief

CTR	Capacity Transfer Rates
ETR	Energy Transfer Rates
UoSC	Use of System Charges (for NTDC)
FPA	Fuel Price Adjustments

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