

Reforming NTDC

Addressing Transmission Challenges and Advancing Market Liberalization

Issue Brief

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On September 13, 2024, a committee comprising the Minister for Power, the Minister for Economic Affairs, the Secretary of the Power Division, and the Chairman of the NTDC Board of Directors presented a restructuring plan for NTDC to the Prime Minister. The Federal Cabinet approved the plan in November 2024, with implementation aimed for June 2025. The plan, as part of a broader set of sectoral reforms, aims to enhance competitiveness, transparency, efficiency, accountability, and reliability. This policy brief evaluates the proposed restructuring plan and explores strategies for its successful implementation by drawing lessons from international best practices.

Background to Restructuring the National Transmission and Dispatch Company (NTDC)

Pakistan's power sector has been struggling with inefficiencies and rising circular debt, causing hikes in consumer tariffs. In a bid to address this gridlock, the government is implementing a wider range of sector-wide reforms, with the National Transmission and Dispatch Company's (NTDC) restructuring plan being one of the key measures taken. NTDC acts as a sole transmission operator with networks extended throughout the country, except for areas under K-Electric. Nonetheless, the firm, ever since its founding, has been experiencing a morass, resulting in operational inefficiencies, governance failures, and obsolete infrastructure, which, in turn, has led to financial losses and bottlenecks in transmission.

The issues in the transmission network, such as the absence of integration between lower-cost power generation plans and transmission planning, have rendered it impossible to evacuate cheaper energy, causing a breach of Economic Merit Order (EMO) and higher dependence on costly plants, resulting in high consumer tariffs and increasing circular debt.

As per the restructuring plan approved by the Federal Cabinet, NTDC will be unbundled into three entities: The Independent System Market Operator (ISMO), the Energy Infrastructure and Development Company (EIDMC), and the National Grid Company (NGC). The plan aims to enhance transmission planning, efficiency, and reduce circular debt.

Previously, NTDC was established following the unbundling of WAPDA in 1988, which was done as part of power sector reforms to enhance efficiency through corporatization and decentralization. Resultantly, WAPDA's responsibilities were divided among three newly created entities: Generation

Companies (GENCOs), Distribution Companies (DISCOs), and NTDC. As a public limited company, NTDC was given the responsibility of managing transmission infrastructure, its development and planning, and system operator. As such, NTDC inherited all transmission assets of 220 kV and above from WAPDA.

It also received an exclusive transmission license for thirty years from the National Electric Power Regulatory Authority (NEPRA) in 2002. With its fragmentation from WAPDA, NTDC was expected to develop an efficient and reliable transmission network, with the ability to keep pace with growing energy needs and generation. However, due to the quagmire of challenges, it could not deliver the desired results, which is evident from the fact that despite the 43749 MW of installed capacity, the transmission capacity of 500/220 kV remains below the satisfactory level at 25950 MW.¹

Constraints in NTDC

Since its establishment, NTDC's performance has been constrained by various factors, including governance failures, financial and resource mismanagement, inadequate planning, delays in decision-making procedures, and complex procurement procedures. Thus, requiring structural reforms.

1. Transmission Constraints

Transmission constraints are among the key challenges. The inadequate transmission capacity prevents the evacuation of energy from efficient power plants, a key factor contributing to high electricity costs and a mounting financial burden on the power sector.² For instance, due to the inability of the transmission network to procure available power from

¹ Afia Malik, Saddam Hussein, and Tehmina Asad, "The Power Equation: A Comprehensive Review of NTDC," (Pakistan Institute of Development Economics, August 2024), V. <https://file.pide.org.pk/pdf/pideresearch/rr-the-power-equation-a-comprehensive-review-oef-ntdc.pdf>.

² National Electric Power Regulatory Authority. 2024. "State of the Industry Report 2024." 90. <https://nepra.org.pk/publications/State%20of%20Industry%20Reports/State%20of%20Industry%20Report%202024.pdf>

renewable plants, a payment of PKR 11,838 million was incurred under Non-Project Missed Volume (NPMV) in FY 2022-23 and PKR 39,521 million in FY 2023-24.³ Moreover, procuring power from inefficient plants further increases consumer tariffs and exacerbates financial losses.

In Pakistan, the installed generation capacity exceeds 40,000MW; yet the transmission network is unable to fully accommodate this capacity, leading to frequent violations of economic merit order, which heavily influence the per unit cost of electricity for the end-consumers.⁴ In addition, transmission losses remain high at 2%, contributing to a financial impact of approximately PKR 30.8 billion in 2023.⁵

Moreover, the imbalances in the utilization of transmission lines are overwhelming. While some lines are overloaded, others remain underutilized due to poor planning. For example, the 15 (550 kV) and 39 (220 kV) transmission lines are operating at over 80% capacity. Whereas, there are 53 (550 kV) and 65 (220 kV) lines operating below 30% utilization, indicating significant inefficiencies in network expansion and planning.⁶ NEPRA's figures echo the same, highlighting that in 2024, there were 12 (500 kV) and 18 (220 kV) underutilized transformers, and 26 (500 kV) and 49 (220 kV) underutilized transmission lines.⁷

Overloading transmission lines is particularly dangerous as it can lead to overheating, voltage instability, and equipment malfunctions, which not only disrupt the electricity supply but can also trigger cascading failures throughout the grid.⁸ It is due to these overloads that result in power outages during demand hikes in the summer.⁹

2. Financial Strain

The financial burden incurred due to the underperformance of NTDC has been immense. For instance, in 2023, transmission constraints led to financial losses of PKR 20.203 billion.¹⁰ Moreover, in

FY 2023-24, an additional PKR 55.671 billion was paid as Part Load Adjustment Charges (PLAC), increasing fuel cost adjustments for consumers.¹¹ Additionally, as outlined by NEPRA, NTDC often tends to revise its timelines set for resolving transmission constraints. For example, the initial timeline to resolve transmission constraints in the Jamshoro Grid was 2018, but now its completion is projected in 2025 as per the revised timeline.¹² Such delays then force the system operator to rely on expensive RFO/RLN-G plants.

Moreover, the financial pressures are further aggravated by the growing dependency on foreign loans to finance transmission infrastructure. NTDC has been relying more on loans since 2014, increasing to 28% in 2023, threatening its financial viability and adding pressure under increasing interest rates.¹³

3. Governance and Operational Inefficiencies

Operational and governance inefficiencies are other reasons for the underperformance of NTDC. Political intervention, bureaucratic influence, inconsistent senior leadership, flawed recruitment procedures, poor performance oversight, and communication barriers mar its performance. Consequently, key infrastructure projects face delays, ultimately resulting in cost overruns and service losses.

In addition, the lack of qualified and competent personnel and technical inertia have added to NTDC's shortcomings.

Moreover, these governance failures, along with broader sectoral problems, have also impacted system reliability, typically in the form of power blackouts and breakdowns. There have been multiple examples of large-scale power outages in recent years. For instance, the January 2023 blackout struck more than 220 million consumers after a major failure in the nation's grid.¹⁴

³ National Electric Power Regulatory Authority, *State of the Industry Report 2024*, 10.

⁴ Malik, Hussein, and Asad, *The Power Equation: A Comprehensive Review of NTDC*.

⁵ Ibid, 23.

⁶ Ibid

⁷ National Electric Power Regulatory Authority, *State of the Industry Report 2024*, 65.

⁸ Ibid.

⁹ Ibid.

¹⁰ Malik, Hussein, and Asad, *The Power Equation: A Comprehensive Review of NTDC*, iv.

¹¹ National Electric Power Regulatory Authority, *State of the Industry Report 2024*, 9.

¹² Ibid, 72.

¹³ Malik, Hussein, and Asad, *The Power Equation: A Comprehensive Review of NTDC*, v.

¹⁴ Deutsche Welle, "Power Outage Plunges Pakistan Into Darkness." DW, January 23, 2023. <https://www.dw.com/en/power-outage-plunges-pakistan-into-darkness/a-64484771>.

4. Weak Long-Term Planning

Lack of vision for long-term planning, which is caused by governance inefficiencies, has resulted in delays in critical decision-making and malinvestments, resulting into sub-optimal dispatch practices and higher electricity costs for the end consumer.

Moreover, NTDC's approach to planning is reactive. Instead of pursuing a proactive approach to implementing long-term solutions and preventing problems from arising, NTDC focuses on short-term fixes and largely functions on a day-to-day basis.¹⁵

This myopic approach is hindering its ability to implement long-term sustainable measures, reducing overall operational and sectoral efficiency.

Thus, to address these challenges, the government has recognized the need to reform the NTDC's structure to improve governance and enhance transmission and planning capabilities.

Current Restructuring Plan

To address issues mentioned above, the committee proposed unbundling NTDC into three entities: National Grid Company (NGC), Independent System & Market Operator (ISMO), and Energy Infrastructure Development and Management Company (EIDMC), to enhance the transmission network and planning and ensure accountability and transparency. The primary aim of this unbundling is to reduce conflicts of interest, address delays in project implementation, and improve system reliability. The functions and responsibilities of the three independent entities are as follows:

I. National Grid Company (NGC)

NGC will take over NTDC as the sole transmission service provider. It will focus on transmission operation and infrastructure maintenance. As a successor, it will inherit all transmission lines above 220 kV, just like NTDC inherited these lines from WAPDA. However, in contrast to the responsibilities delegated to NTDC, NGC will neither be responsible for system operations nor capital-intensive projects. Both roles will be managed by separate entities under the restructuring plan.

This specialization of tasks aims at reducing bureaucratic delay, thereby enhancing operational and

governance efficiency to attract the private sector in grid modernization.

Task differentiation will also ensure the timely execution of transmission projects by the government. This, in turn, will facilitate the procurement of cheaper power and reduce the escalating circular debt.

II. Independent System and Market Operator (ISMO)

ISMO, regarded as one of the most important parts of this unbundling, will oversee the implementation of the Competitive Trading Bilateral Contract Market (CTBCM) and ensure a transparent and efficient market structure. By functioning as an independent market and system operator, it will help Pakistan transition from a centralized single-buyer model to a competitive, decentralized trading framework

Currently, NTDC is responsible for system operations, managing grid stability, and power dispatch to load centers. While CPPA-G takes care of market operations as the sole power purchaser under the single-buyer model. Now, under the restructuring plan, ISMO will integrate functions of CPPA-G's market operator and NTDC's National Power Control Center (NPCC) to create a unified entity to manage both the system and market. This integration is aimed at enhancing dispatch efficiency as per the EMO, market transparency, and direct transactions between power generators and buyers.

It is crucial to have an independent system and market operations entity to eliminate the potential conflicts of interest and bureaucratic inertia and ensure fairness. In addition, it is aimed at enhancing transparency in EMO's compliance. It is responsible for ensuring that all entities, including generation, transmission, and distribution, comply with performance standards. Moreover, it can conduct technical audits to ensure compliance and requisite enforcement

As such, ISMO will be responsible for three critical functions: long-term planning, system operation, and market operations.

Furthermore, when ISMO operates with a sole responsibility to install transmission infrastructure, it will ultimately enhance accountability and the timely delivery of projects. Moreover, if there are penalties due to delays in projects, ISMO will be responsible.

¹⁵ Malik, Hussein, and Asad, *The Power Equation: A Comprehensive Review of NTDC*, 33.

III. Energy Infrastructure Development and Management Company (EIDMC)

EIDMC would undertake capital-intensive projects, previously managed by NTDC. In a broader scope, the objective is to take capital projects beyond transmission infrastructure, including those in DISCOs, power generation plants (including IPPs), and potential energy infrastructure development abroad. This expanded mandate warrants the establishment of EIDMC as a separate entity with fully assigned functions of project development, envisaging efficiency and specialization

EIDMC is envisioned to address the problems related to delays in transmission infrastructure. Traditionally,

NTDC has struggled with the sluggish execution of projects and cost overruns, resulting in transmission bottlenecks.

However, by delegating cost-intensive projects' execution to EIDMC, the plan aims to guarantee that all critical infrastructure development projects are completed on time.

In this regard, it is important to outline that the investment attracted by NGC for transmission projects will be outsourced to EIDMC. Resultantly, transmission assets that remained underdeveloped under NTDC may be developed by the private sector

The following flow chart illustrates the functions delegated to each entity.

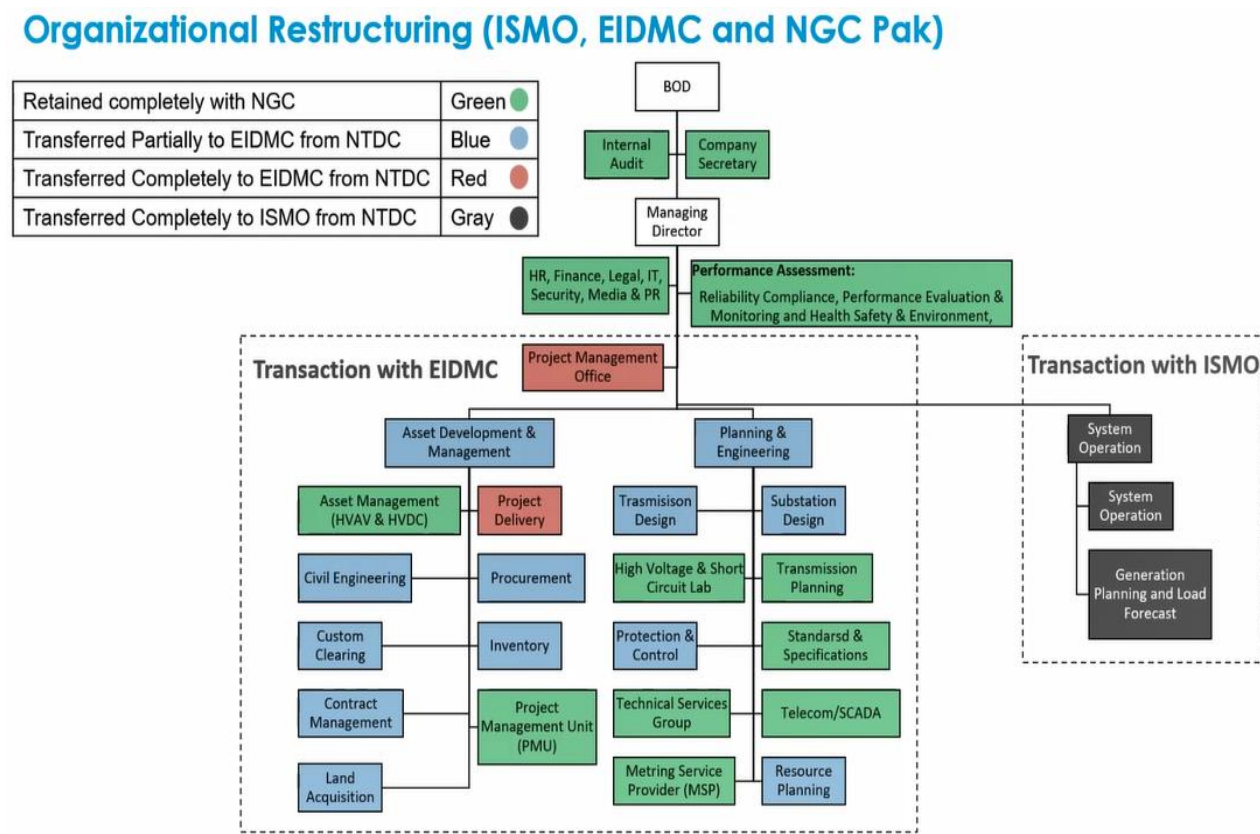


Figure 1: Flowchart showing responsibilities delegated to NGC, ISMO, and EIDMC¹⁶

¹⁶ The flowchart was presented by Dr. Fiaz Chaudhry, chairman, NTDC, during his talk at the Institute of Policy Studies (IPS), Islamabad, on February 20, 2025.

Potential Prospects of Restructuring Plan: Lessons from Global Best Practices

The unbundling of NTDC with specialized roles is a reflection of the reforms made by other countries to improve efficiency and reliability in the power sector. However, to benefit from restructuring, it would be useful to learn from the global best practices, particularly which implemented such reforms in a phased manner. Other important steps in relation to the specific environment of Pakistan's power sector involve keeping tight supervision, emphasizing capacity building, and ensuring smooth coordination among the bodies.

I. Phased Restructuring of NTDC

A phased approach to restructuring NTDC is necessary to allow for market maturity and align it with the unique challenges of the country's power sector. A careful consideration of phased unbundling of system operation roles and market implementation can help manage risks and ensure a smoother transition to a competitive and efficient sector. Global practices also suggest that following a phased approach to unbundling power sector entities is always desirable. In this regard, the European Union's Third Energy Package serves as a relevant case where countries were provided with three-phased models to separate the network operations from supply activities.¹⁷

A phased restructuring of NTDC can involve a gradual unbundling of the functions of NTDC over time instead of implementing all the changes at once. This facilitates careful management of the transition, solving problems step by step, and developing institutional capacity along the way. A critical consideration is to determine the appropriate timing of unbundling in relation to the implementation of market reforms like CTBCM. Unbundling the system operation function before the market is developed can lead to coordination challenges and inefficiencies.

II. Robust Regulatory Oversight

It is important to recognize the fact that the success of these reforms lies in the establishment of effective transmission infrastructure and planning and a competitive market that can only be realized if all three

entities achieve their envisioned objectives. Otherwise, the reforms may face the same fate as the 1992 Power Sector Reforms regarding WAPDA unbundling.

To ensure success this time, a robust regulatory oversight over the three entities is crucial. The strict regulation and periodic checks by NEPRA will not only help in maintaining market integrity but also play a role in enhancing the confidence of private investors and protecting consumer interests.

Examples from best practices worldwide, such as the USA and EU, suggest different entities handling separate functions. However, strict oversight is maintained to ensure the smooth and efficient working of the bodies.

III. Capacity Building

Currently, the technical training curriculum is outdated and fails to meet international standards. This incapability of the workforce in NTDC results in technical and governance failures, among others. According to NEPRA, the persistent inefficiencies in NTDC, particularly voltage and merit order violations, are due to poor management and not the lack of funds. This highlights the need for a skilled and experienced workforce to ensure that the new entities meet their aims. For example, ISMO's success is critically dependent upon skilled people who are experts in market operations, modern grid technologies, and wholesale electricity markets.¹⁸ Otherwise, the transition to a competitive market may face traditional operational challenges and delays, failing the purpose of the reforms to begin with.

Investment in capacity building to ensure that new entities work up to the mark and achieve broader sectoral objectives is a common practice globally. For example, in Malaysia, power sector reforms were accompanied by investments in capacity building. Similarly, Pakistan should invest in this from day one of the implementation of this plan to avoid inefficiencies, which could have spillover effects due to the interconnected nature of the sector.

IV. Ensuring Coordination Between New Entities

Smooth and effective communication between the newly formed entities is critically significant.

¹⁷ "Questions and Answers on the third legislative package for an internal EU gas and electricity market." *European Commission*, March 2, 2011. Accessed March 7, 2025. https://ec.europa.eu/commission/presscorner/detail/en/memo_11_125

¹⁸ Ismail Abubakar, "ISMO: A Game-changer for Pakistan's Electricity Market?" *Business Recorder*, October 16, 2024. <https://www.brecorder.com/news/40327272>.

International examples exhibit that the unbundling of the power sector is not enough to ensure efficiency, transparency, and reliability. There must be clear lines of communication, well-defined roles, and a mechanism for coordination and data sharing in real time.

For example, in India, initially, the restructuring of the power sector separated market operations, system operations, and transmission functions without ensuring and defining the means of coordination between the transmission company and the system operator. This led to inefficiencies. However, over time, it developed mechanisms for data sharing, grid management, and market transparency, resolving the issues. A key takeaway from this is that an effective coordination mechanism is essential to ensuring that the restructuring plan achieves its intended outcomes while preventing new challenges.

A similar case was observed in Germany, where the power sector reforms separated market and system operators to enhance transparency, creating challenges in grid stability and the power dispatch function. This suggests that while independence is crucial for transparency and efficiency, collaboration and communication are equally important.

In Pakistan, the restructuring must also integrate a plan for coordination, communication, and data sharing among NGC, ISMO, and EIDMC.

Some key measures that can ensure this include:

- A centralized data-sharing platform containing time data for effective coordination between three entities. It will also play a critical role in transmission planning and system operation

- A joint planning Committee to hold regular meetings between the three entities to align transmission planning, market operations, and project execution with oversight by NEPRA, ensuring that there are no delays, conflicts, or misaligned priorities.
- Finally, a dispute resolution mechanism is vital for resolving disputes or conflicts of organizational interests over partially delegated tasks to ensure the smooth and efficient working of NGC, EIDMC, and ISMO.

Conclusion

NTDC's unbundling is one of the vital moves taken by the federal government under broader sectoral reforms. It aims to address the longstanding technical and governance inefficiencies and transmission constraints. NTDC is unbundling into three entities: NGC, ISMO, and EIDMC. Each of them has separate functions, which in combination aim to enhance transparency, efficiency, and private investments. However, it must be noted that the success of this plan is dependent upon robust regulatory oversight by NEPRA and effective and consistent coordination among the new entities. As evident from international best practices, structural changes alone do not promise success unless they are complemented by skilled human resources and a seamless communication and coordination mechanism. These reforms, if implemented successfully, can contribute to grid stability and cost efficiency in the longer run. Moreover, it can also play a role in financial sustainability in the overall power sector.

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