PERFORMANCE EVALUATION REPORT (TRANSMISSION) FOR THE PERIOD JULY-DECEMBER 2024

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(Transmission Section)

EXECUTIVE SUMMARY

This Bi-Annual Report presents an overview of the National Transmission and Despatch Company (NTDC) **[PART-A]** and K-Electric (KE) **[PART-B]** transmission networks major issues including key constraints, important projects' progress, and operational challenges for the period from July to December 2024. The Latest status and current progress of some of the most critical issues are summarized below:

1. TRANSMISSION SYSTEM CONSTRAINTS:

NEPRA has implemented proactive measure to ensure NTDC and KE take swift and decisive actions in monitoring and expediting critical projects that address network congestion. Through rigorous regulatory oversight, enhanced reporting mechanisms, and stricter accountability, NEPRA aims to improve transmission efficiency and system reliability and also put efforts to resolve the following constraints:

i. South-to-North Transmission Constraints:

The South-to-North power transmission constraints within the NTDC networks are critical that limit power transfer from cost-effective generation hubs located at the southern parts to northern demand centers of the country, leading to reliance on expensive RFO-based plants. As constraints removal plan, 500kV Lahore North G/S & associated T/Lines were planned with expected completion in September 2021. However, the revised timeline will be April 2025 with current physical progress of 82% as of December 2024. The delay in completing the 500kV Lahore North Grid Station and associated transmission lines resulting underutilization of the 4000 MW HVDC Matiari-Lahore Transmission Line at only 38%. Additionally, the overloaded 500 kV grid stations (Jamshoro and Matiari) and 500 kV transmission lines (Dadu-Shikarpur, and others) resulted in least cost generation curtailment and frequent voltage stability issues due to pending completion of aforementioned transmission project within NTDC networks. The total financial impact of around Rs. 7,529 million attributed due to south to north transmission constraints has been assessed for the period from July to December 2024.

ii. Progress of SCADA-III Project:

The project has been approved in 2018 which was expected to complete in June 2022, but still pending, causing delay of nearly 3 years. As of December 2024, physical progress of 72% has been achieved. As reported by NTDC, the revised expected completion of the said project will be in June 2025.

iii. Progress of 500kV K2/K3 – Port Qasim Transmission Line:

As per PC-I (scope and timeline) approved by ECNEC in April 2017, the dedicated 500kV K2/K3 – Port Qasim transmission line project was planned for evacuation of power from K2/K3 nuclear power plants with an in-out arrangement at 500kV KKI grid station. Initially, the project was slated for completion in April 2022, however the same was delayed and is being operated through interim arrangements even after passage of 3 years. NTDC reported the physical progress of 87 % achieved as of December 2024 and the revised completion of the project is expected to be scheduled in June 2025. It is imperative to highlight that the aforementioned dedicated transmission line project has an in-out arrangement at 500kV KKI grid station (completed in September 2024 and energized through interim arrangements with 1600MW power transformation capacity) and due to the delays in completion of the such project resulting in less drawl through 500kV KKI grid station from national grid to KE network.

2. REGION-WISE PROJECT DELAYS IN NTDC SYSTEM:

North Region: Multiple augmentation and extension projects delayed due to material procurement, ROW constraints, and security concerns, affecting key projects like 765 kV Dasu-Mansehra and 500 kV Tarbela-Islamabad West transmission lines.

South Region: Delays in major grid extensions due to ROW issues and security challenges, with projects like 500 kV K2/K3-Port Qasim and 220 kV TM Khan-Hala Road pushed to 2025.

3. MAJOR INTERIM ARRANGEMENTS WITHIN NTDC NETWORKS:

As per data reported by NTDC, several temporary circuit connections are in the field due to dedicated project delays, stressing the need for timely completion of grid system expansion. Major interim arrangements within NTDC system include non-completion of dedicated transmission lines for evacuation of power from Suki Kinari hydro power plant, HVDC Converter Station at Balloki to Nokhar via Lahore North grid station, 500kV Nokhar grid station and import of power from Pak-Iran Border to Gwadar.

4. DELAYED POWER EVACUATION PROJECT:

Multiple overloading issues at 500 kV and 220 kV levels, affecting power despatch efficiency, must be mitigated with planned efforts. The details of the power evacuation projects provided by NTDC and KE were reviewed and it has been observed that following projects are delayed which are discussed in details in relevant part of this report:

i. Overloading of 500kV Jamshoro-China Hub-HUBCO-K2K3 loop.
ii. Overloading of 500kV Matiari-Lucky-Port Qasim Loop.
iii. Overloading in 500 kV Matiari-Lucky Power, Port Qasim-Matiari interconnection loop.
iv. Overloading of 500kV Nokhar-Karot-Neelum Jhelum Loop.
v. Overloading of 500kV Dadu-Shikarpur Loop.
vi. Overloading of 500kV Shikarpur-Guddu Loop.
vii. Overloading of 500kV Moro-Rahim Yar Khan Loop.
viii. Overloading of 500kV Sheikh Muhammadi-Tarbela Loop.
ix. Overloading of 220kV Jamshoro-Hala Road Loop.
x. Overloading of 220kV Ghakkar-Sahuwala Loop.

5. K-ELECTRIC TRANSMISSION NETWORK CONSTRAINTS:

As reported by KE, 500 kV KKI grid station commissioned in September 2024 under an interim arrangement is still awaiting completion of its dedicated NTDC connection by March 2025. In addition, 220 kV Dhabeji interconnection delayed due to ROW issues, expected to be completed by February 2025. Further, significant delays are also noted in key projects, including 220 kV GIS Landhi Grid and multiple GIS substations, with some projects showing 0% physical progress including limited progress in renewable interconnection projects, affecting KE's transition towards cleaner energy sources.

6. FATAL / NON-FATAL INCIDENTS:

During the period from July to December 2024:

i. NTDC reported three (03) fatal incidents and one (01) non-fatal incident.
ii. KE reported two (02) fatal incidents and twelve (12) non-fatal incidents.

7. LOADING POSITION OF AUTO/POWER TRANSFORMERS OF NTDC:

i. 500/220kV Auto Transformers: 4 out of 47 (8.5%) are loaded above 80%.
ii. 220/132kV Auto/Power Transformers: 36 out of 183 (19.7%) are loaded above 80%.

8. LOADING POSITION OF AUTO/POWER TRANSFORMERS OF KE:

i. 132/11kV Power Transformers: 20 out of 180 (11.1%) are loaded above 80%.
ii. 66/11kV Power Transformers: 2 out of 4 (50%) are loaded above 80%.

9. APPROVAL OF POLICIES BY NTDC W.R.T TRANSMISSION LINE SECURITY, RIGHT OF WAY COMPENSATION AND LAND ACQUISITION:

The approval process for NTDC policies related to Transmission Line Security, Right of Way (ROW) Compensation, and Land Acquisition is progressing through various stages:

i. Transmission Line Security SOPs – A draft policy has been prepared and is currently under review by relevant NTDC departments. Once a consensus is reached, it will be submitted for management review and subsequently forwarded for approval by the competent authority.
ii. Right of Way (ROW) Policy – The NTDC legal team has drafted legislation on ROW issues in consultation with relevant departments. This draft has been sent to the Ministry of Energy for legislative approval, but the process is still pending. The NTDC Board of Directors (BoD) discussed this in their 255th meeting and urged expedited approval efforts.
iii. Compensation Policy for ROW and Land Acquisition – An interim compensation policy was presented in the 255th BoD meeting on October 10, 2023, by the Director General (Land) NTDC. This policy was approved as a temporary measure to address NTDC's ongoing challenges.

PART-A

NTDC CRITICAL ISSUES, CONSTRAINTS & PROJECTS PROGRESS FOR THE PERIOD JULY-DECEMBER 2024

1. SOUTH-TO-NORTH POWER TRANSFER CONSTRAINTS:

The South-to-North transmission constraints are critical barriers in NTDC's network, limiting the efficient transfer of cost-effective power from southern generation hubs (coal, nuclear, and gas) to northern load centers (Punjab and KP). These limitations compel the reliance on expensive RFO-based plants in the north, escalating electricity costs and tariffs.

As a constraint removal plan for smooth power transfer from South to North, 500kV Lahore North Grid Station & associated Transmission Lines were conceived with expected completion in September 2021. However, as per the current investment plan of NTDC, the project was expected to be completed in March 2024, regrettably, as of now the revised timeline for the said project is April 2025. The current physical progress is reported as 82% as of December 2024. The delays are translating to a financial impact of around Rs. 7,529 million assessed for the period from July 2024 to December 2024.

The key challenges and bottlenecks due to delay in completion of the above critical project resulted in the following:

a. Limited Capacity of Existing NTDC HVAC Transmission Lines:

The existing overloaded 500 kV Jamshoro and 500 kV Matiari Grid Stations and their associated Transmission Lines limited the power flows to 1800 MW under normal conditions, despite an available capacity of 4500 MW (1800 MW AC + 2700 MW DC). Such scenario resulted in Frequent load-shedding, voltage stability issues, and curtailment of 1,750 MW.

b. Underutilization of 4000 MW HVDC Matiari-Lahore Transmission Line:

The full operational capacity i.e. 4000MW of the 878 km HVDC transmission line (commissioned in September 2021) is still unachievable due to various reasons including the delay in completion of the 500 kV Lahore North substation and its associated 500 kV and 220 kV transmission lines. The underutilization (approx. 38%) of the HVDC line imposed a substantial financial burden on end-consumers since its commissioning.

c. Transmission and Transformation Constraints Curtailing South-to-North Power Flow:

The insufficient current carrying capacity of 500 kV Dadu-Shikarpur, 500 kV Shikarpur-Guddu and 500 kV Moro-Rahim Yar Khan force NTDC to curtail cost-effective southern generation from Port Qasim and Hub China power plants under normal (N-0) conditions, limiting full utilization of least cost generation potential.

2. SCADA-III PROJECT:

2.1 Project Overview:

Initially the SCADA System was operational since 1992 but outdated due to lack of hardware/software updates, impairing functionality. To modernize and nationwide expansion aimed for real-time data acquisition, enhanced visibility, and improved operations, the SCADA-III project, sponsored by ADB, was planned to initiate for efficient monitoring of power plants and Common Delivery Points (CDPs).

The SCADA-III project has been approved in 2018 and was expected to complete in June 2022, but still pending completion, causing delay of nearly 3 years. As reported by NTDC, revised completion of the project will be in June 2025. As of December 2024, overall physical progress of 72% has been achieved.

2.2 Updated Timelines:

Description	**Original Deadline**	**Revised Deadline**	**Progress**
OPGW (Backbone)	January 2024	May 2024 (Completed)	Completed in May 2024
OPGW (Remaining)	February 2024	December 2024	Ongoing
SCADA Go-Live	March 2024	December 2024	Expected in Dec 2024
Microwave	May 2024	June 2025	Pending
SCADA Completion	May 2024	June 2025	Pending
Overall Completion	**June 2024**	**June 2025**	**Ongoing**

2.3 Key Reasons of Delays:
The reported reasons in implementation of the SCADA-III project are the delays in approval of design documents, Installation of Optical Ground Wire (OPGW) and delay in transmission towers installation in the jurisdictions of HESCO, SEPCO and Ghazi Barotha regions.

2.4 Implications of Delays:

i. Operational Impact: Limited real-time monitoring capabilities hinder NTDC's ability to efficiently manage power flow, to optimize grid monitoring including smooth operations and system reliability.
ii. Financial Burden: Delays result in increased reliance on manual interventions, leading to higher operational costs.
iii. Strategic Importance: Timely completion is crucial for ensuring improved power Despatch efficiency and reducing network vulnerabilities.

3. DELAY IN CONSTRUCTION OF DEDICATED 500 KV K2/K3 - PORT QASIM TRANSMISSION LINE:

The dedicated transmission line for evacuating power from the K2/K3 nuclear power plants was originally planned for completion by April 2022, but due to delays, it was energized through an interim arrangement in March 2022. After a partial blackout in October 2022, NTDC engaged in negotiations with the contractor, and the project was scheduled for completion by December 2024.

3.1 Updated Status from NTDC:
As per 2nd quarter of FY 2024-25, the overall physical progress: 87% and expected completion of project will be March 31, 2025.

3.2 Reasons of Delay:
The Severe ROW problems in Balochistan (District Hub) area and in Gaddap (District Malir Karachi) by the landowners and ROW issues in Bahria Town Karachi (BTK-I) under the jurisdiction of District Jamshoro.

4. REGION-WISE ANALYSIS OF DELAYED PROJECTS OF NTDC:

A significant number of NTDC projects are facing substantial delays, with their expected completion dates extending well beyond the original contractual deadlines.

4.1 North Region:

Key projects in the North Region are facing persistent delays due to recurring issues. The WB-07A-2020 Augmentation at Sammundri Road and Ghakkhar G/S has been delayed until February 2025, primarily due to shutdown unavailability during peak load seasons, late equipment procurement, and LC constraints, despite 97.5% progress at Ghakkhar. Similarly, the WB-07E-2020 Augmentation at WAPDA Town and Sheikhupura G/S, now expected by December 2024, is delayed due to approval issues for changing the manufacturer of 250 MVA ATRs, with physical progress at 91%.

The WB-10A-2021 Augmentation at 500 kV Nokhar G/S has seen slow progress (39.3%), now projected for completion by December 2025 due to design revisions and delays in control house extension. The WB-10B-2021 Augmentation at Ludewala and New Kot Lakhpat G/S has faced setbacks due to delayed material deliveries, pushing the revised timeline to March 2025. Meanwhile, critical projects such as the 765 kV Dasu-Mansehra Transmission Line Project (LOT-1) and associated Islamabad infrastructure (LOT-4) are experiencing delays due to security concerns, ROW issues, and design complexities, leaving progress at 22.4% and 7%, respectively.

ROW issues have also stalled the 500 kV Nowshera T/L, now targeted for December 2024, with physical progress at 82%. Similarly, the 500 kV Tarbela-Islamabad West T/L has been delayed to August 2025 due to ROW constraints, despite 72% completion. These challenges highlight the urgent need for addressing ROW bottlenecks, expediting approvals, and ensuring timely delivery of materials to mitigate further delays.

4.2 South Region:

Key projects in the South Region continue to face significant delays due to recurring issues such as right-of-way (ROW) challenges, security concerns, and logistical barriers. The 500 kV K2/K3-Port Qasim Transmission Line (NPP-03C-2019)**,** originally scheduled for completion by August 2024, has been delayed to March 2025. This is primarily due to severe ROW issues in Hub, Gadap, and Bahria Town Karachi, as well as road-cutting charges levied by Town Municipal Corporation (TMC) Mauripur. Despite repeated engagements with local authorities and the Ministry of Energy, the matter remains unresolved, with 87.02% physical progress achieved.

The Augmentation at 220 kV TM Khan and Hala Road G/S and Extension at 500 kV Jamshoro G/S (WB-8A-2020) is delayed to June 2025, with physical progress at 55.4%. Previous delays stemmed from changes in transformer manufacturers and non-availability of shutdowns, while current delays are due to security arrangements and NOCs for Chinese engineers.

The Extension at 220 kV Sibbi and Loralai G/S (WB-9A-2020) is now expected by February 2025, with 82% physical progress. Earlier, LC-related delays hampered material delivery, but ongoing security concerns in Baluchistan have stalled contractor activities. Similarly, the Augmentation at 220 kV Quetta Industrial G/S (WB-9B-2020)**,** with 79.53% physical progress, faces delays until January 2025 due to severe security risks and previous LC issues delaying tap changer delivery.

These delays highlight the urgent need for strengthened coordination with local authorities, enhanced security measures, and expedited resolution of ROW and administrative challenges to ensure timely project delivery in the South Region.

5. REGION-WISE MAJOR INTERIM ARRANGEMENTS WITHIN NTDC NETWORKS:

This summary highlights key interim arrangements in NTDC's transmission network. These temporary setups are necessitated by incomplete grid stations, ongoing construction, or technical modifications to ensure system reliability and power flow continuity.

5.1 North Region Interim Arrangements:

The North Region continues to rely on several interim transmission circuits, with a key focus on the 500 kV Lahore North Grid Station, which is now expected to be energized by March 2025. This will help resolve many of the existing constraints and interim arrangements in the area. The 500 kV Nokhar-Lahore North Circuit has shown an overall physical completion of 90.14% by the first quarter of 2025. Additionally, the 220 kV circuits including Lahore (Sheikhupura)-Ravi, Kala Shah Kaku-Ravi, and Kala Shah Kaku-Ghazi remain part of the temporary looping arrangements. The 500 kV Suki Kinari-Neelum Jhelum Circuit is expected to be completed by December 2026, depending on contract award by February 2025, with tenders currently under evaluation. These ongoing interim setups emphasize the critical need for timely grid station commissioning to ensure a reliable and efficient transmission network. The existing Interim Arrangements in North Region are listed below:

Sr. No.	Name of Circuit	Timeline for Removal of Interim Arrangement	Progress in % as per the 2nd Quarter 2025
1	500kV Nokhar - Lahore North CCT	These transmission lines are part of PC-I of 500kV Lahore North G/S. They have been energized through looping of circuits due to unavailability of 500kV Lahore North which is expected to be energized by March-2025.	T/Ls (1-4) have been energized. Progress of 500 kV Lahore North G/S is as under: Physical Progress: 77.96% (up to 30.09.2024) Physical Progress: 87.7% (up to 31.12.2024) Physical Progress: 90.14% (to date)
2	220kV Lahore (Sheikhupura) - Ravi CCT		
3	220kV Kala Shah Kaku-Ravi CCT		
4	220kV Kala Shah Kaku-Ghazi CCT		
5	500kV Suki Kinari-Neelum Jhelum CCT	Dec-2026 (Subject to award of contract by Feb-25)	Tender under evaluation
6	500kV Suki Kinari-Karot CCT	The said T/L is included in PC-1 and not a part of interim arrangement	

5.2 South Region Interim Arrangements:

In the South Region, several key interim transmission circuits are also under development. The 500 kV K2-Hub Circuit, now renamed the 500 kV K2/K3-CPHGC Transmission Line due to the disconnection of the Hub Power Plant, has made steady progress, reaching 87.02% completion. The 500 kV Jamshoro-K2K3 Circuit-II, part of the KKI-NTDC interconnection, is on track for completion by March 2025. The 132 kV Jhampir-I-Tanaga Circuit interim arrangement was discontinued, as it became redundant with the expected commissioning of the Dhabeji Grid Station by December 2024. Furthermore, the 220 kV Pak-Iran Border (Gabd)-Jiwani Circuit is pending full utilization, awaiting the resolution of financing and implementation issues with M/s. Sunir, Iran, with completion targeted for December 2026.

While progress has been made across several circuits, the timely resolution of issues related to financing, ROW (Right of Way), and contractual delays remains essential for eliminating interim setups and optimizing the overall transmission infrastructure. The existing Interim Arrangements in South Region are listed below:

1	500kV K2-Hub Circuit	31-03-2025 Now the circuit. became ***500kV Transmission Line K-2/K-3 to CPHGC energized on 21-11-2024*** Due to disconnection/isolation of 500kV Switchyard of HUB Power Plant.	Overall Physical Progress: 87.02% (up to 31st Dec-2024)
2	500kV Jamshoro-K2K3 Circuit-II	31-03-2025 KKI-NTDC interconnection with existing K-2/K-3 to Jamshoro Ckt-II energized as per below arrangements: ***Energization of 500kV K-2/K-3-KKI Transmission Line on dated 25-09-2024 @ 20:34 Hrs.*** ***Energization of 500kV Jamshoro-KKI Transmission Line on dated 25-09-2024 @ 20:39 Hrs.***	
3	132kV Jhampir-I - Tanaga Circuit (via 220kV Gharo-Jhampir-I T/L)	The option of said interim arrangement was proposed on Jhimpir-II to Gharo T/L at 132kV level but that would have become unfunctional/ redundant upon commissioning of Dhabeji GS. As such, the said interim arrangement was not feasible and hence dropped as energization of Dhabeji was expected by then in Dec 2024.	
4	220kV Transmission Line from Pak-Iran border (Gabd) to 132kV Jiwani Gwadar interconnection point	Matter dealt by CE (MP&M)-NTDC	220kV Transmission Line from Pak-Iran border to existing Jiwani Gwadar (132kV) Transmission Line was completed on 08/02/2023.

Overall, the progress is notable on several circuits, however, timely resolution of ROW, financing, and contractual delays is essential to eliminate interim setups and optimize transmission operations.

6. OVERALL LOADING POSITION IN NTDC NETWORKS:

i. 500/220kV Auto Transformers: 4 out of 47 (8.5%) are loaded above 80%.
ii. 220/132kV Auto/Power Transformers: 36 out of 183 (19.7%) are loaded above 80%.

6.1 Loading Position of Transformers in NTDC North Region:

- Overview:
  - Grid Stations: 50
  - Power Transformers: 234
  - Transformers Loaded >80%: 34

- Loading of Transformer Breakdown by Voltage Level (As per Dec 2024):
  - 500/220 kV: 1 out of 36 transformers are loaded beyond 80%.
  - 220/132 kV: 30 out of 145 transformers exceeded 80% loading.
  - 132 kV: 3 out of 53 transformers heavily loaded.

6.2 Loading Position of Transformers in NTDC South Region:

- Overall:
  - Grid Stations: 18
  - Power Transformers: 49
  - Transformers Loaded >80%: 9

- Loading of Transformer Breakdown by Voltage Level (As per Dec 2024):
  - 500/220 kV: 3 out of 11 transformers are loaded beyond 80%.
  - 220/132 kV: 6 out of 38 transformers exceeded 80% loading.
  - 132 kV: Data not reported.

7. FATAL / NON-FATAL INCIDENTS WITHIN NTDC TRANSMISSION NETWORKS:

According to the data provided by NTDC, for the first quarter FY 2024-25, NTDC reported three (03) fatal incidents and one (01) non-fatal incident involving NTDC employees. However, during 2nd quarter, no fatal or non-fatal incidents were reported in NTDC's transmission networks.

8. DETAILS OF POWER EVACUATION CONSTRAINTS WITHIN NTDC SYSTEM:

8.1 Power Evacuation Constraints at 500kV Transmission Lines: -

i. **Constraint:** 500kV Jamshoro Grid Station: Overloading in Jamshoro-China Hub-HUBCO-K2K3 loop prevents full load Despatch.
- **Plan**: Lahore North G/S (87%), KKI grid station (99% completed by KE), Dhabeji SEZ (42%), Mirpur Khas (78.13%).
- As of 2nd quarter of 2025, no physical progress achieved w.r.t Dhabeji & Mirpurkhas has been provided by NTDC.

ii. **Constraint:** 500kV Matiari-Lucky-Port Qasim Loop: Limited HVAC capacity hinders full load Despatch during outages.
- **Plan**: Same as above.

iii. **Constraint:** 500kV Jamshoro Grid Station: Overloading unable to Despatch power plants (China Hub & HUBCO) on Full Load during outage of either 500 kV China HUB-Jamshoro or 500 kV HUBCO-K2K3
- **Plan**: Same as above

iv. **Constraint:** 500 kV Jamshoro Grid Station: Overloading in 500 kV Matiari-Lucky Power, Port Qasim-Matiari interconnection loop
- **Plan**: Same as above

v. **Constraint:** 500kV Nokhar-Karot-Neelum Jhelum Loop: Overloading affects power evacuation from Suki Kinari and karot during circuit outages.
- **Plan**: Double circuit T/L between Maira & Karot (Dec 2025). Progress: Tender for civil works under preparation.

vi. **Constraint:** 500kV Sheikh Muhammadi-Tarbela Line: Overloading reduces operational flexibility and load management by NPCC.
- **Plan**: Second supply source (June 2026). Progress: PC-I preparation underway.

vii. **Constraint:** 500 kV Dadu-Shikarpur Transmission Lines: Generation Curtailment required from Southern Power Plants in case of N-0 as HVAC current carrying capacity from South to North is less than generation capacity in South.
- **Plan**: Same as Constraint No. 1.

viii. **Constraint:** 500kV Shikarpur-Guddu 1 & 2 and 500kV Moro-Rahim Yar Khan Transmission Lines: Unable to Despatch existing Power Plants in South on Full Load.
- **Plan**: Same as Constraint No. 1

8.2 Power Evacuation Constraints at 220kV Transmission Lines:

i. **Constraint:** Jamshoro-Hala Road Circuits: Overloading impacts 500kV Jamshoro G/S.
- **Plan:** In-out arrangement with T.M. Khan Circuit (2026-27). Progress: Tender under evaluation.
- **Progress:** As of 2nd quarter of 2025, no physical progress achieved w.r.t removal of the constraint has been provided by NTDC.

ii. **Constraint:** New Ghakkar Line: Overloading during low Mangla generation resulting in use of expensive power generation from Nandipur and HUBCO Narowal.
- **Plan:** Gujranwala-II G/S (June 2026).
- **Progress:** Land acquired; financing pending.

iii. **Constraint:** Ghakkar-Sahuwala Line: Overloading impacts grid reliability resulting in use of expensive power generation from Nandipur and HUBCO Narowal.
- **Plan:** Sialkot G/S (May 2027).
- **Constraint:** Material procurement & civil works tenders under preparation.

8.3 Overloading of 500kV Transformers:

i. **500kV New Rawat:** Overloaded auto transformers since 2017 resulting in use of expensive power generation from Attock Gen limited.
- Plan: Chakwal G/S (land acquired), Islamabad West G/S (6%).

ii. **500 kV Gatti:** Overloading of the 500/220 kV (4x450 MVA) auto transformers at the 500 kV Gatti Grid Station since 2018 resulting in generation from Liberty Power Tech.
- Plan: (i) Completion of pending works of 500 kV Faisalabad West (87.28%).
  (ii) 2nd Source of supply to Jaranwala Road Faisalabad, under preparation, tender scrapped twice, under preparation.
  (iii) Commissioning of 3rd 750 MVA ATB at 500 kV Faisalabad West, tender scrapped and retender floated on 14.09.2024 which will open 29.10.2024.

iii. **500 kV Multan:** Overloading of the 500/220 kV (2x450 MVA) transformers resulting in expensive generation from PTPL, FKPCL and AES Pakgen Power Plants.
- Plan: (i) Upgradation of Vehari from 220 kV to 500 kV level, tender under preparation.
  (ii) Replacement of existing 450 MVA ATB with new one at 500 kV Multan Substation, tender under preparation.

iv. **500 kV Muzaffargarh:** Overloading of its 500/220 kV (2x600 MVA) auto transformers resulting in expensive generation from PTPL, FKPCL and AES Pakgen Power Plants.
- Plan: (i) Upgradation of Vehari from 220 kV to 500 kV level, tender under preparation.

v. **500 kV Yousafwala:** Overloading of its 500/220 kV (3x600 MVA) auto transformers (T1, T2, and T3) resulting in expensive generation from Saif Power Plant.
- Plan: (i) Upgradation of Vehari from 220 kV to 500 kV level, tender under preparation.

vi. **500 kV Sheikh Muhammadi Peshawar:** Overloading issues with its 500/220 kV (3x450 MVA) autotransformers (T1, T2, and T3) since July 2023.
- Plan: (i) Addition of a 4th 450 MVA transformer (500/220 kV), with an expected completion deadline in 2026, requirement being re-assessed.
  (ii) Construction of the HVDC 500/220 kV Nowshera Substation is underway to help alleviate the overload at Sheikh Mohammadi (76%).

vii. **500kV Lahore Sheikhupura:** Overloading of 4x160 MVA transformers since 2019 reliance on generation from Saba, Halmore & Sapphire plants.
- Plan: Augmentation of Auto Transformers. Progress: 79% as per 1st quarter, however, no overall % is shared in the 2nd quarter i.e. December 2024.

8.4 Overloading of 220kV Transformers:

i. **220kV Sarfaraz Nagar:** Overloaded 4x160MVA transformers since 2018 resulting in use of generation from Nishat Chunian, Nishat Power and Kohinoor Plant.
- Plan: Augmentation at Sarfaraznagar (complete), 3rd transformer at Okara (completed), Construction of 220kV Sunder (2023-24).
- As of 2nd quarter, FY 2024-25, revised studies indicate no need for Kasur after Sundar grid stations due to reduced load demand.

ii. **220kV Sahuwala Sialkot:** Overloaded 3x160MVA transformers since 2019 reliance generation from Nandipur and HUBCO Narowal.
- Plan: Commissioning of 500kV Sialkot G/S (2027) & 220kV Gujranwala-II G/S (2026).
- Progress: In December 2024, land acquisition completed for Gujranwala-II, but financing is pending, whereas Sialkot substation tender preparation in progress.

iii. **220kV Luddewala:** Overloading of 250 MVA & 160 MVA transformers since 2017.
- Plan: Augmentation of Auto Transformers. Progress: 83% as per 1st quarter.
- NOTE: As of 2nd quarter, the deadline has been revised from Jun 2024 to December 2024 and now March 31, 2025

iv. **220kV switchyard of 500kV Yousafwala:** Overloaded since June 2018, requiring reliance on expensive generation from Fauji Kabirwala and Saif Power.
- Plan: New 500kV Circuit between Yousafwala & Sahiwal (June 2026). Progress: PC-I under preparation.

v. **220kV switchyard of 500kV Lahore Sheikhupura:** Overloading of 4x160 220MVA transformers since 2019 reliance on generation from Saba, Halmore & Sapphire plants.
- Plan: Augmentation of Auto Transformers. Progress: 79% as per 1st quarter, however, no overall % is shared in the 2nd quarter i.e. December 2024.

9. APPROVAL OF POLICIES BY NTDC W.R.T TRANSMISSION LINE SECURITY, RIGHT OF WAY COMPENSATION AND LAND ACQUISITION:

9.1 Updated Status of Transmission Line Security SOPs:

Draft Policy by NTDC w.r.t Transmission Line Security has been prepared and is under review/ discussion among relevant NTDC departments, please. After joint consensus, it will be submitted to the management for review/vetting. After vetting, the same may be submitted for approval from the competent Authority please.

9.2 Updated Status of ROW Policy:

With consultation of the relevant department/DG (Land) NTDC, the legal team of NTDC has proposed a basic/first draft of the legislation on right of way as an attempt to resolve such issues effectively. The said draft had been sent to the Ministry of Energy to be presented in the legislature to pass as a law and the same is pending for legislative purposes. In 255th meeting of the Board of Directors, NTDC this matter was also discussed, where the BoD requested Additional Secretary and member of the BoD to make efforts to expedite the process of getting the legislation approved from the legislature, whenever it is in session next. The NTDC Compensation Policy for Right of Way and Land Acquisition was presented at the 255th meeting of the Board of Directors (BoD) on October 10, 2023. It was introduced by the Director General (Land) of NTDC as an interim arrangement to address the ongoing challenges faced by the NTDC, the policy was subsequently approved by the BoD.

PART-B

K-ELECTRIC CRITICAL ISSUES, CONSTRAINTS & PROJECTS PROGRESS FOR THE PERIOD JULY-DECEMBER 2024

1. INADEQUATE NTDC & KE INTERCONNECTION/TRANSFORMATION CAPACITY:

1.1 500kV KKI:

The 500/220kV KKI Grid station was completed in September 2024. Subsequently, it has been commissioned after NTDC approval under interim arrangement with a total power evacuation capacity of 1600 MW.

As per initial studies and scope, the 500kV KKI grid was planned to be connected to 500 kV NTDC system through 500kV double circuit transmission line connecting KKI grid to K2/K3 power plants (through an in-out arrangement) and Matiari converter station. However, the dedicated 500kV K2/K3 – Port Qasim transmission line project is currently under construction therefore the project was energized under interim arrangement. According to NTDC, the aforesaid dedicated transmission line is expected to be completed in March 2025.

1.2 220kV Dhabeji:

KE completed the 220kV/132kV/11kV Dhabeji-2 grid station in January 2024. However, the interconnection facilities (Overhead portion & Underground portion) between Dhabeji-2 grid station and NTDC networks are still not completed due to delay in arrangement of ROW from Railway and also impacted due to prohibition by NHA for RoW as open cutting of highway is not allowed therefore underground boring method has been adapted. Subsequently during second quarter of FY 2024-25, KE substantially completed the overhead portion of the interconnection line and had requested NTDC to energize the Dhabeji Interconnection through an interim arrangement via this overhead transmission line, which has not been agreed by NTDC. Subsequently, the remaining portion of interconnection is being carried out as per the original plan by KE with physical progress of 95% for OH and 68.97% for UG and also achieved financial progress of 90.90% for OH and 47.8% for UG. This interconnection scheme is expected to be completed by February 2025.

2. MAJOR INTERIM ARRANGEMENTS WITHIN K-ELECTRIC NETWORKS:

As reported by KE, no interim arrangements are existed within K-Electric transmission system.

3. ANALYSIS OF K-ELECTRIC'S DELAYED PROJECTS:

K-Electric's project delivery continues to face significant delays across multiple initiatives. Key projects like the 220 kV GIS Landhi Grid**,** 132 kV GIS Site 2 Grid**,** 132 kV GIS K-Central 1 Grid**,** and 132 kV GIS LILO STDC**,** along with critical additions such as the ATR Addition at Surjani and PTR Additions at Jail and KESC Hospital**,** remain at 0% progress**,** reflecting persistent issues in project initiation and execution. Similarly, vital interconnection projects such as the 1x600 MVA ATR at NKI and 350 MW Renewable Interconnection show no progress, further delaying critical enhancements to the network**.**

While some major projects have advanced, they still fall short of expected timelines. The 500 kV KKI Grid and 500 kV KKI-NTDC Interconnection, though completed and energized in November 2024, missed original deadlines, with the 220 kV KKI Transmission Line nearing

completion but delayed until January 2025. The 220 kV Dhabeji-NTDC Interconnection remains incomplete, with 95% progress in overhead works and 68.97% in underground works, primarily hindered by ROW issues and administrative challenges.

The repeated delays highlight the need for enhanced project management, efficient coordination with stakeholders, and timely resolution of operational and logistical challenges to ensure that critical infrastructure projects are completed without further setbacks.

4. TRANSFORMER LOADING POSITION IN KE TRANSMISSION NETWORKS:

Overall, KE operates 78 grid stations and 184 transformers across all voltage levels. Out of these, 22 transformers (approximately 12%) are loaded above 80%, pointing to a relatively moderate level of strain on the grid. KE reported that its transformer planning is designed to operate at 93% of the rated load, indicating a strategy for ensuring efficient resource utilization while avoiding overloading.

5. FATAL / NON- FATAL INCIDENTS WITHIN K-ELECTRIC TRANSMISSION NETWORKS:

In K-Electric, during 1st quarter of FY 2024-25, a total of one (1) fatal incident was reported, including one employee, whereas, eight (08) non-fatal incidents occurred, involving 8 members of the general public. During 2nd quarter, KE reported one (01) fatal incident and four (04) non-fatal accidents.

6. KE TRANSMISSION NETWORKS CONSTRAINTS:

As per K-Electric, there are no transmission constraints existed within its transmission network.

CONCLUSION & RECOMMENDATIONS

1. Urgent completion of crucial NTDC projects is required to improve South-to-North power flows, reduce dependency on expensive generation, and optimize the HVDC Matiari-Lahore transmission line including avoidance of financial burden to national exchequer.

2. Acceleration of SCADA-III and key augmentation projects will enhance grid monitoring and operational reliability.

3. Resolving ROW, security, and logistical challenges is essential for both NTDC and KE to meet completion targets and ensure efficient power delivery.

4. Ensuring coordination between NTDC, KE, civic agencies and relevant departments is critical to expediting approvals and financing for priority projects including resolution of ROW and land acquisition issues.

5. Licensees to strictly comply with safety code and other applicable documents to ensure avoidance fatal/non-fatal incidents.

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