



PERFORMANCE EVALUATION REPORT OF TRANSMISSION COMPANIES 2024-25



**NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
PERFORMANCE EVALUATION REPORT (2024-25)**

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY:

This Performance Evaluation Report (PER) of Transmission Licensees covers a period from July 2024 to June 2025 and provides considerable insights of the transmission sector of Pakistan with respect to the performance and effectiveness of the standards as laid down in the NEPRA's Performance Standards (Transmission) Rules, 2005 (PSTR, 2005) **[PART-A]**. The Report also highlights key constraints, current progress of planned infrastructure projects, interim arrangements for power evacuation projects and critical issues / challenges of transmission sector during this period **[PART-B]**.

The Annual Performance Report(s) for the period FY 2024-25, submitted by National Grid Company of Pakistan (NGC), K-Electric Limited (KE), Fatima Transmission Company Limited (FTCL), and Sindh Transmission & Despatch Company Limited (ST&DCPL), have been reviewed and analysed in terms of Performance Indicators such as system reliability, security of supply and quality of service. In a nutshell, during FY 2024-25, the performance of NGC and ST&DCPL to the extent of performance standards as laid down in PSTR, 2005 has been improved in comparison to the previous year i.e. FY 2023-24, however, the performance of KE and FTCL showed a declining trend as compared to their performance in the previous year for the same aforementioned parameters. A detailed analysis against each performance standard(s) reported by transmission licensees is included in the relevant part of this report.

Additionally, the updated progress report(s) submitted by Khyber Pakhtunkhwa Transmission and Grid System Company (Khyber Pakhtunkhwa T&GSC), Punjab Grid Company Limited (PGCL), and Pak Matari Lahore Transmission Company (PMLTC) have also been included in this review and analysis.

A summary of the performance, critical system constraints, updated status of important projects and ongoing developments of most crucial transmission related matters are provided below:

PART A: PERFORMANCE OF TRANSMISSION LICENSEES UNDER PSTR – 2005:

Overview of NGC Performance for the period from FY 2024-25:

- System Duration of Interruption: 0.03 hours per point.
- System Frequency of Interruption: 0.09 interruptions per circuit.
- Energy Not Served (ENS): 2.77 GWh.
- Loss of Supply Incidents: 49 incidents reported.
- Voltage Violations: 107,012 incidents reported under normal (N-0) conditions and 563 incidents under N-1 conditions, where voltage exceeded permissible limits;
- Frequency Violations: 8 incidents, accumulating a total duration of 44 minutes.

Reliability of Tie Lines within NGC Networks:

- Outages on Tie Lines: NIL
- System Duration of Interruption: NIL
- System Frequency of Interruption: NIL.

K-Electric Performance Overview for the period from FY 2024-25:

- System Duration of Interruption: 0.35 hours per point at the 220 kV transmission network.
- System Frequency of Interruption: 0.05 interruptions per circuit at the 220 kV transmission network.
- Energy Not Served (ENS): 0.654 GWh at the 220 kV transmission network.
- Loss of Supply Incidents: 3 incidents occurred during the reported period.
- Voltage Violations: 13 incidents recorded under normal (N-0) conditions, where voltage exceeded permissible limits; whereas, no incidents under N-1 conditions has been noted.
- Frequency Violations: 5 incidents, accumulating a total duration of 16.91 minutes.

Reliability of Tie Lines within KE Networks:

- Outages on Tie Lines: 59.13 outage occurred during the reported period
- System Duration of Interruption: 8.45 hours per point.
- System Frequency of Interruption: 2 interruptions per circuit.

Performance of Special Purpose Transmission Licensees (SPTLs) during FY 2024-25:

A summary of reported performance against SPTLs is as follows:

Fatima Transmission & Company Limited (FTCL):

- System Duration of Interruption: 41.11 hours per point.
- System Frequency of Interruption: 3.5 interruptions per circuit.
- Outages at Interconnection Points: 7 outages, totalling 82.21 hours, with Energy Not Served (ENS) recorded at 3.14 GWh.
- Voltage Violations: The highest voltage violation recorded under normal (N-0) conditions as 144.2 kV; whereas, no voltage violations occurred under N-1 conditions.
- Frequency Violations: 159 instances where frequency was outside permissible limits, totalling 367 minutes.

Pak Matiari Lahore Transmission Company Private Limited (PMLTC):

- Total outages recorded during reported period: 45 at Matiari Converter Station and 4 at Lahore Converter Station due to AC Networks instability.
- Total number of commutation failure recorded during reporting year: 279.
- Average Power Transferred over the Reported Period: 1397.46 MW (out of total 4000 MW) having Average Utilization of 34.93%.

Performance / Progress of Provincial Grid Companies (PGCs) for FY 2024-25:

A summary of reported performance against PGCs is as follows:

Sindh Transmission & Despatch Company (ST&DCPL):

- System Duration of Interruption: 52.65 hours per point.
- System Frequency of Interruption: 10.5 interruptions per circuit.
- Outages at Interconnection Points: 21 outages, totalling 105.29 hours.
- Energy Not Served (ENS): 10.68 GWh.
- Frequency Violations: Nil times frequency violations were reported.
- Voltage violations: 2 voltage violations were recorded during the reported period.

Khyber Pakhtunkhwa Transmission and Grid System Company (Khyber Pakhtunkhwa T&GSC):

The Khyber Pakhtunkhwa T&GSC, incorporated in September 2020 and licensed as a Provincial Grid Company by NEPRA in February 2021 for 30 years, is mandated to develop and operate transmission infrastructure in Khyber Pakhtunkhwa. During FY 2024-25, handing / taking over of transmission assets were taking place between PEDO and the Khyber Pakhtunkhwa T&GSC for independent operation, revenue generation, and improved grid reliability and is expected to conclude by March 2026.

During the reporting period, Feasibility Studies of the following projects are underway:

220kV Madyan–Chakdara TL (Lot-02) for PEDO HPPs.
132kV OHTL looping for HPPs and industrial zones.
Direct evacuation from 18MW Pehur HPP.
500kV Chitral–Chakdara TL with GS (3000MW dispersal).

The detailed status of the upcoming projects and financial status of the company is discussed in the relevant section of this report.

Punjab Grid Company Limited (PGCL):

In FY 2024–25, Punjab Grid Company Limited (PGCL) was operationalized with PKR 500 million equity, a new Board, and initiation of stakeholder engagement, policy drafting, and governance frameworks. With three planned 132 kV projects (~113 km, PKR 9 billion) to evacuate power from Waste to Energy (WtE) project at Lahore, 135 MW Taunsa Hydropower Project to load centre at Southern Punjab and 250 MW Chishtian Solar Power Plant. An update on activities and progress in respect of PGCL is included at the relevant part of this report.

PART B: CRITICAL ISSUES / CHALLENGES OF TRANSMISSION SECTOR:

Transmission System Constraints of NGC:

Despite repeated regulatory interventions and the availability of approved investment plans, NGC was unable to complete its critical transmission projects during the reporting period (FY 2024-25). As a result, several priority projects remain incomplete. These delays have prolonged network constraints, overloading of grid stations & transmission lines, and underutilization of major transmission assets, including the 4,000 MW HVDC line and several HVAC corridors.

The failure to timely commission the 500 kV Lahore North Grid Station and associated transmission lines exemplifies NGC's poor project execution and inadequate coordination among planning, procurement, and construction functions. Such inefficiencies have not only impeded the evacuation of economical generation but also contributed to operational bottlenecks, higher system losses, and increased financial burdens on the sector.

While NEPRA has strengthened its monitoring, enforcement, and reporting mechanisms to ensure accountability and adherence to approved timelines, NGC's recurring implementation slippages undermine these efforts and reflect systemic deficiencies in project management and governance. The Authority views these delays as a serious impediment to achieving a reliable, efficient, and modern transmission network, and has emphasized the need for immediate institutional reforms within NGC to ensure timely completion of projects.

NEPRA also requires transmission licensees to provide regular updates on project milestones, risks, and mitigation strategies. Additionally, NEPRA is enforcing greater accountability by closely tracking performance indicators, project monitoring and intervening where progress of NGC is unsatisfactory. Due to regulatory monitoring, twenty-one (21) constraints have been removed from NGC network, however, several key constraints removal projects are still waiting their revised completion targets.

These steps are part of a broader effort to modernize Pakistan's transmission infrastructure, reduce bottlenecks, and enhance system resilience. Through these reforms, NEPRA aims to foster a more transparent, responsive, and efficient transmission network, while specifically targeting the following key constraints:

- i. South to North Constraints including delay in Commissioning of 500 kV Lahore North Grid Station and its associated Transmission Lines.
- ii. Non-Optimal Utilization of HVAC Transmission Capacity including under-utilization of 4000 MW HVDC Transmission Lines.
- iii. Congestion / Overloading of 500 kV & 220 kV Grid Stations and Transmission Lines.

Delay of SCADA-III Project:

The first SCADA system, commissioned in 1992, became obsolete due to the lack of timely hardware and software upgrades. To modernize grid operations and expand nationwide visibility, the SCADA-III project sponsored by ADB was launched. The project supports renewable integration, real-time monitoring of power plants and CDPs, and improved reliability of the national grid. Implemented by the NGC, SCADA-III aims to upgrade ISMO operations with advanced SCADA, EMS, and GMS platforms, a secure telecom backbone, enhanced cybersecurity, and a Backup Control Centre at Jamshoro for operational continuity.

Initially approved in 2018 with a completion target in June 2022, the project has experienced nearly three (03) years of delay and now has a revised completion date of June 2026. Major progress has been achieved in OPGW, telecom, RTU, and control room works, but key activities like microwave installations and EMS-GMS deployment remain pending since long despite having regulatory approvals for this project.

Delayed Power Evacuation Projects within NGC & KE Networks:

Overloading at the 500 kV and 220 kV levels remains a critical issue due to delays on part of NGC in several power evacuation projects. In the North Region, progress has been hampered by right-of-way disputes, land acquisition issues, foreign exchange constraints, and persistent delays on contractor part, while in the South Region, priority projects such as the 500 kV K2/K3–Port Qasim transmission line and multiple grid station upgrades are stalled by long-standing ROW problems, land acquisition litigations, funding shortfalls, and security concerns. These delays are compounding system congestion, restricting the integration of new least cost generation, and posing significant risks to grid stability and reliability. To mitigate these constraints, NGC has planned a series of new grid stations and transmission line upgrades; however, continued delays in following key evacuation projects are noted:

- i. Augmentation at 220 kV Sammundri Road and Ghakkhar G/S
- ii. Augmentation at 220 kV WAPDA Town and 500 kV Sheikhpura G/S
- iii. Augmentation Works at 220 kV Ludewala G/S and Extension Works at
- iv. New Kot Lakhpat G/S
- v. 765/220kV Mansehra Grid Station (LOT-3)
- vi. 500 kV T/L for Nowshera (HVAC) G/S
- vii. 500 kV Maira Switching Station
- viii. 500 kV Tarbela-Islamabad West Transmission Line for Evacuation of Power from Tarbela 5th Extension
- ix. Extension Works at 220kV University
- x. 500kV HVDC Converter Station Nowshera & Electrode Station Charsadda
- xi. 500kV HVDC Transmission Line & Electrode Line
- xii. 500kV HVAC Grid Station Nowshera
- xiii. 500 kV K2/K3-Port Qasim T/L (102km)
- xiv. Extension and Augmentation Works at 220 kV Rohri, Daharki & Bahawalpur G/S
- xv. Augmentation Works at 220 kV TMK G/S, 220 kV HR G/S & Ext. Works at 500 kV Jamshoro G/S
- xvi. Extension Works at 220 kV Sibbi G/S & 220 kV Loralai G/S
- xvii. Augmentation at 220 kV Quetta Industrial G/S

Similar to NGC, several power evacuation projects in KE networks are also facing delays as listed below:

- i. 220 kV GIS Landhi Grid and TL
- ii. HVUB Grid and TL
- iii. 1x600 MVA ATR at 500 kV NKI with TL
- iv. 500kV KKI Grid
- v. 220kV KKI Transmission Line

- vi. 500 KV KKI - NGC Interconnection
- vii. 220KV Dhabeji - NGC Interconnection
- viii. 350 MW Renewable Interconnection at 220 kV Surjani Grid Station, OH 20 km
- ix. 220 kV Step up grid at Gharo, 3x250 MVA

Loading Position of Transmission Networks of NGC & KE:

NGC's transmission network is under significant stress, at the 500/220 kV level, there are 20 grid stations equipped with 48 power transformers, of which 41 units are operating at more than 80% of their rated capacity, Similarly, at the 220/132 kV level, 49 grid stations, 187 power transformers, with 87 units loaded beyond 80%, of their rated capacity. Such scenario poses reliability risks and underscores the urgent need for capacity augmentation and system reinforcement.

KE's transmission network also faces growing stress, with 35% of transformers—mainly at the 132 kV level—operating beyond 80% of their name plate capacity, resulting outages and reduced reliability in Karachi's key demand centers.

Inadequate NGC & KE Interconnection:

In FY 2024-25, K-Electric strengthened Karachi's network through the commissioning of the Dhabeji-2 Grid Station and its interconnection with the National Grid, energized in March 2025. The 500/220 kV KKI Grid Station was also provisionally commissioned with a 1,600 MW import limit, ahead of the double-circuit line completed in 2025. Load flow studies confirm KE's growing off-take capacity, with full configuration set to enhance reliability, power exchange, and energy security.

Fatal/Non fatal Accidents reported by NGC & KE:

In FY 2024–25, both NGC and KE reported two (02) fatal accidents occurred in their networks. NGC reported two (02) non-fatal cases in the reporting year, whereas, KE, reported twenty-three (23) non-fatal accidents. While fatalities remain a going concern for both the transmission licensees, however, KE requires stronger safety protocols and workforce sensitization, whereas NGC must sustain efforts to eliminate residual risks.

Tower Collapse at 500kV & 220kV levels in NGC & KE:

From 2020–21 to 2024–25, tower collapses in NGC peaked at 42 in 2022–23, driven mainly by the North Region, before declining to 16 in 2024–25, reflecting effective corrective measures. The South Region showed fewer but more fluctuating incidents, ranging between 1 and 9 cases. KE, by contrast, maintained relatively lower numbers, with collapses ranging from 2 to 15 over the period and ending at 4 in 2024–25.

Interim Arrangements within NGC's transmission network:

This section highlights key interim arrangements in NGC's transmission network. These temporary setups are in field due to inadequate grid infrastructure including delays of dedicated transmission lines and interconnection facilities, which are critical to ensure system reliability and power flow continuity. Some of the major interim arrangements currently existed in the NGC system are mentioned below:

- i. 500kV Nokhar - Lahore North CCT
- ii. 220kV Lahore (Sheikhupura) - Ravi CCT
- iii. 220kV Kala Shah Kaku-Ravi CCT
- iv. 220kV Kala Shah Kaku-Ghazi CCT
- v. Suki Kinari Hydro Power Station to interconnection point of existing Neelum- Jehlum 500kV D/C Quad Bundle T/line
- vi. 500kV K2K3-Hub Circuit
- vii. 500kV Jamshoro-K2K3 Circuit-II
- viii. 220kV Transmission Line from Pak-Iran border (Gabd) to 132kV Jiwani Gwadar interconnection point

Deterioration of NGC Assets due to Environmental Pollution:

NEPRA has raised concerns regarding the recurring tripping of transmission lines and the accelerated deterioration of switchyard equipment in the NGC network, primarily attributed to environmental pollution. Insulators and other critical assets are particularly vulnerable to pollution-induced degradation. During FY 2024-25, a fire incident at the 220kV Band Road Grid Station underscored these challenges. Investigations revealed that a nearby sewerage drain/canal was contributing to corrosion and rapid equipment deterioration, while pollution deposits on insulators further compromised system reliability. NEPRA emphasized that transmission licensees must adopt stringent environmental control measures to safeguard network assets. These measures include:

- Deployment of anti-pollution insulators in high-risk areas.
- Regular cleaning and washing of equipment in polluted zones.
- Strict adherence to periodic maintenance standards.
- Installation of RTV-coated insulators on critical transmission lines in high-pollution areas, reducing contamination-related flashovers and extending maintenance intervals.
- Systematic washing and cleaning of grid station equipment in line with SOPs developed by its Technical Services Group.
- Launch of a comprehensive pollution study and mapping exercise across Pakistan, in collaboration with NESPAK and specialized consultants. This initiative aims to optimize insulation design and insulator string configurations, thereby minimizing insulation failures and strengthening the reliability of NGC's transmission network.

Cyber-Security Threats and Mitigation Measures:

To address growing cyber-security risks and comply with evolving regulatory requirements, NEPRA directed NGC to implement a robust cyber-security framework in line with NEPRA's Cyber-Security Regulations. The directives included conducting regular vulnerability assessments, ensuring compliance with ISO/IEC 27001 standards, and undergoing independent audits.

In response, NGC confirmed that the ISMO IT network fully complies with NEPRA's Security of IT and OT Regulations, 2022. Although ISO/IEC 27001 certification has not yet been obtained, NGC emphasized that its OT/SCADA network remains fully isolated from the IT network, with no physical connectivity between the two—an arrangement verified by NEPRA in July 2024. This segregation provides a strong safeguard against cyber intrusions. These initiatives demonstrate NGC's commitment to strengthening resilience against emerging cyber threats and ensuring compliance with NEPRA's directives, thereby enhancing the security and reliability of Pakistan's power transmission infrastructure.

Renewable Energy Integration Plan:

The integration of Renewable Energy (RE) into the national grid continues to face significant challenges, including technical constraints (intermittency, transmission bottlenecks, lack of storage), operational limitations (system flexibility and monitoring), and regulatory/financial barriers. Recognizing the urgency of this matter, NEPRA directed NGC to formulate a comprehensive RE integration plan that enables efficient absorption, transmission, and utilization of renewable energy while maintaining grid stability and ensuring cost-effective transition to clean energy. After the regulator's intervention, NGC initiated several measures that mark significant progress toward enabling large-scale RE integration, supporting Pakistan's long-term clean energy transition while ensuring grid reliability and economic efficiency.

Approval of Policies by NGC w.r.t Transmission Line Security & Right of Way:

NGC has strengthened its policy and legal framework through the approval of a Transmission Line Security Policy and a Compensation Policy for Right of Way (RoW), aimed at enhancing infrastructure protection, ensuring transparent compensation, and minimizing land-related disputes. In parallel, draft RoW legislation is under review to establish a uniform legal framework across provinces and align with international standards. These initiatives collectively reinforce grid security, improve project execution

efficiency, and support the sustainable expansion of the national transmission network to meet rising energy demand.

Delay in construction of dedicated TSG training center:

A tender for the project drew only one bidder, leading the BoD to cancel it due to lack of competition and concerns over transparency and cost-effectiveness. The case has been referred to the Chief Engineer (Civil) to identify causes for limited participation and recommend measures for re-tendering to ensure transparency, competitiveness, and timely execution.

Status of Legal Proceedings:

In FY 2024–25, a fine amounting to Rs. 10 million has been imposed on NGC against occurrence of fatal accidents, while additional fines relating to frequent tower collapses, a fatal accident, and the partial blackout in September 2021 at Jamshoro area were challenged before the NEPRA Appellate Tribunal. The licensee also faced explanation and show-cause notices over delays in completion of the 500 kV Lahore North Grid Station, fire incident at the 220 kV Band Road Grid Station, and a payment dispute amounting to Rs. 697.10 million between NGC and NPGCL. Further notices were issued against violations of NGC Specification P44:2018 and observations made during NEPRA’s visit to Jamshoro and other South Region facilities. Overall, the proceedings underscore the need for stronger compliance and operational oversight.

Monitoring & Investigations Conducted against NGC & KE:

In FY 2024–25, NEPRA conducted key investigations and meetings to strengthen monitoring oversight. These included probing violations of NGC Specification P44:2018 and visiting Jamshoro Grid Station and other South Region sites (Jhimpir-II). Progress on KE interconnection projects, reliability issues at BQPS-III, and the delays of SCADA-III project were monitored in coordination with NGC, KE and ISMO. Additionally, transmission licensees were engaged on investment plan monitoring formats and data uploading through the NEPRA DXP online platform.

PART A:
PERFORMANCE OF
TRANSMISSION
LICENSEES
UNDER PSTR – 2005

1. Introduction:

The transmission sector in Pakistan plays a key role in delivering electricity from various generation sources—thermal, hydropower, nuclear, and renewable—to load centers across the country. The network operates at 500 kV, 220 kV, 132 kV, and 66 kV, forming the backbone of the national grid. Notably, a 660 kV HVDC line has been made operational under the China-Pakistan Economic Corridor (CPEC) for facilitating long-distance transmission of power from Matiari to Lahore, helping reduce losses and enhance grid stability.

Pakistan is also expanding cross-border transmission to support regional energy trade, with interconnections to Iran supplying electricity to Balochistan and the CASA-1000 project set to import hydropower from Central Asia via Afghanistan, boosting energy security and access to clean power.

1.1 Transmission Licensees in Pakistan:

Under the NEPRA Act, licenses are issued for key activities in the electricity sector, including electric power transmission, to ensure compliance with regulatory standards and promote reliability and safety. Electric power transmission is specifically regulated under Sections 16, 17, 18(A), and 19 of the NEPRA Act, 1997 (as amended).

(a) NGC as the National Grid Company (NGC):

Under Section 17 of the NEPRA Act, the National Grid Company Limited (NGC) was granted a transmission license in December, 2002. NGC is responsible for the efficient transmission of electricity at voltage levels of 220 kV and above. The NEPRA Act stipulates that only one National Grid Company (NGC) can operate at the national level at any given time. Currently, NGC functions as the NGC under its NEPRA license.

(b) K-Electric Transmission Licence:

Under Sections 16 and 25 of the NEPRA Act, NEPRA granted a transmission license to K-Electric (KE) in June, 2010. KE operates its own power plants and transmission lines, supplying electricity independently of the national grid. To meet its demand, KE has interconnections with the NGC grid to import power.

1.2 Special Purpose Transmission Licensees:

Under Section 19 of the NEPRA Act, Special Purpose Transmission Licenses were granted to three entities: Fatima Transmission Company Limited (FTCL), Sindh Transmission and Dispatch Company (STDC), and Pak Matiari-Lahore Transmission Company (PMLTC).

1.3 Provincial Grid Company (PGC):

The NEPRA (Amendment) Act, 2018 allows Provincial Governments to establish their own Provincial Grid Company (PGC) to build powerhouses, grid stations, and transmission lines for use within their provinces. Each province can operate one PGC responsible for power transmission within its territorial limits. Under Section 18A of the NEPRA Act, NEPRA has granted Provincial Grid Company licenses to:

- i. Sindh Transmission & Dispatch Company (ST&DCPL) on November 5, 2019
- ii. Khyber Pakhtunkhwa Transmission and Grid System Company (Khyber Pakhtunkhwa T&GSCPL) on February 26, 2021
- iii. Punjab Grid Company Limited (PGCL) on November 08, 2023

1.4 Performance Standards (Transmission) Rules, 2005:

In exercise of the powers conferred by Section 46 of the Generation, Transmission, and Distribution of Electric Power Act, 1997 (NEPRA Act), along with Section 7(2)(c) and Section 34, NEPRA, with the approval of the Federal Government, established the NEPRA Performance Standards (Transmission) Rules, 2005 (PSTR-2005). These rules are designed to ensure the reliability and security of the transmission system within specified parameters, and all transmission licensees must comply with the PSTR-2005.

As per the directions of the Authority, all transmission licensees were directed to submit their quarterly reports for all the quarters of FY 2024-25 under the aforementioned requirement of PSTR, 2005. In compliance with the directions of the Authority, NGC, KE, FTCL, ST&DCPL, and PMLTC have submitted their Performance Reports for four quarters of FY 2024-25. These reports have been reviewed, and a comprehensive Performance Evaluation Report for reporting period has been prepared.

1.5 Reporting of Performance Report:

According to Rule 9 of the PSTR-2005, licensees are required to submit an annual performance report to the Authority by August 31st of the following year. The report should detail all relevant information demonstrating compliance with the rules for the year and include a comparison of the current year's performance with that of the previous year.

1.6 Compliance by Transmission Licensees:

Pursuant to Rule 9 of the PSTR-2005, NGC, KE, FTCL, ST&DCPL, and PMLTC submitted their Performance Reports for FY 2024-25, which have been reviewed to prepare a comprehensive Performance Evaluation Report. This evaluation focuses on system reliability, security, and supply quality across the transmission networks of the licensees during the period, and includes a five-year trend analysis. Additionally, Punjab Grid Company Limited (PGC) and Khyber Pakhtunkhwa Transmission and Grid System Company (Private) Limited (Khyber Pakhtunkhwa T&GSCPL) have submitted updated information regarding their activities for FY 2024-25

SECTION I
**NATIONAL GRID COMPANY OF
PAKISTAN (NGC)**

2. Introduction of NGC:

NGC was established on November 6, 1998, under the Companies Ordinance 1984 (now governed by the Companies Act 2017) and began commercial operations on December 24, 1998, as a result of WAPDA’s unbundling into separate entities for power generation, transmission, and distribution. NGC is primarily responsible for the design, operation, and maintenance of 500 kV and 220 kV transmission lines and their related substations.

2.1 License:

Pursuant to Section 17 of the NEPRA Act, NGC was granted an exclusive transmission license on December 31, 2002, valid for thirty years. Under the authority of Section 26 of the NEPRA Act, as amended, NEPRA has issued several modifications to NGC’s Transmission License (No. TL/01/2002), including Modification I (April 11, 2014), Modification II (May 29, 2015), and Modification III (March 21, 2023).

Operating under the amended NEPRA Act, NGC functions and is responsible for delivering safe, reliable, and non-discriminatory transmission and interconnection services, including providing direct connections to Bulk Power Consumers (BPCs) at its facilities.

2.2 Transmission Network:

NGC operates and maintains 20 grid stations at 500 kV and 49 grid stations at 220 kV, with a total of 9,313 km of 500 kV transmission lines and 11,933 km of 220 kV transmission lines. The NGC transmission network is organized into five regions: Islamabad, Lahore, Multan, Hyderabad, and Quetta. A region-wise illustration of NGC’s transmission system is provided in figure below.

Figure 1: NGC Transmission System

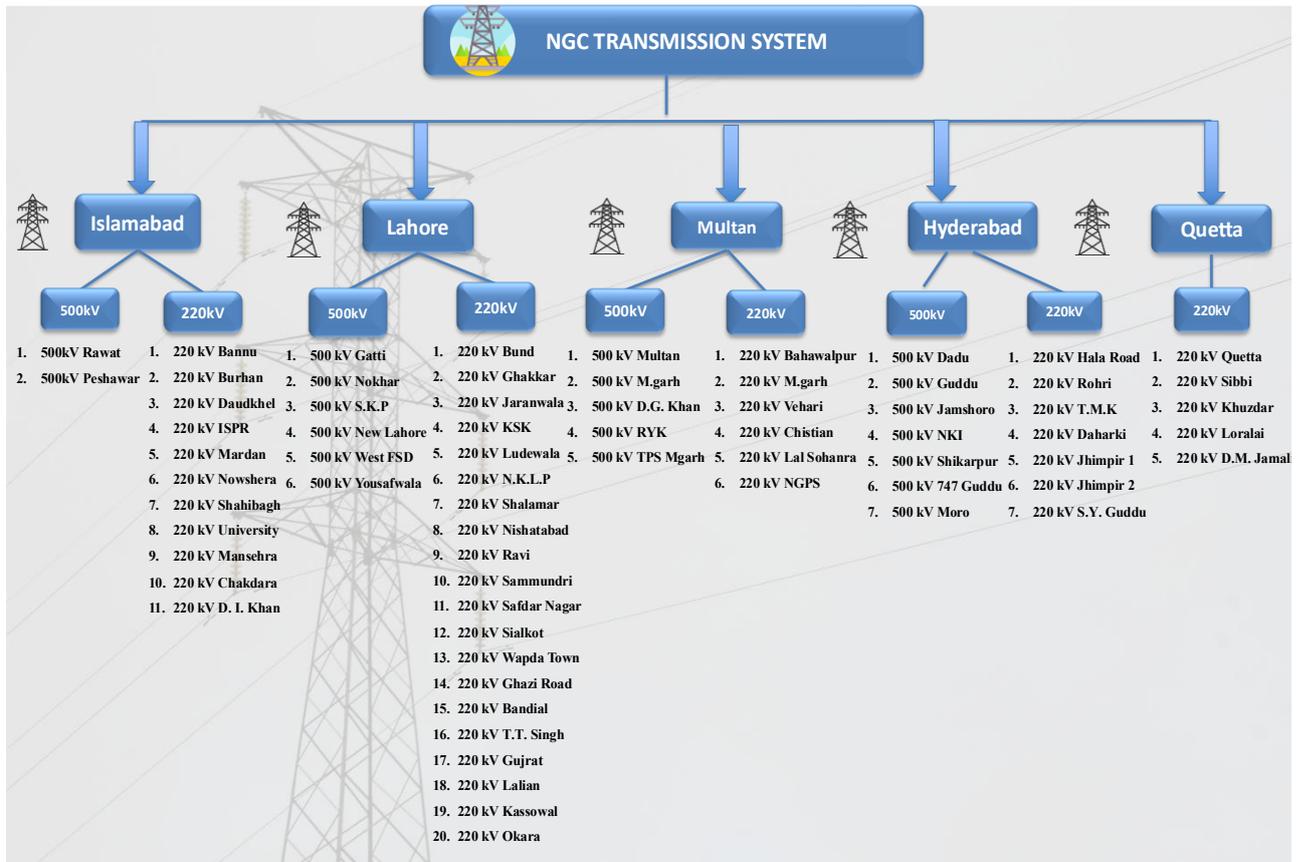


Table 1: Progressive NGC Network Statistics

Description		2020-21	2021-22	2022-23	2023-24	2024-25
No. of Existing Grid Stations	500 kV	16	19	19	19	20
	Added	0	3	0	0	1
	220 kV	45	50	50	50	49
	Added	0	5	0	0	-1
	Total	61	69	69	69	69
Length of Transmission Line (Circuit km)	500 kV	8,059	8,431	8,825	9,201	9,313
	Added	589	372	394	376	112
	220 kV	11,438	11,565	11,637	12,136	11,933
	Added	157	127	72	499	-203
	Total	19,497	19,996	20,462	21,337	21,246
Transformation Capacity (MVA)	500 kV	30,610	25,500	25,950	25,952	26,700
	Added	6,610	-5,110	450	2	748
	220 kV	25,770	35,360	37,190	38,460	39,930
	Added	-6,130	9,590	1,830	1,270	1,470
	Total	56,380	60,860	63,140	64,410	66,630

Source: NGC/DXP

As seen in the table above, during FY 2024-25, one new grid station was added to the 500 kV network. However, the length of transmission lines increased by 112 km in the 500 kV network and decreased by 203 km in the 220 kV network. The transformation capacity increased by 748 MVA in the 500 kV network and the transformation capacity of the 220 kV network increased by 1,470 MVA.

Over the past five years, a total of four grid stations were added in both 500 kV and 220 kV networks and the length of 500 kV & 220 kV transmission lines increased by 1,843 km and 652 km, respectively. During the same period, the transformation capacity of the 500 kV network increased by 2,700 MVA, while the 220 kV network saw an increase of 8,030 MVA in transformation capacity.

2.3 Performance of NGC under PSTR - 2005:

A thorough evaluation of NGC's performance has been carried out, examining System Reliability, System Security, and Quality of Supply. The details of each performance parameter are outlined below:

2.4 System Reliability:

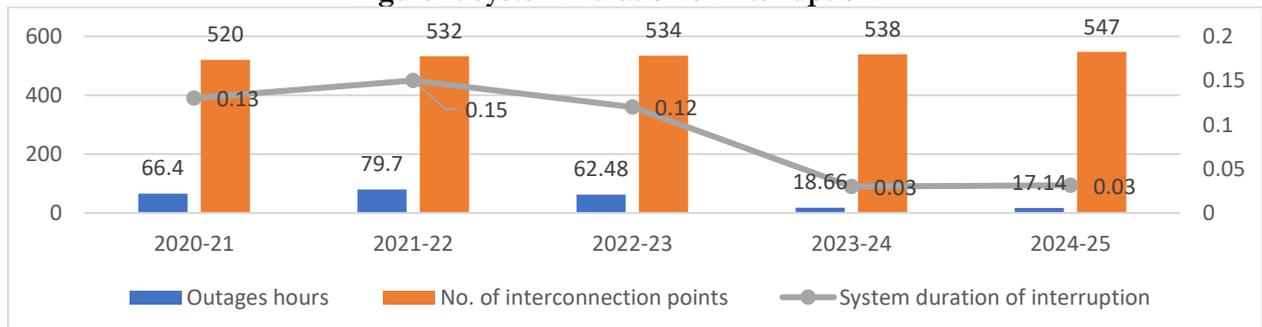
2.4.1 Average Duration of Interruption:

- (a) Total outage hours recorded at all interconnection points (other than 132 kV line tripping) = 17.14 Hrs.
- (b) Total number of interconnection points = 547
- (c) System duration of interruption = 0.03 Hrs. /point i.e. 1.8 min.

Source: NGC/DXP

During the reporting period, the total outage duration at all interconnection points (excluding 132 kV line trippings) was 17.14 hours, reflecting a 8.14% decrease compared to the previous year's 18.66 hours. Additionally, nine (09) new interconnection points were added, bringing the total to 547, as shown in Figure below.

Figure 2: System Duration of Interruption



Source: NGC/DXP

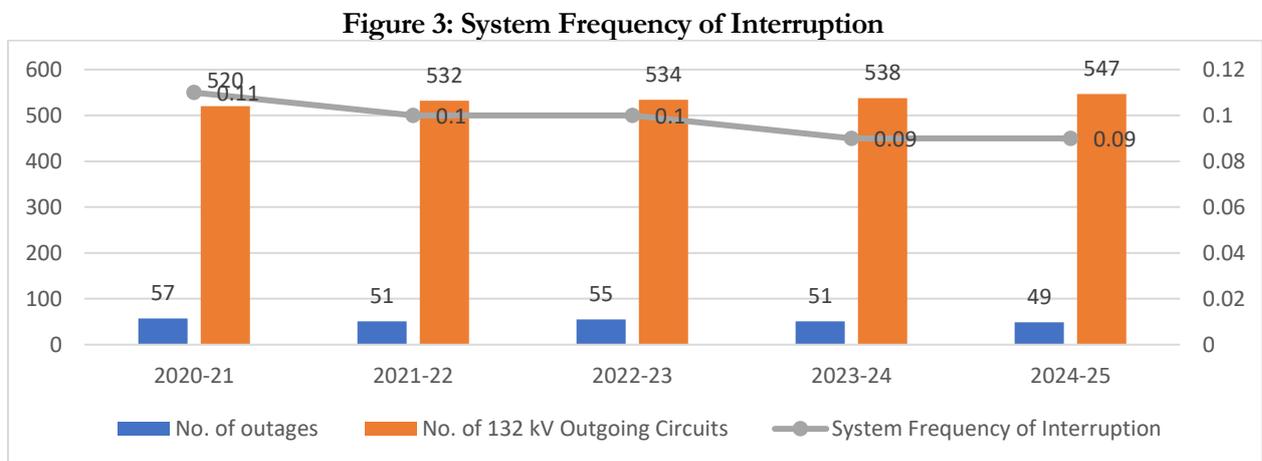
As shown in above Figure, the number of outage hours has fluctuated over the past five years, with the highest recorded in 2021-22 at 79.7 hours. However, the number of interconnection points has consistently increased each year, reflecting ongoing growth and expansion of the network.

2.4.2 System Frequency of Interruption:

- (a) Total number of outages recorded at all 132 kV outgoing circuits (other than 132 kV line tripping) = 49
- (b) Total number of 132 kV circuits = 547
- (c) System frequency of interruption = 0.09 No./circuit.

Source: NGC/DXP

As shown in the figure below, during FY 2024-25, a total of 49 outages were reported, reflecting an approximately 3.92% decrease compared to the 51 outages experienced in the previous year, as shown in Figure below. Over the past five years, the data indicates a consistent downward trend in outage frequency.



Source: NGC/DXP

The Figure above further highlights that the continuous reduction in interruptions over this period suggests that NGC has implemented effective measures to enhance system reliability.

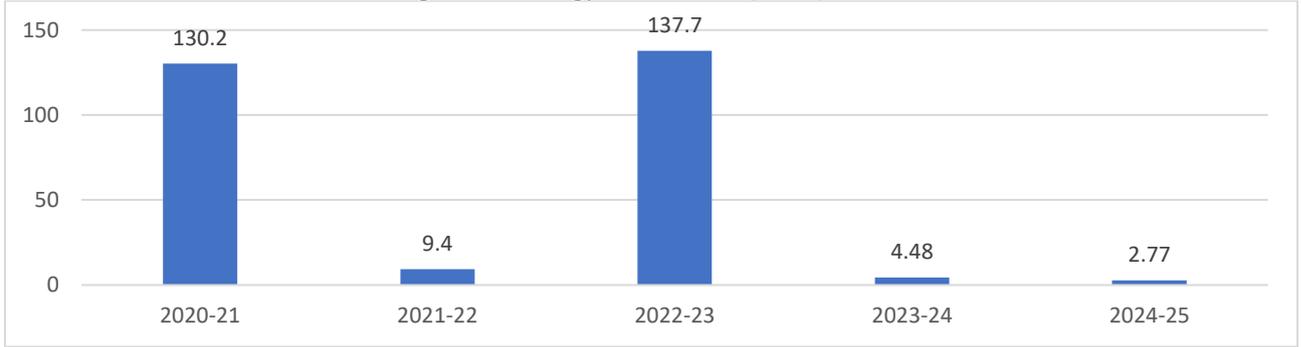
2.5 System Security:

2.5.1 Energy Not Served (ENS):

- (a) Total ENS = 2.77GWh
- (b) Number of incidents, where there has been a loss of supply = 49
- (c) Average ENS per incident = 0.06 GWh
- (d) Average duration per incident = 0.35 Hrs
- (e) ENS reported due to Transmission lines = 0.61GWh
- (f) ENS reported due to Transformer = 2.16 Gwh

Source: NGC/DXP

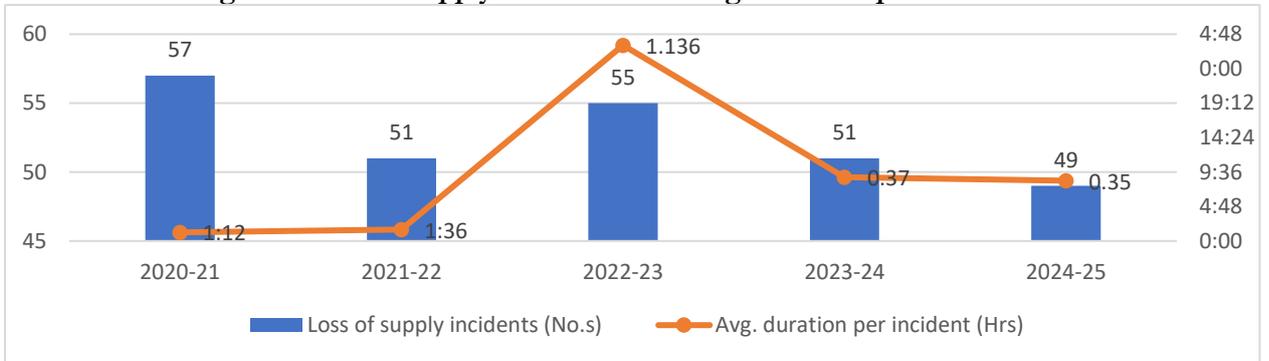
Figure 4: Energy not served (GWh)



Source: NGC/DXP

The Figure above shows a decrease in Energy Not Served (ENS) to 2.77 GWh, compared to 4.48 GWh reported in the previous year. Notably, during FY 2024-25, no major breakdowns occurred on the NGC network, contributing to this significant reduction in ENS.

Figure 5: Loss of supply incidents & Average duration per incident



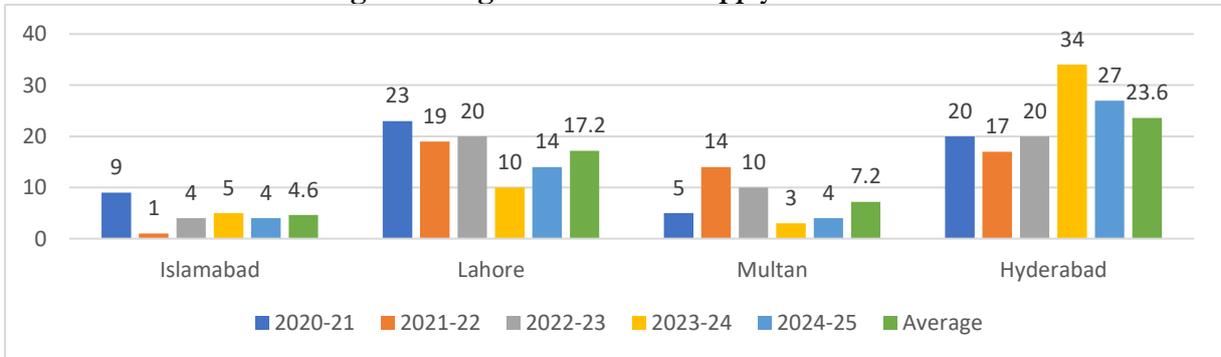
Source: NGC/DXP

The Figure above shows a decrease in the number of loss-of-supply incidents, dropping to 49 in FY 2024-25, compared to 51 incidents in FY 2023-24. Additionally, the average duration per incident decreased to 0.35 hours, a significant improvement from the 0.36 hours reported in the previous year.

2.5.2 Region wise loss of supply incidents:

As shown in Figure below, over the past five years, the Lahore and Hyderabad regions have consistently experienced the highest number of incidents.

Figure 6: Region wise loss of supply incidents



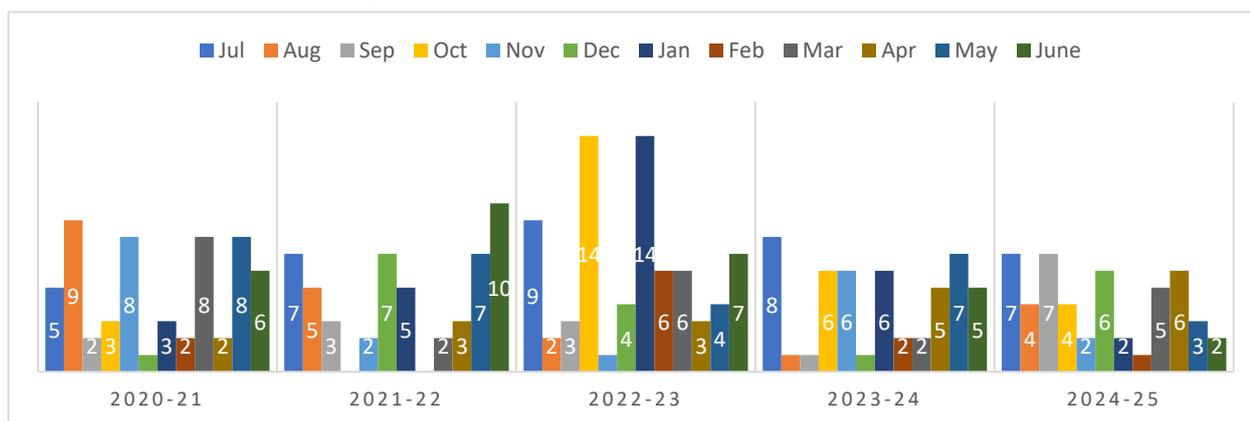
Source: NGC/DXP

As seen in the figure above, during FY 2024-25, Lahore reported 14 incidents, while the Hyderabad region reported 27 incidents. In contrast, the Multan and Islamabad region recorded the lowest incidents with a number value of 4.

2.5.3 Seasonal trend of loss of supply incidents:

Figure below illustrates the seasonal trend of loss-of-supply incidents, with noticeable variations in incident numbers from month to month. July and September appears to have the highest number of incidents in FY 2024-25.

Figure 7: Seasonal trend of loss of supply incidents



Source: NGC/DXP

The figure above also presents the seasonal trends over the past five years. To enhance incident management and prevention strategies, NGC should conduct a detailed analysis of the underlying causes of these trends, taking into account seasonal factors and potential external influences

2.5.4 Details of Loss of Supply Incidents:

The table below shows the total number of trippings occurred on transmission lines and transformers alongwith the Energy not served reported against each tripping:

Table 2: Loss of Supply Incidents occurred on Transmission lines & Transformers

Sr. No.	Grid Name	Equipment	Trip Date & Time	Recovery Date & Time	Duration	Loading at tripping (MW)	Disco Affected	Energy not served (kWh)
Transmission lines								
1	220 kV Khuzdar	220kV Dadu-Khuzdar circuit No. 02	2024-07-04 18:01:00	2024-07-04 18:40:00	00:39:00	74	QESCO	18500
2	220 kV Khuzdar	220kV Dadu-Khuzdar circuit No. 02	2024-07-10 18:45:00	2024-07-10 18:53:00	00:08:00	120	QESCO	16000
3	220 kV Khuzdar	220kV Dadu-Khuzdar circuit No. 1	2024-08-14 01:05:00	2024-08-14 21:07:00	20:02:00	86	QESCO	8600
4	220 kV Khuzdar	220KV Dadu-khuzdar circuit 1	2024-08-15 21:36:00	2024-08-16 18:58:00	21:22:00	154	QESCO	77000
5	220 kV Khuzdar	220kv Dadu-Khuzdar circuit no. 2	2024-08-16 11:42:00	2024-08-16 11:52:00	00:10:00	120	QESCO	20000
6	220 kV D. I. Khan	220kv C1C2-DI Khan	2024-09-03 06:52:00	2024-09-03 09:10:00	02:18:00	64	PESCO	33067
7	220 kV D. I. Khan	220KV D.I.Khan-C3C4 Circuit	2024-09-03 06:52:00	2024-09-03 18:58:00	12:06:00	64	QESCO	

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Sr. No.	Grid Name	Equipment	Trip Date & Time	Recovery Date & Time	Duration	Loading at tripping (MW)	Disco Affected	Energy not served (kWh)
8	220 kV Loralai	220KV Loralai-DGK Circuit 2	2024-09-08 12:07:00	2024-09-08 19:00:00	06:53:00	76	QESCO	11400
9	220 kV Loralai	220KV Loralai-DGK Circuit No. 01	2024-09-23 17:54:00	2024-09-23 18:16:00	00:22:00	32	QESCO	1067
10	220 kV Khuzdar	220KV Khuzdar-Dadu Circuit No. 02	2024-09-26 19:29:00	2024-09-26 19:41:00	00:12:00	35	QESCO	7000
11	220 kV Quetta	220KV Quetta-Sibbi Circuit No. II	2024-10-02 10:25:00	2024-10-02 11:08:00	00:43:00	340	QESCO	175666.67
12	220 kV Khuzdar	220KV Khuzdar - Dadu Circuit No. II	2024-10-02 23:19:00	2024-10-02 23:21:00	00:02:00	106	QESCO	3533.33
13	220 kV Khuzdar	220KVKhuzdar-Dadu Circuit No. II	2024-10-23 10:32:00	2024-10-23 10:52:00	00:20:00	66	QESCO	22000
14	220 kV Khuzdar	220KV Khuzdar-Dadu Circuit No. 1	2024-11-21 18:30:00	2024-11-21 18:33:00	00:03:00	66	QESCO	3300
15	220 kV Khuzdar	220KV Khuzdar - Dadu Circuit No. I	2024-12-09 18:17:00	2024-12-09 18:24:00	00:07:00	96	QESCO	11200
16	220 kV Khuzdar	220KV Khuzdar - Dadu Circuit No. 1	2025-02-23 09:01:00	2025-02-23 09:30:00	00:29:00	106	QESCO	70667
17	220 kV Quetta	220KV Quetta - Sibbi Circuit No. I & II	2025-03-26 12:16:00	2025-03-26 13:04:00	00:48:00	15	QESCO	7500
18	220 kV Muzaffargarh	220KV New Muzaffargarh-New Multan Circuit	2025-04-04 17:13:00	2025-04-04 18:02:00	00:49:00	150	MEPCO	32700
19	220 kV University Islamabad	220KV University - Rawat Circuit No. I & II	2025-04-17 18:55:00	2025-04-17 20:09:00	01:14:00	210	IESCO	31500
20	220 kV New Kot Lakhpat	220KV New Kot Lakhpat - Bund Road Circuit No. I & II, 220KV New Kot Lakhpat - Sheikhpura Circuit, 220KV New Kot Lakhpat - Sarfaraznagar Circuit, 220KV New Kot Lakhpat - New Lahore (South) Circuit	2025-04-23 10:40:00	2025-04-23 12:13:00	01:33:00	207	LESCO	58650
Transformers								
1	500 kV Sheikhpura	220/132kV 250MVA Auto Transformer T-5	2024-07-08 08:10:00	2024-07-08 11:13:00	03:03:00	175	LESCO	114234.2
2	500 kV Sheikhpura	220/132kV 250MVA Auto Transformer T-5	2024-07-08 12:14:00	2024-07-08 16:24:00	04:10:00	196	LESCO	114875.6
3	500 kV Dadu	220/132kV Auto Transformer T-1	2024-07-20 15:23:00	2024-07-21 14:47:00	23:24:00	46	HESCO, SEPCO	63154.2
4	500 kV Sheikhpura	220/132kV 160MVA Auto Transformer T-6	2024-07-23 12:02:00	2024-07-23 13:13:00	01:11:00	70	LESCO	94300
		220/132kV 160MVA Auto Transformer T-7	2024-07-23 12:02:00	2024-07-23 12:56:00	00:54:00	68	LESCO	

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Sr. No.	Grid Name	Equipment	Trip Date & Time	Recovery Date & Time	Duration	Loading at tripping (MW)	Disco Affected	Energy not served (kWh)
5	500 kV Sheikhupura	220/132kV 160MVA Auto Transformer T-6	2024-07-24 10:40:00	2024-07-24 11:32:00	00:52:00	70	LESCO	64400
		220/132kV 160MVA Auto transformer T-7	2024-07-24 10:40:00	2024-07-24 20:00:00	09:20:00	68	LESCO	
6	500 kV Guddu	220/132kV 160MVA Auto Transformer T-13	2024-08-18 18:30:00	2024-08-18 20:50:00	02:20:00	19	MEPCO	1266.7
7	220 kV New Kot Lakhpat	220/132kV 250MVA ATFs T-1, T-2 and T-3	2024-09-09 11:53:00	2024-09-09 12:31:00	00:38:00	351	LESCO	61425
8	220 kV T. M. Khan Road	220kV Tando Mohammad Khan Road	2024-09-27 08:20:00	2024-09-27 09:34:00	01:14:00	60	HESCO	39650
9	220 kV Sarfraznagar	220/132 kV Auto Transformers T-1 & T-2	2024-10-05 13:16:00	2024-10-05 14:58:00	01:42:00	172	LESCO	433266.7
		220/132 kV 160MVA Auto Transformer T-3	2024-10-05 13:16:00	2024-10-05 15:48:00	02:32:00	86	LESCO	
10	220 kV Muzaffargarh	220/132kV Auto transformer T-4	2024-11-29 03:59:00	2024-11-29 05:29:00	01:30:00	80	MEPCO, QESCO	29333.3
11	220 kV Nishatabad	220/132kV 160MVA Auto Transformers T-1 & T-3	2024-12-09 17:48:00	2024-12-09 19:23:00	01:35:00	95	FESCO	54900
		220/132kV 160 MVA Auto Transformers T-4 & T-5	2024-12-09 17:48:00	2024-12-09 19:43:00	01:55:00	88	FESCO	
12	220 kV Khuzdar	220/132kV 160MVA Auto Transformers T-1 & T-2	2024-12-03 19:57:00	2024-12-03 20:16:00	00:19:00	80	QESCO	25333.3
13	220 kV Khuzdar	220/132kV Auto Transformers T-1 & T-2	2024-12-03 21:02:00	2024-12-03 21:17:00	00:15:00	96	QESCO	24000
14	220 kV Khuzdar	220/132kV 160MVA Auto Transformers T-1 & T-2	2024-12-05 10:32:00	2024-12-05 10:42:00	00:10:00	116	QESCO	5800
15	220 kV Bahawalpur	220/132kV 250MVA Auto Transformers T-1, T-2 & T-3	2024-12-24 13:26:00	2024-12-24 14:25:00	00:59:00	29	MEPCO	5280
16	220 kV Muzaffargarh	220/132kV 160MVA Auto Transformer T-4	2025-01-10 09:40:00	2025-01-10 10:39:00	00:59:00	14	MEPCO	2800
		220/132kV 160MVA Auto Transformer T-1	2025-01-10 09:40:00	2025-01-10 10:49:00	01:09:00	14	MEPCO	

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Sr. No.	Grid Name	Equipment	Trip Date & Time	Recovery Date & Time	Duration	Loading at tripping (MW)	Disco Affected	Energy not served (kWh)
17	220 kV Burhan	220/132kV 250MVA Auto Transformer T-1	2025-01-21 13:20:00	2025-01-21 14:45:00	01:25:00	50	IESCO, PESCO	160000
		220/132kV 250MVA Auto Transformers T-2 & T-3	2025-01-21 13:20:00	2025-01-21 14:46:00	01:26:00	100	IESCO, PESCO	
		220/132kV 250MVA Auto Transformer T-4	2025-01-21 13:20:00	2025-01-21 14:31:00	01:11:00	50	IESCO, PESCO	
18	220 kV Hala Road	220/132kV 160MVA Auto Transformer T-1	2025-03-01 19:53:00	2025-03-01 20:03:00	00:10:00	88	HESCO	23466.7
19	500 kV Yousafwala	220/132kV 160MVA Auto Transformer T-3	2025-03-25 15:08:00	2025-03-26 23:15:00	32:07:00	56	MEPCO	78400
		220/132kV 160MVA Auto Transformer T-4	2025-03-25 15:08:00	2025-03-25 15:53:00	00:45:00	56	MEPCO	
		220/132kV 160MVA Auto Transformer T-5	2025-03-25 15:08:00	2025-03-25 16:01:00	00:53:00	56	MEPCO	
		220/132kV 160MVA Auto Transformer T-6	2025-03-25 15:08:00	2025-03-25 15:57:00	00:49:00	56	MEPCO	
20	220 kV Khuzdar	220/132kV 160MVA Auto Transformer T-1	2025-03-26 12:10:00	2025-03-26 12:47:00	00:37:00	34	QESCO	47600
		220/132kV 160MVA Auto Transformer T-2	2025-03-26 12:10:00	2025-03-26 12:53:00	00:43:00	34	QESCO	
21	220 kV Khuzdar	220/132kV 160MVA Auto Transformer T-1	2025-03-30 03:50:00	2025-03-30 03:59:00	00:09:00	6	QESCO	200
		220/132kV 160MVA Auto Transformer T-2	2025-03-30 03:50:00	2025-03-30 03:59:00	00:09:00	6	QESCO	
22	500 kV Guddu	220/132kV 160MVA Auto Transformer T-4	2025-04-14 19:52:00	2025-04-14 23:04:00	03:12:00	23	SEPCO/QESCO	1916.7
23	500 kV Dadu	220/132kV 160MVA Auto Transformer T-1	2025-04-15 01:08:00	2025-04-15 16:37:00	15:29:00	24	SEPCO/HESCO	17600
24	220 kV Bund Road Lahore	220/132kV 250MVA Auto Transformer T-1	2025-04-19 07:12:00	2025-04-19 07:52:00	00:40:00	77	LESCO	56466.7
		220/132kV 250MVA Auto Transformer T-2	2025-04-19 07:12:00	2025-04-19 07:52:00	00:40:00	77	LESCO	
		220/132kV 250MVA Auto Transformer T-3	2025-04-19 07:12:00	2025-04-19 07:52:00	00:40:00	77	LESCO	
		220/132kV 250MVA Auto Transformer T-4	2025-04-19 07:12:00	2025-04-19 07:52:00	00:40:00	77	LESCO	
25	220 kV Jaranwala Road	220/132kV 160MVA Auto Transformer T-1	2025-05-21 05:33:00	2025-05-21 06:36:00	01:03:00	68	FESCO	51787.5

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Sr. No.	Grid Name	Equipment	Trip Date & Time	Recovery Date & Time	Duration	Loading at tripping (MW)	Disco Affected	Energy not served (kWh)
		220/132kV 160MVA Auto Transformer T-2	2025-05-21 05:33:00	2025-05-21 06:36:00	01:03:00	69	FESCO	
		220/132kV 160MVA Auto Transformer T-3	2025-05-21 05:33:00	2025-05-21 06:36:00	01:03:00	64	FESCO	
		220/132kV 160MVA Auto Transformer T-4	2025-05-21 05:33:00	2025-05-21 06:36:00	01:03:00	74	FESCO	
26	220 kV Kala Shah Kaku	220/132kV 160MVA Auto Transformer T-1	2025-05-26 03:22:00	2025-05-26 04:55:00	01:33:00	89	GEPSCO/LESCO	66750
		220/132kV 160MVA Auto Transformer T-2	2025-05-26 03:22:00	2025-05-26 05:12:00	01:50:00	89	GEPSCO/LESCO	
		220/132kV 160MVA Auto Transformer T-4	2025-05-26 03:22:00	2025-05-26 05:12:00	01:50:00	89	GEPSCO/LESCO	
		220/132kV 160MVA Auto Transformer T-3	2025-05-26 03:22:00	2025-06-04 23:12:00	235:50:00	0	LESCO	
27	220 kV Hala Road	220/132kV 250MVA Auto Transformer T-2	2025-05-27 12:51:00	2025-05-27 14:55:00	02:04:00	150	HESCO	127500
28	220 kV Gujrat	220/132kV 250MVA Auto Transformer T-1	2025-06-14 23:16:00	2025-06-15 00:37:00	01:21:00	187	GEPSCO	224400
		220/132kV 250MVA Auto Transformer T-2	2025-06-14 23:16:00	2025-06-15 00:42:00	01:26:00	187	GEPSCO	
		220/132kV 250MVA Auto Transformer T-3	2025-06-14 23:16:00	2025-06-15 01:16:00	02:00:00	187	GEPSCO	
29	220 kV Bund Road Lahore	220/132kV 250MVA Auto Transformer T-1	2025-06-29 14:52:00	2025-06-29 18:51:00	03:59:00	106	LESCO	169600
		220/132kV 250MVA Auto Transformers T-2, T-3 & T-4	2025-06-29 14:52:00	2025-06-29 16:35:00	01:43:00	318	LESCO	
Total Energy not served (kWh)								2769055.92
Total Energy not served (GWh)								2.77

Source: NGC/DXP

As it can be seen in the above table that a total of 49 loss-of-supply incidents were recorded, out of which 20 occurred on the transmission lines and 29 occurred on the transformers. Combining the impact of trippings occurred on transmission line and transformers the total energy not served value comes out as 2.77 GWh

2.6. Quality of Supply:

Quality of Supply (QoS) is evaluated primarily through two key indicators: System Voltage and System Frequency. The following analysis is based on the data provided by NGC for these parameters:

2.6.1 System Frequency:

As shown in the table below, during FY 2024-25, eight instances were observed when the system frequency exceeded the upper permissible limit of 50.50 Hz, as stipulated in Rule 8 of the PSTR.

Table 3: System frequency statistics

Month	Number of days/hours for a month over a		Frequency violation recorded		Duration of variation		Variation (%)			Number of times frequency remained outside
	year		(Hz)		Mins	Hrs	Highest	Lowest	Period	the limits
	Days	Hours	Highest	Lowest						Nos.
1	2	3	4	5	6	7	8=(4-50)/50*100	9=(5-50)/50*100	10=7/3*100	11
July	31	744	50.57	Nil	6	0.1	1.14	Nil	0.013	2
Aug	31	744	50.52	Nil	6	0.1	1.04	Nil	0.013	1
Sep	30	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
Oct	31	744	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
Nov	30	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
Dec	31	744	50.54	Nil	7	0.1	1.08	Nil	0.016	1
Jan	31	744	50.62	Nil	6	0.1	1.24	Nil	0.013	1
Feb	28	672	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
Mar	31	744	50.6	Nil	13	0.2	1.2	Nil	0.030	2
Apr	30	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
May	31	744	50.66	Nil	6	0.1	1.32	Nil	0.013	1
June	30	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0
Year	365	8760	50.66	Nil	44	0.7	1.32	Nil	0.008	8

Source: NGC/DXP

As seen in the table above, the highest recorded frequency i.e., 50.66 Hz, was 1.32% above from the nominal frequency of 50 Hz in the FY 2024-25. No lower frequency was reported during the FY 2024-25.

Table 4: System frequency details with comparison

Description / Unit / Year	Unit	2020-21	2021-22	2022-23	2023-24	2024-25
Number of times Frequency remained outside the Limits in a Year	In a year	4	3	15	7	8
	Average/month	0.3	0.25	1.25	0.58	0.67
	Average/day	0.01	0.01	0.04	0.02	0.02
Time duration the Frequency remained outside the Limits in a Year	Days	0.02	0.02	0.07	0.03	0.03
	Hours	0.6	0.4	1.7	0.82	0.74
	%age of year	0.007	0.005	0.02	0.01	0.01

Source: NGC/DXP

Table above presents five years' worth of data on the average number of occurrences and the average duration for which the frequency remained outside the permissible limits.

NGC’s Monthly Frequency variation (Highest System):

The comparison of frequency limit violations for the past five years is presented below:

Table 5: System frequency details with comparison

Month	2020-21	2021-22	2022-23	2023-24	2024-25
July	50.72	50.59	50.66	50.61	Nil
August	Nil	Nil	50.61	50.55	50.66
September	50.54	50.54	50.65	Nil	Nil
October	Nil	Nil	Nil	Nil	Nil
November	Nil	Nil	Nil	Nil	Nil
December	Nil	Nil	50.53	Nil	50.54
January	Nil	Nil	50.57	50.54	50.62
February	Nil	Nil	Nil	Nil	Nil
March	Nil	Nil	Nil	Nil	50.6
April	Nil	Nil	50.57	Nil	Nil
May	Nil	50.61	50.55	Nil	50.66
June	Nil	50.66	50.56	50.62	Nil

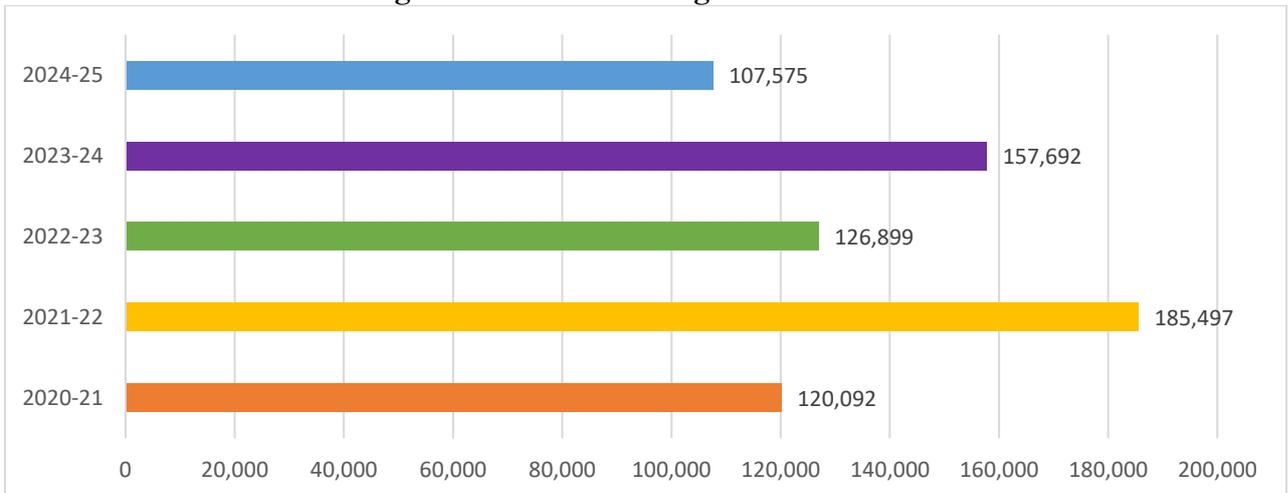
Source: NGC/DXP

As it can be seen in table above, that during FY 2024-25 the highest frequency recorded was 50.66 Hz in the month of August and May. If we analyze the past five years data, it can be seen that the highest frequency recorded was 50.72 Hz in the month of July during the FY 2020-21.

2.6.2 System Voltage:

According to Rule 7 of PSTR-2005, voltage variations of $\pm 5\%$ are allowed under normal conditions, while under (N-1) contingency conditions, variations of $\pm 10\%$ are permissible. Voltage variations outside these limits, as specified in Sub-Rules (2) and (3) of PSTR-2005, must be reported only if the duration of the variation exceeds a continuous period of thirty (30) minutes.

Figure 8: Number of voltage violations



Source: NGC/DXP

As it can be seen in the figure above, during FY 2024-25, NGC reported a total of 107,575 voltage variations, which represents a 31.8% decrease compared to the previous year. Figure below illustrates the five-year trend of voltage violations. It is observed that the highest number of voltage variations in the past five years occurred in FY 2021-22, with a total of 185,497 violations. In comparison, FY 2024-25 saw 107,575 voltage violations, a decrease from the 157,692 violations recorded in FY 2023-24. This indicates an improvement in NGC's performance with respect to voltage violations in FY 2024-25 compared to the previous year.

2.6.3 Region-wise voltage violations:

Region-wise detail of voltage violations is given hereunder:

Table 6: Number of voltage violations

System Condition	NGC Region	2020-21	2021-22	2022-23	2023-24	2024-25
Normal	Islamabad	21,710	28,147	18,101	9,644	6,104
	Lahore	53,741	73,697	38,974	29,588	17,875
	Multan	5,493	7,949	6,805	9,509	13,819
	Hyderabad	38,811	70,304	61,548	107,793	69,214
Total (Normal)		119,755	180,097	125,428	156,534	107,012
N-1	Islamabad	–	–	–	–	–
	Lahore	–	444	43	49	309
	Multan	203	1,805	548	186	118
	Hyderabad	134	3,151	880	923	136
Total (N-1)		337	5,400	1,471	1,158	563
Total (Normal & N-1)		120,092	185,497	126,899	157,692	107,575

Source: NGC/DXP

Under Normal system conditions, the Multan region recorded an increase in voltage violations compared to the previous year. In contrast, the Hyderabad region showed improvement, as violations that had risen to 107,793 during 2023-24 declined significantly to 69,214 in 2024-25. This reduction highlights better system performance and stability in the region compared to the previous year.

Under N-1 system conditions, the Lahore region experienced an increase in voltage violations, while the Hyderabad region demonstrated notable progress with violations decreasing sharply from 923 in 2023-24 to 136 in 2024-25. Overall, during FY 2024-25, the total number of voltage violations amounted to 107,012 under Normal conditions and 563 under N-1 conditions, making a combined total of 107,575 violations.

2.6.4. Grid-wise voltage violation of each region:

The grid station-wise breakup for each region is given below:

Table 7: Number of voltage violations (Islamabad Region)

Sr. No.	Grid Station	2020-21	2021-22	2022-23	2023-24	2024-25
1	500kV Rawat	4,298	3,464	2,048	2156	1048
2	500kV Sheikh Muhammadi Peshawar	1,417	4,357	3,491	1494	1057
3	220 kV Bannu	664	1,915	3,787	1966	1328
4	220 kV Burhan	644	468	72	16	22
5	220 kV Daudkhel	243	12	399	186	162
6	220kV ISPR (Sangjani)	582	1,422	533	277	358
7	220kV Mardan	3,999	6,279	3,907	1916	423

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Sr. No.	Grid Station	2020-21	2021-22	2022-23	2023-24	2024-25
8	220kV Nowshera	628	2,301	1,264	327	336
9	220kV New Shahibagh Peshawar	4,350	4,770	1,74	701	837
10	220kV University	2,363	1,469	618	257	159
11	220kV Mansehra	312	178	54	154	272
12	220kV Chakdara	368	366	170	56	67
13	220kV D. I. Khan	1,842	1,146	44	138	35
Total		21,710	28,147	18,101	9,644	6,104

Source: NGC/DXP

During FY 2024-25, the 500 kV Sheikh Muhammadi grid station recorded the highest number of voltage violations, totaling 1,057 incidents. In contrast, over the past five years, the 500 kV Rawat grid station has consistently remained the weakest performer, with a cumulative tally of 13,014 violations, indicating long-standing reliability concerns.

At the 220 kV level, the Bannu grid station registered the highest number of violations in FY 2024-25 with 1,328 cases. Over the same five-year period, however, the 220 kV Mardan grid station emerged as the most problematic, with a cumulative figure of 16,524 violations. These trends point to persistent voltage stability issues at both Rawat and Mardan grid stations, emphasizing the urgent need for focused remedial measures.

Table 8: Number of voltage violations (Lahore Region)

Sr. No.	Grid Station	2020-21	2021-22	2022-23	2023-24	2024-25
1	500 kV Gatti	254	871	833	567	143
2	500 kV Nokhar	602	245	1655	1,528	1,135
3	500 kV Shiekhupura	173	356	100	177	326
4	500 kV New Lahore	886	1,566	2,545	1099	354
5	500 kV West FSD	-	1,496	7,982	2977	2,880
6	220 kV Bund	3,420	8,412	2,248	1524	652
7	220 kV Ghakkar	6,584	3,526	236	89	508
8	220 kV Jaranwala	52	268	3	Nil	Nil
9	220 kV Kala Shah Kaku	4,454	6,471	639	1237	726
10	220 kV Ludewala	157	757	285	178	292
11	220 kV New Kot lakhpat	4,735	4,649	1,787	1390	784
12	220 kV Shalamar	1,902	1,897	1,232	912	620
13	220 kV Nishatabad	28	12	6	6	Nil
14	220 kV Ravi	2,912	3,493	538	345	169
15	220 kV Samundari	224	1,552	350	83	556
16	220 kV Safraznagar	6,162	7,460	4,441	3183	943
17	220 kV Sialkot	2,350	2,833	1,454	844	372
18	220 kV Wapda Town	1,238	937	412	136	85
19	220 kV Ghazi Road	12,862	12,085	8,806	6674	1,307
20	220 kV Bandala	656	456	134	490	592
21	220 kV T.T.Singh	448	3,171	1,470	2663	2,662
22	220 kV Gujrat	3,294	3,696	1,851	951	594
23	220 kV Lalian	-	-	10	81	144
24	500 kV Yousafwala	-	6,126	2993	1417	1,086
25	220 kV Kassowal	144	1,200	520	477	844
26	220 kV Okara	204	606	606	609	410
Total		53,741	74,141	43,136	29,637	18,184

Source: NGC/DXP

In FY 2024-25, the 500 kV Faisalabad West grid station recorded the highest number of voltage violations, with 2,880 incidents. Over a five-year period, it has also consistently remained the most affected station at the 500 kV level, with a cumulative total of 15,335 violations, pointing to persistent reliability concerns.

At the 220 kV level, the T.T. Singh grid station reported 2,662 violations during FY 2024-25, reflecting a significant level of instability. Meanwhile, the Ghazi Road grid station has faced the most severe long-term challenges, with a cumulative total of 41,734 violations over the last five years. These findings emphasize critical voltage stability issues at Faisalabad West and Ghazi Road, highlighting the need for immediate and focused corrective actions.

Table 9: Number of voltage violations (Multan Region)

Sr. No.	Grid Station	2020-21	2021-22	2022-23	2022-23	2024-25
1	500 kV Multan	55	24	851	4653	7,682
2	500 kV Muzaffargarh	–	–	–	–	485
3	500 kV D.G.Khan	185	233	133	1052	1,430
4	500 kV Rahimyar Khan	–	–	–	567	927
5	500 kV TPS Mgarh	–	–	–	–	511
6	220 kV Bahawalpur	833	1,502	641	178	274
7	220 kV Muzaffargarh	329	462	371	191	68
8	220 kV Vehari	1,659	2,279	2,048	1,332	848
9	220 kV Chistian	2,427	5,054	3,210	1,667	446
10	220 kV Lal Sohanra	208	202	99	55	409
11	220 kV NGPS Multan	–	–	–	–	857
Total		5,696	9,756	7,353	9,695	13,937

Source: NGC/DXP

During FY 2024-25, the 500 kV Multan grid station recorded the highest number of voltage violations, reporting 7,682 incidents. At the 220 kV level, the NGPS Multan grid station also showed instability, with 857 violations during the same period.

Over the past five years, the 500 kV Multan grid station accumulated the highest total of 13,265 violations, while the 220 kV Chishtian grid station registered a significantly high cumulative figure of 12,804. These results point to persistent voltage stability concerns at both Multan and Chishtian, highlighting the need for focused and sustained remedial actions.

Table 10: Number of voltage violations (Hyderabad Region)

Sr. No.	Grid Station	2020-21	2021-22	2022-23	2023-24	2024-25
1	500kV Dadu	53	10	44	1,915	319
2	500kV Guddu	114	165	1,646	7,438	4,479
3	500kV Jamshoro	6,086	16,220	7,141	15,424	6,008
4	500kV NKI Karachi	-	-	123	6,149	63
5	500kV Shikarpur	10,311	13,494	11,270	13,515	8,990
6	500kV 747 MW Guddu	-	-	17,878	18,250	14,563
7	500 kV Moro	-	-	-	-	988
8	220kV Hala road	2	-	1	230	647
9	220 kV Rohri	1,500	5,104	2,597	3,776	3,122
10	220 kV T.M.Khan Road	1,824	2,372	1,430	1,945	2,266
11	220kV Daharki	1,165	1,178	1,245	2,116	2,534
12	220 kV Jhampir 1	-	-	303	5,415	4,224
13	220 kV Jhampir 2	-	-	396	821	596
14	220kV Switchyard Guddu	-	-	3,230	4,356	3,725
Total		21,055	38,543	47,304	81,350	52,524

Source: NGC/DXP

During FY 2024-25, the 500 kV Guddu grid station (747 MW) reported the highest number of voltage violations, totaling 14,563 incidents. Looking at long-term performance, the 500 kV Shikarpur grid station showed the most severe instability over the past five years, with a cumulative total of 57,580 violations, highlighting chronic reliability concerns at the 500 kV level.

At the 220 kV level, the Jhampir-I grid station recorded the highest number of violations in FY 2024-25, with 4,224 incidents. Over the same five-year period, the 220 kV Rohri grid station experienced a significant cumulative total of 16,099 violations. These trends point to persistent voltage stability issues at Guddu, Shikarpur, Jhampir-I, and Rohri, underscoring the need for focused interventions to strengthen system performance.

Table 11: Number of voltage violations (Quetta Region)

Sr. No.	Grid Station	2020-21	2021-22	2022-23	2023-24	2024-25
1	220kV Quetta Industrial-II	5,702	15,034	1,948	3,223	3,232
2	220 kV Sibbi	7,200	9,407	8,375	15,785	8,405
3	220kV Khuzdar	2,722	4	1,100	757	170
4	220kV Loralai	2,064	3,266	2,204	1,909	1,063
5	220kV Dera Murad Jamali	NP	3,275	1,497	5,692	3,956
Total		17,688	30,986	15,124	27,366	16,826

Source: NGC/DXP

In FY 2024-25, the 220 kV Sibbi grid station recorded the highest number of voltage violations among all 220 kV stations, with a total of 8,405 incidents. This reflects a severe level of instability within the station’s operational performance during the year.

Over the past five years, Sibbi has continued to show persistent challenges, accumulating a total of 49,172 violations — the highest at the 220 kV level. These recurring issues underscore chronic voltage stability problems at the station, emphasizing the urgent need for focused and sustained corrective measures.

2.6.5. Grid wise voltage variation of 500 kV and 220 kV grid stations under Normal & N-1 condition:

Table 12: Permissible voltage limits at 500 kV and 220 kV under Normal & N-1 condition

Grid Station Level	System Condition	Permissible Voltage Variation	Voltage Range (kV)	Duration Allowed
500 kV	Normal	±5%	475 – 525	Up to 30 minutes
	(N-1) Contingency	±10%	450 – 550	Up to 30 minutes
220 kV	Normal	±5%	209 – 231	Up to 30 minutes
	(N-1) Contingency	±10%	198 – 242	Up to 30 minutes

Highest and Lowest voltages recorded at 500 kV and 220 kV voltage level under Normal and N-1 Conditions during FY 2024-25:

The following series of tables is categorized by 500 kV and 220 kV voltage levels under both Normal and N-1 conditions. Each table presents the highest and lowest voltages recorded at the respective grid stations during FY 2024-25

Table 13: Highest voltages at 500 kV Grid Stations under Normal Condition

Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Islamabad	500 kV Sheikh Muhammadi	556	660	525	5.90
Lahore	500 kV New Lahore	548	120	525	4.38
	500 kV Nokhar	541	360	525	3.05

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Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
	500 kV Yousafwala	557	150	525	6.10
	500 kV Sheikhpura	549	180	525	4.57
	500KV WFSD	548	540	525	4.38
Multan	500 kV Rahim Yar Khan	553	1380	525	5.33
	500KV Muzaffargarh	548	60	525	4.38
	500 kV Multan	558	1440	525	6.29
	500 kV D.G. Khan	555	1440	525	5.71
Hyderabad	500 kV Moro	545	60	525	3.81
	500 kV Dadu	538	270	525	2.48
	500 kV Guddu	544	300	525	3.62
	500 kV 747 Guddu	548	60	525	4.38
	500 kV Jamshoro	539	60	525	2.67
	500 kV NKI Karachi	530	90	525	0.95
	500 kV Shikarpur	546	120	525	4.00

Source: NGC/DXP

The highest voltage violation recorded was 558 kV at the Multan 500 kV grid station, representing a deviation of 6.29% from the allowed +5% limit (525 kV) under normal conditions. Details of the highest voltage incidents at 500 kV grid stations under normal conditions are provided in the table above.

Table 14: Lowest voltage incidents recorded at 500 kV grid station under Normal condition

Region	Grid Stations	Voltage	Duration	Minimum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Islamabad	500 kV Sheikh Muhammadi	470	60	475	1.05

Source: NGC/DXP

The lowest voltage of 470 kV was determined at 500 kV Sheikh Muhammadi with a deviation of 1.05% from the allowed limit under Normal condition.

Table 15: Highest voltage incidents recorded at 500 kV grid station under N-1 condition

Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Lahore	500KV WFSD	554	180	550	0.73

Source: NGC/DXP

The highest voltage of 554 kV was determined at 500 kV West Faisalabad with a deviation of 0.73 % from the allowed limit under N-1 condition. No instances of lowest voltage violations were determined at 500 kV grid stations under N-1 condition.

Table 16: Highest voltage (kV) recorded at 220 kV grid stations under Normal condition

Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Islamabad	220 kV Rawat	245	360	231	6.06
	220 kV University	244	330	231	5.63
	220 kV Bannu	243	1440	231	5.19
	220 kV Sheikh Muhammadi	236	120	231	2.16
	220 kV Burhan	239	120	231	3.46
	220 kV Daud khel	238	720	231	3.03
	220 kV ISPR	241	242	231	4.33
	220 kV Mardan	237	420	231	2.60
	220 kV Nowshera	236	300	231	2.16
	220 kV Mansehra	240	420	231	3.90
	220 kV Chakdara	233	120	231	0.87
	220 kV D.I.Khan	238	300	231	3.03
Lahore	220KV Toba Tek Singh	241	450	231	4.33
	220KV WFSD	243	60	231	5.19
	220 kV Gujrat	245	210	231	6.06
	220 kV Samundri Road	248	180	231	7.36
	220 kV Lalian	237	300	231	2.60
	220 kV Ludewala	237	150	231	2.60
	220 kV Bandala	241	90	231	4.33
	220 kV Sheikhpura	240	60	231	3.90
	220 kV Gatti	240	120	231	3.90
	220 kV Yousafwala	244	90	231	5.63
	220 kV Okara	243	150	231	5.19
	220 kV Nokhar	243	180	231	5.19
	220 kV Kassowal	249	150	231	7.79
220 kV New Lahore	243	120	231	5.19	
Multan	220 kV D.G. Khan	251	240	231	8.66
	220KV Muzaffargarh	241	60	231	4.33
	220 kV Multan	248	1440	231	7.36
	220 kV Bahawalpur	247	150	231	6.93
	220 kV Vehari	242	510	231	4.76
	220 kV TPS Mgarh	244	240	231	5.63
	220 kV Chishtian	242	480	231	4.76
	220 kV Lal Sohanra	251	1110	231	8.66
Hyderabad	220 kV Shikarpur	246	120	231	6.49
	220 kV Switchyard Guddu	246	120	231	6.49
	220 kV NKI Karachi	234	60	231	1.30
	220kV Jamshoro	262	60	231	13.42
	220 kV Jhampir II	244	60	231	5.63
	220 kV Jhampir I	243	120	231	5.19
	220 kV T.M. Khan	242	60	231	4.76
	220 kV Rohri	247	60	231	6.93

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Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
	220 kV Hala Road	240	120	231	3.90
	220 kV Daharki	250	60	231	8.23
	220 kV Dadu	235	90	231	1.73
Quetta	220 kV Loralai	260	120	231	12.55
	220 kV Sibbi	248	60	231	7.36
	220 kV Khuzdar	245	60	231	6.06
	220 kV D. M. Jamali	248	60	231	7.36
	220 kV Quetta	249	120	231	7.79

Source: NGC/DXP

The 220 kV Jamshoro grid station recorded the highest voltage of 262 kV, representing a deviation of 13.42% from the allowed limit of 231 kV (with a +5% tolerance) under Normal condition.

Table 17: Lowest voltage incidents recorded at 220 kV grid station under Normal condition

Region	Grid Stations	Voltage	Duration	Minimum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Islamabad	220 kV Bannu	200	120	209	4.31
	220 kV Sheikh Muhammadi	202	60	209	3.35
	220 kV ISPR	195	120	209	6.70
	220 kV Mardan	193	360	209	7.66
	220 kV Nowshera	205	90	209	1.91
	220 kV Mansehra	197	240	209	5.74
	220 kV Chakdara	200	60	209	4.31
	220 kV New Shahi Bagh	194	180	209	7.18
Lahore	220 kV Bund Road	195	1170	209	6.70
	200 kV Kala Shah Kaku	198	1410	209	5.26
	220 kV Ghazi	187	1440	209	10.53
	220 kV Ghakkar	197	840	209	5.74
	220 kV Sheikhpura	201	90	209	3.83
	220 kV Gujrat	200	210	209	4.31
	220 kV Lalian	207	120	209	0.96
	220 kV Shalamar	186	990	209	11.00
	220 kV Sarfaraznagar	188	1440	209	10.05
	220 kV Wapda Town	200	390	209	4.31
	220 kV Gatti	205	120	209	1.91
	220 kV Yousafwala	198	150	209	5.26
	220 kV Ravi	202	1440	209	3.35
	220 kV Sialkot	191	1410	209	8.61
	220 kV Okara	194	480	209	7.18
	220 kV New Kot Lakhpat	192	690	209	8.13
Multan	220 kV Kassowal	185	210	209	11.48
	220 kV Vehari	185	60	209	11.48
	220 kV Chishtian	198	1140	209	5.26

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Region	Grid Stations	Voltage	Duration	Minimum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Quetta	221 kV Sibbi	202	60	209	3.35
	221 kV Khuzdar	190	120	209	9.09
	220 kV Quetta	180	60	209	13.88

Source: NGC/DXP

The 220 kV Quetta grid station recorded the lowest voltage of 180 kV, representing a deviation of 13.88% from the allowed limit of 209 kV (with a -5% tolerance) under Normal condition.

Table 18: Highest voltage incidents recorded at 220 kV grid station under N-1 condition

Region	Grid Stations	Voltage	Duration	Maximum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Lahore	220KV Toba Tek Singh	250	150	242	3.31
	220KV WFSB	252	60	242	4.13
Multan	220KV Muzaffargarh	248	60	242	2.48
	220 kV Bahawalpur	245	1380	242	1.24
	220 kV Lal Sohanra	252	270	242	4.13
Quetta	221 kV Loralai	258	60	242	6.61
	220 kV Quetta	246	120	242	1.65

Source: NGC/DXP

The 220 kV Loralai grid station recorded the highest voltage of 258 kV, representing a deviation of 6.61% from the allowed limit of 242 kV (with a +10% tolerance) under N-1 condition.

Table 19: Lowest voltage incidents recorded at 220 kV grid station under N-1 condition

Region	Grid Stations	Voltage	Duration	Minimum Allowed Limit for voltage (kV)	Deviation w.r.t allowed Limit (%)
		(kV)	(min)		
Lahore	220 kV Safraznagar	193	300	198	2.53
Multan	220 kV Chishtian	180	180	198	9.09
Quetta	222 kV Loralai	195	60	198	1.52
	222 kV Khuzdar	190	60	198	4.04
	220 kV Quetta	180	60	198	9.09

Source: NGC/DXP

The 220 kV Quetta and 220 kV Chistian grid station recorded the lowest voltage of 180 kV, representing a deviation of 9.09% from the allowed limit of 198 kV (with a -10% tolerance) under N-1 condition.

2.7 Performance of Tie Lines Submitted by NGC:

To meet the power demand of K-Electric (KE), NGC has established interconnections with KE's grid system. These interconnections are facilitated through two 500kV and five 220kV transmission circuits, as follows:

- (a) 500kV K2/K3-KKI
- (b) 500kV Port Qasim-KKI
- (c) 220kV NKI-KDA
- (d) 220kV NKI-Baldia
- (e) 220kV Jhampir II-I-KDA
- (f) 220kV Jhampir II-II-KDA
- (g) 220kV Jhampir II-KE Dhabejee

These tie lines enable the export of electricity from NGC Network to KE's Grid, supporting the stability and reliability of power supply to KE's service areas. NGC maintains interconnections with K-Electric (KE) grids through two 500kV and five 220 kV transmission circuits for power export. Of these, the following circuits are maintained by NGC:

- (a) 500kV K2/K3-KKI
- (b) 500kV Port Qasim-KKI
- (c) 220 kV Jhampir-II Circuit 1 - KDA
- (d) 220 kV Jhampir-II Circuit 2 - KDA
- (e) 220kV Jhampir II-KE Dhabejee

The remaining two circuits, 220kV NKI-KDA and 220kV NKI-Balidia, are maintained by K-Electric.

2.8 System Reliability:

2.8.1 Average Duration of Interruption:

- (a) Total outage hours at all interconnection points (excluding 132 kV line tripping): 0 hours
- (b) Total number of interconnection points: 7
- (c) System duration of interruption: 0 hours

Source: NGC/DXP

2.8.2 Average Frequency of Interruption:

- (a) Number of outages at all 132 kV outgoing circuits (excluding 132kV line tripping): 0
- (b) Total number of 132 kV circuits: 7
- (c) System frequency of interruption: 0 outages per circuit

Source: NGC/DXP

SECTION II

K – ELECTRIC LIMITED (KE)

3. Introduction of KE:

K-Electric Limited (KE) is a vertically integrated utility company in Pakistan, managing the generation, transmission, and distribution of electricity in Karachi. It was originally founded as the Karachi Electric Supply Corporation (KESC) on September 13, 1913, under the Indian Companies Act of 1882. Following its privatization on November 29, 2005, the company was rebranded as Karachi Electric Supply Company in September 2008. In commemoration of its centenary in 2013–14, the company adopted its current name, K-Electric Limited (KE).

3.1 License:

Pursuant to Sections 16 and 25 of the NEPRA Act, 1997, NEPRA issued a transmission license to K-Electric (KE) in June 2010. This license authorizes KE to carry out transmission operations within its defined service area for a period of thirty (30) years.

3.2 KE Transmission Network:

As of June 2025, the K-Electric (KE) transmission system consists of a total of 78 grid stations (66 kV, 132 kV, 220 kV, 500 kV), 1,432 km of transmission lines, and a transformation capacity of 14,496 MVA. KE's grid system is connected to the NGC network through two 500 kV and five 220 kV transmission circuits, as follows:

- (a) 500kV KKI-K2K3 (NGC Maintained)
- (b) 500kV KKI-PQEPCL (NGC Maintained)
- (c) 220kV KDA-NKI (KE Maintained)
- (d) 220kV Baldia-NKI (KE Maintained)
- (e) 220kV KDA-Jhampir2-I (NGC Maintained)
- (f) 220kV KDA-Jhampir2-II (NGC Maintained)
- (g) 220kV Dhabeji-Jhampir2 (NGC Maintained)

These circuits facilitate the transfer of power between KE's grid and NGC, supporting the electricity supply to Karachi.

Figure 9: KE Transmission System

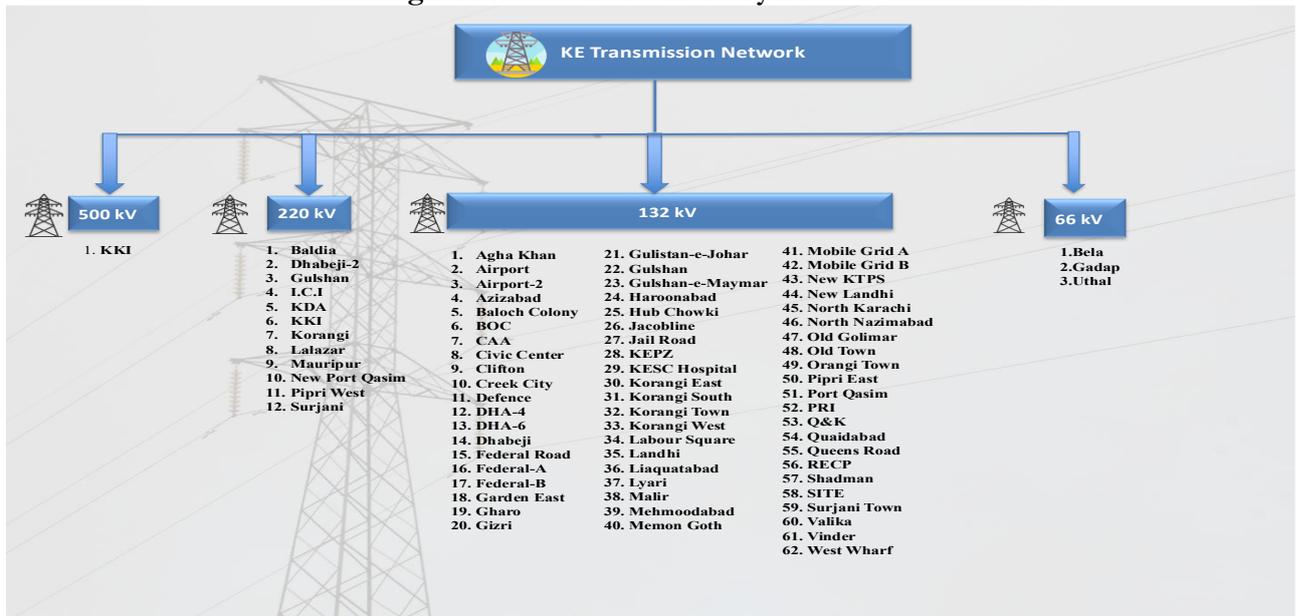


Table 20: KE Network Statistics

Description		2020-21	2021-22	2022-23	2023-24	2024-25
No. of Grid Stations	500 kV	0	0	0	0	1
	Added	0	0	0	0	1
	220 kV	10	10	10	11	12
	Added	0	0	0	1	1
	132 kV	58	58	58	60	62
	Added	0	0	0	2	2
	66 kV	3	3	3	3	3
	Added	0	0	0	0	0
	Total	71	71	71	74	78
Length of Transmission Line (Circuit km)	500 kV	0	0	0	0	7
	Added	0	0	0	0	7
	220 kV	365	364	364	436	467
	Added	0	-1	0	72	31
	132 kV	833	838	838	805	805
	Added	32	5	0	-33	0
	66 kV	153	153	153	153	153
	Added	0	0	0	0	0
	Total	1,352	1,355	1,355	1394	1432
Transformation Capacity (MVA)	500 kV	0	0	0	0	1800
	Added	0	0	0	0	1800
	220 kV	4,500	4,500	4,500	5500	5500
	Added	0	0	0	1000	0
	132 kV	6,557	6,824	6,986	7116	7117
	Added	184	267	162	130	1
	66 kV	79	79	79	79	79
	Added	0	0	0	0	0
	Total	11,136	11,403	11,565	12,695	14,496

Source: KE/DXP

As shown in the table above, four new grid stations were commissioned in KE's network during FY 2024–25. In addition, 38 km of transmission lines were added to the system, while the overall transformation capacity increased by 1,801 MVA.

Over the past five years, KE has expanded its network with the addition of seven grid stations i.e. (One-500 kV, Two - 220 kV, four - 132kV), 113 km of transmission lines, and a total of 3,544 MVA in transformation capacity. This growth reflects KE's ongoing efforts to enhance its transmission infrastructure and capacity.

3.3 Performance of K-Electric under PSTR-2005:

This part of the report analyzes K-Electric's (KE) overall operational performance, focusing on three critical aspects: system reliability, system security, and quality of supply. The subsequent sections provide a detail review of KE's performance in each of these areas.

3.4. System Reliability:

3.4.1 Average Duration of Interruption:

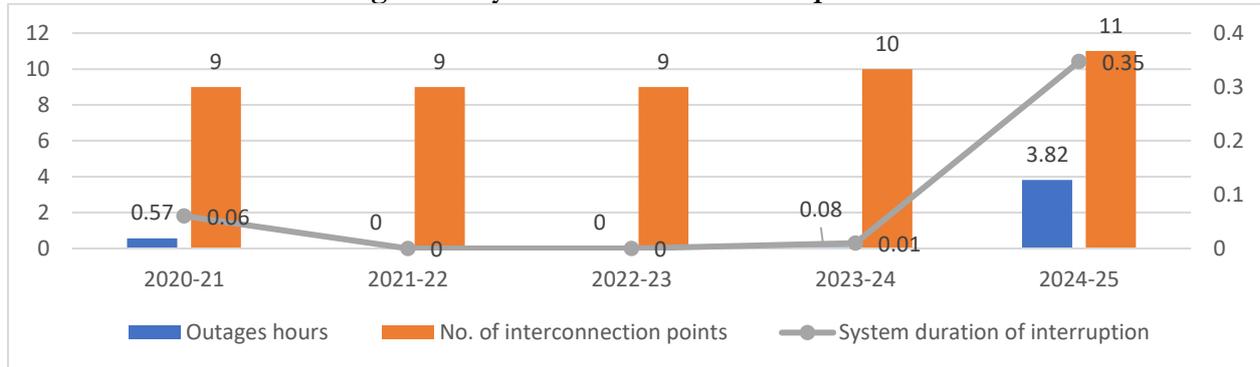
- (a) Total outage hours recorded at all interconnection points (other than 132 kV line tripping) = 3.82 hours
- (b) Total number of interconnection points: 11
- (c) Average system duration of interruption: 0.35 hours per point

Source: KE/DXP

Over the past five years, Average Interruption Duration at interconnection points has shown a shifting pattern in system reliability. It was 0.06 hours in FY 2020-21, then dropped to 0.0 hours in both FY 2021-22 and FY 2022-23, reflecting a period of exceptional reliability. However, a slight increase to

0.01 hours in FY 2023-24 was followed by a sharp rise to 0.35 hours in FY 2024-25, indicating a significant decline in system reliability after several years of stable performance.

Figure 10: System duration of interruption



Source: KE/DXP

During FY 2024-25 KE reported a total of 3.82 outage hours which shows as increase in the outage hours compared to the figure of 0.08 outage hours in the previous FY 2023-24. Notably, one additional interconnection point was added compared to the previous year, bringing the total to 11.

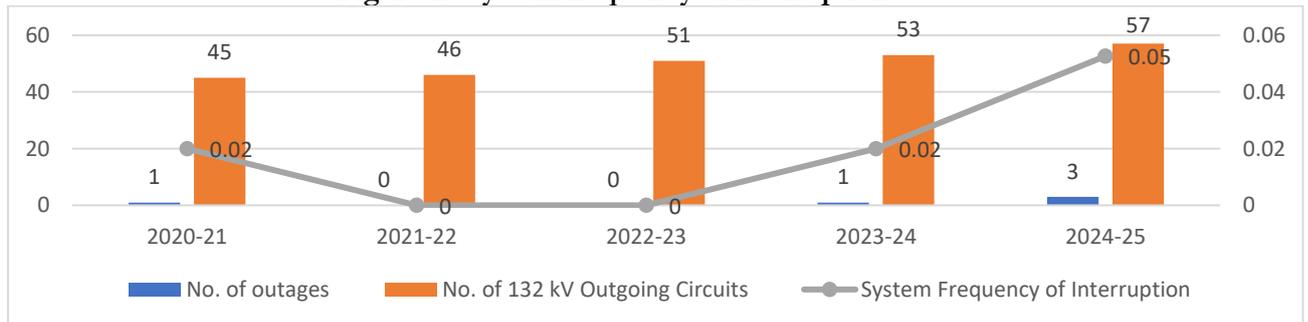
3.4.2 Average Frequency of Interruption:

- (a) Total number of outages recorded at all 132 kV outgoing circuits (other than 132 kV line tripping) = 3
- (b) Total number of 132 kV circuits: 57
- (c) System frequency of interruption: 0.05 outages per circuit

Source: KE/DXP

As shown in the figure below, the total number of outages are 3 during the FY 2024-25 which has been increased in comparison to the previous year when it was reported as 1. Additionally, four outgoing circuits were added during the reporting period.

Figure 11: System frequency of interruption



Source: KE/DXP

The average number of interruptions per circuit has seen a slight increase, rising to 0.05 outages per circuit, compared to 0.02 outages per circuit reported in the previous year by KE.

3.5. Tie Line Reliability submitted by KE:

K-Electric’s transmission system is linked to the national grid through two 500kV tie-lines and five 220 kV tie-line circuits, connecting its network with NGC’s. These interconnection circuits are:

- (a) 500kV KKI-K2K3 (NGC Maintained)

- (b) 500kV KKI-PQEPCL (NGC Maintained)
- (c) 220kV KDA-NKI (KE Maintained)
- (d) 220kV Baldia-NKI (KE Maintained)
- (e) 220kV KDA-Jhampir2-I (NGC Maintained)
- (f) 220kV KDA-Jhampir2-II (NGC Maintained)
- (g) 220kV Dhabeji-Jhampir2 (NGC Maintained)

Out of these, two 500kV and five 220kV Tie Lines between KE and NGC, five come under the jurisdiction of NGC and are operated and maintained by them (namely, 500kV KKI/K2K3 circuit, 500kV KKI/PQEPCL circuit, 220kV KDA/Jhampir circuits 1 and 2, and 220kV Dhabeji/Jhampir-2 circuit), while two come under the jurisdiction of K-Electric and are operated and maintained by it (namely 220kV KDA-NKI and 220kV Baldia-NKI).

3.5.1 System Duration of Interruption of Tie Lines:

- (a) Total outage hours recorded at all tie line circuits = 59.13 hours
- (b) Total number of tie line circuits = 7
- (c) System duration of interruption: 8.45 hours per point

Source: KE/DXP

It is observed that in FY 2024-25, all tie lines experienced a total of 59.13 hours of outage with a system duration of interruption of 8.45 which shows a significant increase in comparison to the FY 2023-24 where the same parameters were reported as 11.65 hours of outages, with a system duration of interruption averaging 2.91 hours. Moreover, the total number of tie line circuits increase to 7 in comparison to the previous year where it was reported as 4 number of tie line circuits.

3.5.2 System Frequency of Interruption of Tie Lines:

- (a) Total number of outages recorded at all tie line circuits = 14
- (b) Total number of tie line circuits: 7
- (c) System frequency of interruption: 2 outages per circuit

Source: KE/DXP

During the reporting period, a total of 14 outages were recorded across all 7 tie line circuits in the system. This translates into an average system frequency of interruption of 2 outages per circuit, indicating that each tie line circuit experienced two instances of supply interruption during the period under review.

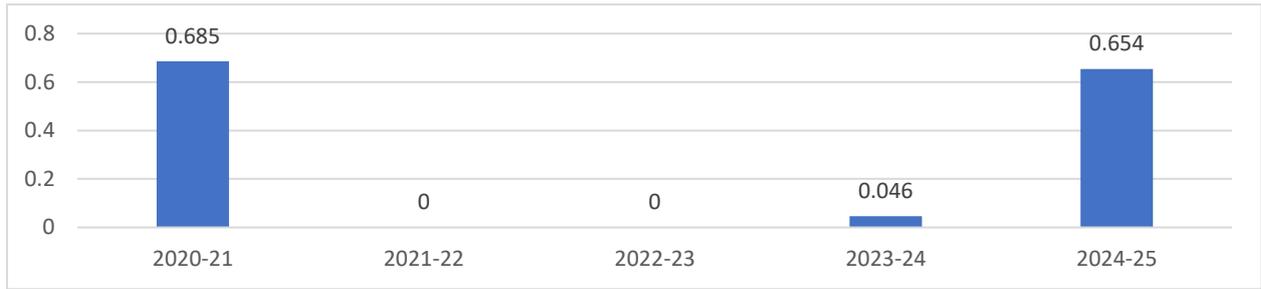
3.6. System Security:

3.6.1 Energy Not Served (ENS):

- (a) Total ENS = 0.654 M kWh
- (b) Number of incidents, where there has been a loss of supply = 3
- (c) Average ENS per incident = 0.218 M kWh
- (d) Average duration per incident = 1.27 hrs

Source: KE/DXP

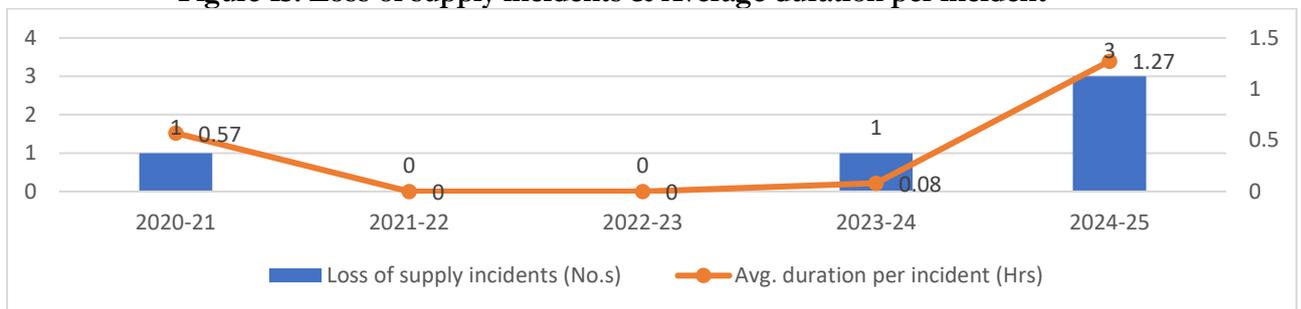
Figure 12: Energy not served (GWh)



Source: KE/DXP

According to KE, the total Energy Not Served (ENS) for FY 2024-25 was reported as 0.654 million kWh which has been increased in comparison to the previous year when it was reported as 0.046 million kWh.

Figure 13: Loss of supply incidents & Average duration per incident



Source: KE/DXP

The Figure above shows graphical representation of the five years comparison of loss of supply incidents and average duration of interruption. The loss of supply incidents increased to three in comparison to the previous year when it was reported as 1. Moreover, the average duration of interruption was reported as 1.27 showing an increase in comparison to the number value of 0.08 previous year.

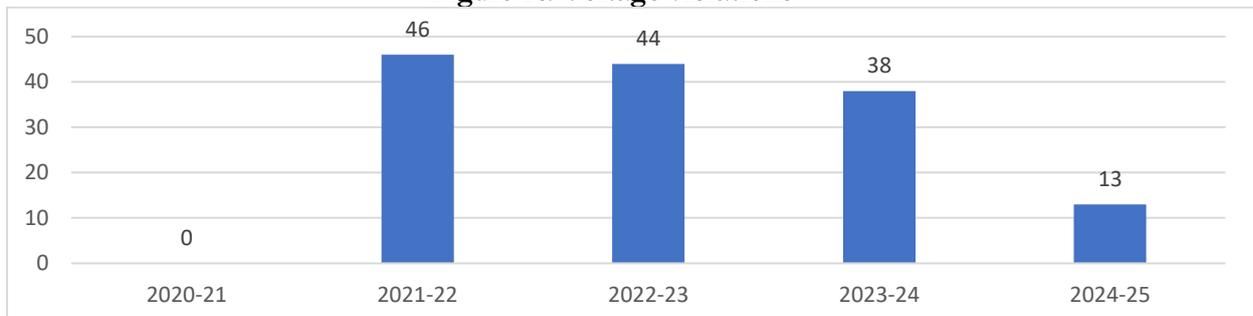
3.7. Quality of supply:

3.7.1. System Voltage:

- (a) Total number of violations under Normal conditions = 13
- (b) Total number of violations under N-1 conditions = Nil
- (c) Total number of violations under Normal & N-1 conditions = 13

Source: KE/DXP

Figure 14: Voltage violations



Source: KE/DXP

The Figure above shows the comparison of the total number of voltage violations occurred in the previous five years. It can be seen that number of voltage violation occurred has been decreased every year in last five years i.e. 46 in 2021-22 to 13 in 2024-25 which shows a great improvement in the performance of KE.

3.7.2. System frequency:

- (a) Number of times frequency remained outside the limits in a year = 5
- (b) Time duration the frequency remained outside the limits in a year = 16.91 min.
- (c) % age time of the year the frequency remained outside the limits = 0.003% time of the year.
- (d) Highest frequency recorded = 50.53 Hz
- (e) No violation at the lower end.
- (f) Allowable limits: 49.5 Hz – 50.5 Hz

Source: KE/DXP

The table below shows the frequency violations occurred both on highest and lowest side on monthly basis and it is concluded in number value for the FY 2024-25 at the end:

Table 21: Frequency violations

Parameters	Highest Frequency		Lowest Frequency		Number of times the frequency remained outside the permissible limits
	Frequency recorded (Hz)	Duration (min)	Frequency recorded (Hz)	Duration (min)	
Jul-24	Nil	Nil	Nil	Nil	Nil
Aug-24	Nil	Nil	Nil	Nil	Nil
Sep-24	Nil	Nil	Nil	Nil	Nil
Oct-24	Nil	Nil	Nil	Nil	Nil
Nov-24	Nil	Nil	Nil	Nil	Nil
Dec-24	Nil	Nil	Nil	Nil	Nil
Jan-25	50.51	5.18	Nil	Nil	1
Feb-25	Nil	Nil	Nil	Nil	Nil
Mar-25	50.51	6.38	Nil	Nil	1
Apr-25	Nil	Nil	Nil	Nil	Nil
May-25	50.53	5.35	Nil	Nil	3
Jun-25	Nil	Nil	Nil	Nil	Nil
2024-25	50.53	16.91	Nil	Nil	5

Source: KE/DXP

As it can be seen in the above table that the highest frequency was recorded in the month of May, 2025 which is 50.53 Hz for a duration of 5.35 min wherein at the end of table the for FY 2024-25 the concluding number values can be seen which shows that a total of 5 times the frequency remained outside the permissible limit for a total duration of 16.91 mins. Moreover, all the frequency violations that are reported occurred on the higher side no incident of low frequency violations occurred during the FY 2024-25.

3.8. System reliability of 132 kV and 66 kV network of KE

3.8.1. System Duration of Interruption on 132 kV and 66 kV transmission network:

The system duration of interruption on 132 kV and 66 kV network combined is recorded as 3.65 hours during the FY 2024-25.

Table 22: System Duration of Interruption

Months	System duration of interruption on transmission consumers in hours (excluding external trips)
Jul-24	1.4
Aug-24	0.4
Sep-24	0.25
Oct-24	0.25
Nov-24	0.12
Dec-24	0.18
Jan-25	0.43
Feb-25	0.03
Mar-25	0.10
Apr-25	0.06
May-25	0.06
Jun-25	0.38
Total	3.65

Source: KE/DXP

As it can be seen in the table above, the trend shows that the highest interruption occurred in July 2024 (1.4 hours), which was significantly higher compared to the rest of the months. Afterward, interruption durations declined considerably, averaging below one hour per month. The lowest interruption was observed in February 2025 (0.03 hours), indicating improved network stability during that period.

3.8.2. System Frequency of Interruption on 132 kV and 66 kV transmission network:

The system frequency of interruption on 132 kV and 66 kV network combined is recorded as 2.60 during the FY 2024-25.

Table 23: System Frequency of Interruption

Months	System frequency of interruption on transmission consumers (excluding external trips)
Jul-24	0.33
Aug-24	0.43
Sep-24	0.15
Oct-24	0.29
Nov-24	0.14
Dec-24	0.17
Jan-25	0.26
Feb-25	0.06

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Months	System frequency of interruption on transmission consumers (excluding external trips)
Mar-25	0.17
Apr-25	0.17
May-25	0.10
Jun-25	0.34
Total	2.60

Source: KE/DXP

The highest frequency of interruptions was recorded in August 2024 (0.43), closely followed by July 2024 (0.33) and June 2025 (0.34). On the other hand, the lowest frequency occurred in February 2025 (0.06) indicating a period of relatively stable operations. Most other months remained within a narrow band of 0.10 to 0.29 interruptions, reflecting overall consistency in system performance.

SPECIAL PURPOSE TRANSMISSION LICENSEES

SECTION III
FATIMA TRANSMISSION COMPANY
LIMITED (FTCL)

4. Introduction of FTCL:

Fatima Transmission Company Limited (FTCL) is a public, non-listed company incorporated under Section 32 of the Companies Ordinance, 1984. The company was established to design, develop, and operate dedicated transmission infrastructure, linking the Fatima Energy Limited co-generation power plant—located in Sanawan, Kot Addu, Punjab—to the 220/132 kV Muzaffargarh Grid Station in Punjab.

4.1 License:

Under Section 19 of the NEPRA Act, the Authority has the power to grant a Special Purpose Transmission License to any entity, allowing it to construct, own, operate, and maintain specified transmission facilities within NGC’s exclusive jurisdiction. Exercising this authority, NEPRA awarded such a license to Fatima Transmission Company Limited (FTCL) on 28.08.2015 to construct, own, maintain and operate specified transmission facilities connecting to generation facility/co-generation power plant as set out in its license. The license permits FTCL to undertake electricity transmission activities for a period of thirty (30) years.

4.2 Transmission Network:

Fatima Transmission Company Limited (FTCL) operates a 132 kV double-circuit transmission line spanning 37 kilometers, specifically designed to evacuate electricity from the 120 MW Fatima Energy power plant to the 220 kV Muzaffargarh Grid Station. Each circuit is fully capable of carrying the plant’s entire power output, ensuring the efficient and reliable transmission of electricity from the generation site to the national grid.

4.3 Performance of FTCL under PSTR-2005:

This section provides a comprehensive assessment of FTCL’s performance in key areas: System Reliability, System Security, and Quality of Supply. A detailed analysis of each of these performance indicators is provided below.

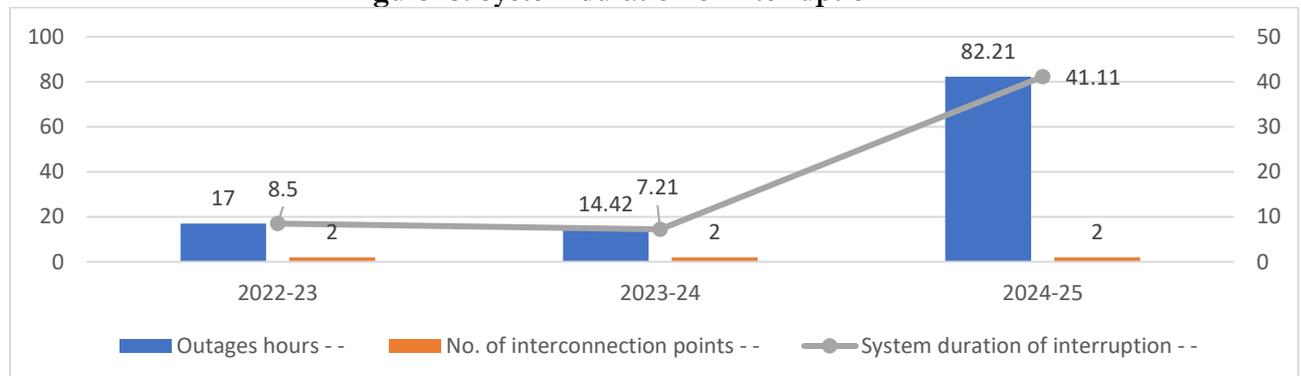
4.4. System Reliability:

4.4.1 System Duration of Interruption:

- (a) Total outage hours recorded at all interconnection points = 82.21 Hrs.
- (b) Total number of interconnection points = 2
- (c) System duration of interruption = 41.11 Hrs. /point i.e. 100% increase as compared to the previous year i.e. 7.21 Hrs. /point.

Source: FTCL

Figure 15: System duration of interruption



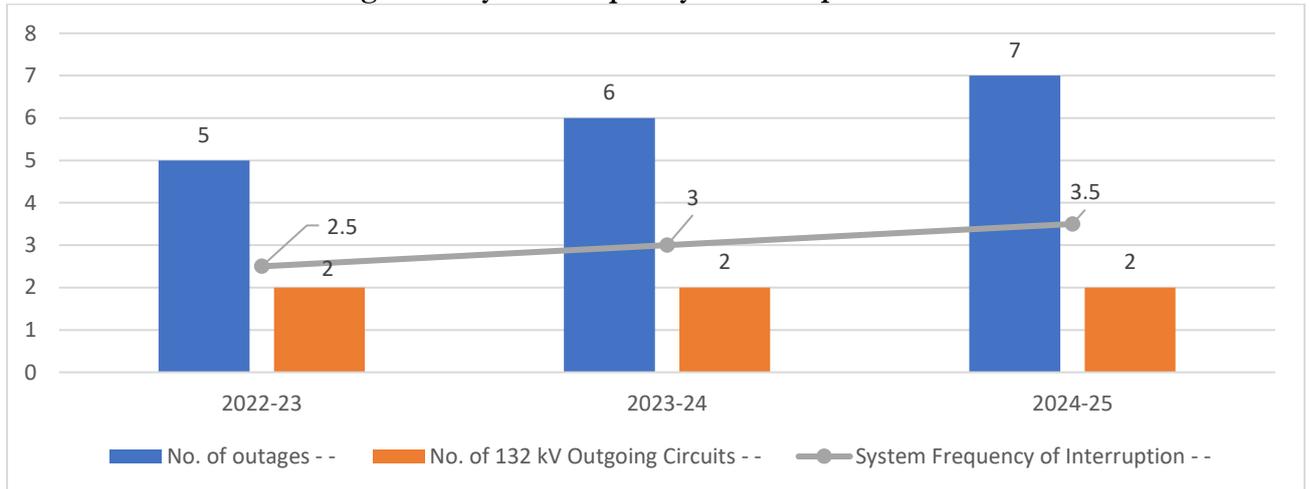
Source: FTCL

4.4.2 System Frequency of Interruption:

- (a) Total number of outages recorded at all interconnection points= 7
- (b) Total number of 132 kV circuits = 2
- (c) System frequency of interruption = 3.5 no. /circuit i.e. 16.67% increase compared to the previous year i.e. 3 no. /circuit

Source: FTCL

Figure 16: System frequency of interruption



Source: FTCL

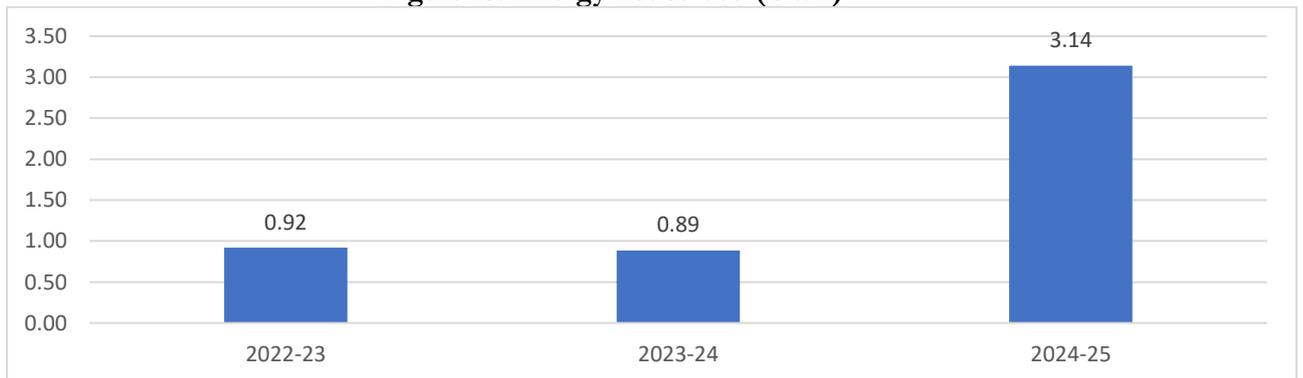
4.5. System Security:

4.5.1 Energy Not Served (ENS):

- (a) Total ENS = 3.14 M kWh
- (b) Number of incidents, where there has been a loss of supply = 7
- (c) Average ENS per incident = 0.45 MWh
- (d) Average duration per incident = 11.74 hrs

Source: FTCL

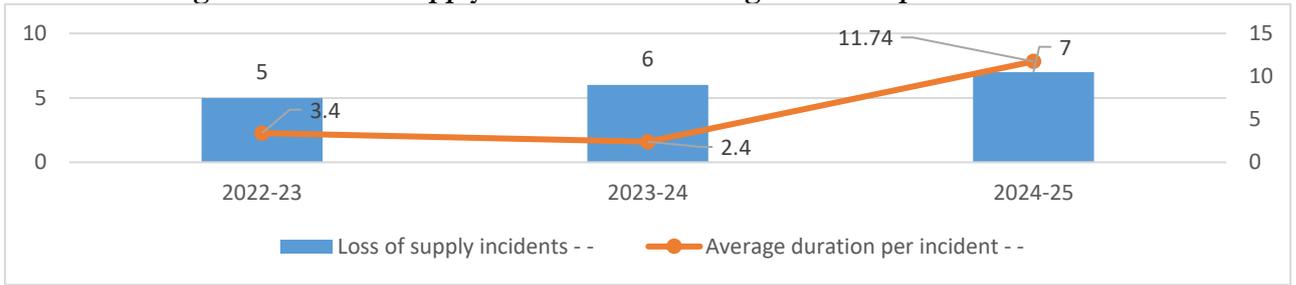
Figure 17: Energy not served (GWh)



Source: FTCL

According to FTCL as depicted in the above figure, the total Energy Not Served (ENS) for FY 2024-25 was reported as 3.14 million kWh in comparison to the previous year when it was reported as 0.89 million kWh. A three years comparison of the Energy not served in the figure below

Figure 18: Loss of supply incidents and Average duration per incident



Source: FTCL

The figure above shows graphical representation of the three years comparison of loss of supply incidents and average duration of interruption. The loss of supply incidents increased to seven in comparison to the previous year when it was reported as 6. Moreover, the average duration of interruption also increased which was reported as 11.74 hrs in comparison to the number value of 2.4 hrs previous year.

4.6. Quality of Supply:

The assessment of Quality of Supply (QoS) focuses on two key parameters: System Voltage and System Frequency. The following analysis is based on the data submitted by FTCL for these parameters.

4.6.1 System Voltage:

A total of 301 instances of voltage violations occurred in FY 2024-25, the highest voltage violation recorded under normal conditions was 144.20 kV.

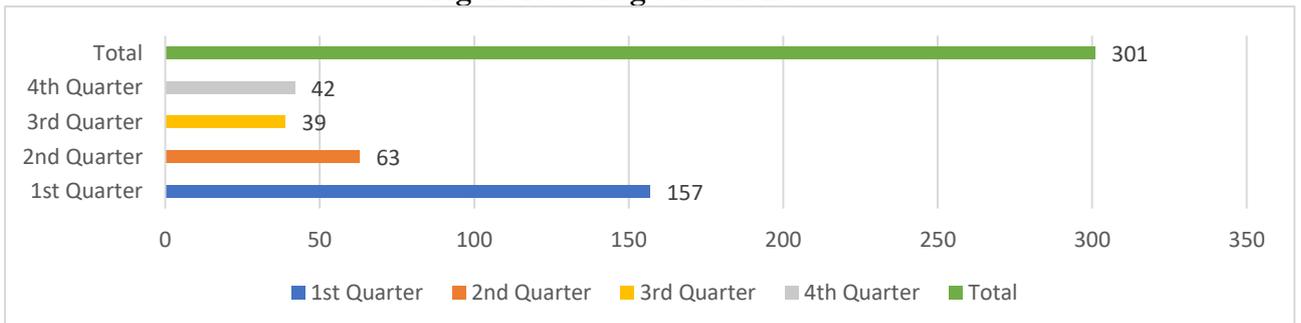
Table 24: Voltage Violations of FTCL

Sr. No.	Voltage Class (132 KV)	Highest voltage recorded (kV)	Duration of variation (min)	% Variation	Lowest voltage recorded	Duration of variation	% Variation
1	Normal	144.20	354.75	16.1%	Nil	Nil	Nil
2	N-1	Nil	Nil	Nil	Nil	Nil	Nil

Source: FTCL

However, no highest and lowest voltage violations were observed under N-1 conditions. Additionally, there were no instances of the lowest voltage recorded under either normal or Normal conditions.

Figure 19: Voltage violations



Source: FTCL

A quarterly comparison of the number of voltage violations occurred during the FY 2024-25 has been shown above in the graph alongwith with the total number of violations which occurred during the aforementioned period.

4.6.2. System Frequency:

During FY 2024–25, the system frequency of the transmission network generally remained close to the nominal value of 50 Hz; however, several deviations outside the prescribed limits were observed. Over the course of the year, the highest recorded frequency was 51.07 Hz (in May 2025), while the lowest was 49.24 Hz (in February 2025). The total duration of frequency variation amounted to 367 minutes (6.12 hours) during the year

Table 25: Frequency violations of FTCL

Month	Number of days/hours for a month over a year		Frequency Violation recorded (Hz)		Duration of variation		% Variation			Number of times frequency remained outside the limits
	Days	Hours	Highest	Lowest	Mins	Hrs	Highest	Lowest	Period	Nos.
1	2	3	4	5	6	7	$8 = \frac{(4-50)}{50} * 100$	$9 = \frac{(5-50)}{50} * 100$	$10 = \frac{7}{3} * 100$	11
Jul-24	31.00	744	50.72	49.29	37	0.62	1.44	-1.42	0.08	12
Aug-24	31.00	744	50.73	49.36	54	0.90	1.46	-1.28	0.12	9
Sep-24	30.00	720	50.68	49.30	37	0.62	1.36	-1.40	0.09	13
Oct-24	31.00	744	50.58	49.37	34	0.57	1.16	-1.26	0.08	10
Nov-24	30.00	720	50.72	49.29	38	0.63	1.44	-1.42	0.09	12
Dec-24	31.00	744	50.69	49.48	32	0.53	1.38	-1.04	0.07	9
Jan-25	31.00	744	50.71	49.34	33	0.55	1.42	-1.32	0.07	21
Feb-25	28.00	672	50.73	49.24	28	0.47	1.46	-1.52	0.07	15
Mar-25	31.00	744	50.74	49.29	32	0.53	1.48	-1.42	0.07	19
Apr-25	30.00	720	50.71	49.29	10	0.17	1.42	-1.42	0.02	9
May-25	31.00	744	51.07	49.31	15	0.25	2.14	-1.38	0.03	16
Jun-25	30.00	720	50.72	49.37	17	0.28	1.44	-1.26	0.04	14
Year	365	8760	51.07	49.24	367	6.12	2.14	-1.52	0.07	159

Source: FTCL

In terms of frequency violations, the number of instances when the system frequency went outside permissible limits stood at 159 during the year. The month of January 2025 recorded the highest number of violations (21 instances), followed by March 2025 (19 instances) and May 2025 (16 instances). In contrast, October 2024 and April 2025 had relatively fewer violations, with only 10 and 9 instances respectively.

SECTION IV

PAK MATIARI LAHORE TRANSMISSION COMPANY PRIVATE LIMITED (PMLTC)

5. Introduction of Pak Matiari Lahore Transmission Company Private Limited (PMLTC):

To ensure the efficient transmission of electricity from a diverse mix of energy sources—including imported and indigenous coal, nuclear, and renewable energy to the northern regions of Pakistan, the Government of Pakistan initiated the development of a High Voltage Direct Current (HVDC) transmission line. To promote private sector participation in this initiative, the government introduced the Private Sector Transmission Line Project 2015 Policy, providing a framework for private investment in transmission infrastructure.

Under this policy, the National Grid Company Limited (NGC) entered into a Transmission Service Agreement (TSA) with the State Grid Corporation of China (SGCC) for the construction of the Matiari–Lahore HVDC transmission line. SGCC, in turn, appointed China Electric Power Equipment and Technology Company Limited (CET) to develop the project on a Build, Own, Operate, and Transfer (BOOT) basis.

5.1. License:

In accordance with Section 19 of the NEPRA Act, 1997, the National Electric Power Regulatory Authority (NEPRA) is empowered to grant a Special Purpose Transmission License (SPTL) to entities for the construction, ownership, operation, and maintenance of specified transmission facilities within the exclusive domain of NGC.

Exercising this mandate, NEPRA issued SPTL/03/2018 to the Pak Matiari–Lahore Transmission Company (PMLTC) for the development and operation of the ± 660 kV Matiari–Lahore HVDC Transmission Line. The license authorizes PMLTC to undertake dedicated transmission operations and remains valid for a period of twenty-five (25) years, starting from the project's Commercial Operations Date (COD).

5.2. Transmission Network of ± 660 kV Matiari to Lahore HVDC Transmission:

The Pak Matiari – ± 660 kV Lahore HVDC Transmission Line, operated by PMLTC, has been developed to ensure efficient evacuation of power from several major generation facilities to key load centers in northern Pakistan. The line is designed to transmit electricity generated by the following power plants:

- (a) HUBCO – 1,292 MW
- (b) HUBCO CFPP (Coal Fired Power Plant) – 2 x 660 MW
- (c) Power Qasim – 2 x 660 MW
- (d) Thal Nova – 1 x 330 MW
- (e) Energy Thar – 2 x 330 MW
- (f) TEL (Thar Energy Limited) – 1 x 330 MW
- (g) SSRL/SECL – 2 x 660 MW

5.3. Component of Infrastructure of HVDC:

i. ± 660 kV HVDC Transmission Line:

The Matiari-Lahore ± 660 kV HVDC transmission line spans a total length of 886.12 km, stretching from the Matiari Converter Station in Sindh to the Lahore Converter Station in Punjab. The line runs in a southwest to northeast direction, crossing both Sindh and Punjab provinces, and serves as a key infrastructure component to evacuate electricity from power plants in the southern regions to load centers in the north.

ii. Matiari Converter Station:

Two converter stations are located at Matiari (Sundar and Lahore (Punjab)) to convert AC to DC and vice versa

iii. **Repeater Stations:**

To ensure seamless telecommunications across the entire transmission system, the project includes a total of three repeater stations. These are strategically located at:

- (a) Sukkur
- (b) Rahim Yar Khan
- (c) Hasilpur

These repeater stations ensure reliable communication between the various components of the HVDC transmission system, supporting efficient operation and monitoring.

iv. **Electrode Lines & Grounding:**

PMLTC includes two electrode lines (78 km at Matiari end and 48 km at Lahore end) and grounding electrode station 876 km for completing the DC circuit.

This comprehensive infrastructure is pivotal in ensuring the successful operation of the Matiari-Lahore HVDC Transmission Project, improving the transmission capacity between the southern and northern regions of Pakistan.

5.4. Performance of Pak-Matiari Lahore Transmission Company (PMLTC):

The 660 kV HVDC transmission line of PMLTC, extending 876 km from Matiari to Lahore. NEPRA approved the project in 2018, with a power transfer capacity of 4,000 MW. During FY 2024-25, the HVDC line encountered several issues including the following:

- (a) System Stability Issues: Stability concerns adversely affected the line’s operation, contributing to its underperformance.
- (b) Infrastructure Deficiencies: The necessary Alternating Current (AC) infrastructure, such as the 500 kV Lahore North Grid Station and related transmission lines, was not fully developed, limiting the line’s effectiveness.

These challenges led to considerable underutilization of the HVDC line. During FY 2024-25, the month-wise utilization and loading of HVDC line is as under:

Table 26: HVDC Average Loading & Utilization

Month	Average Loading (MW)	Utilization (%)
Jul-24	2204.85	55.12
Aug-24	1829.38	45.73
Sep-24	1463.89	36.60
Oct-24	1096.44	27.41
Nov-24	799.81	19.99
Dec-24	950.76	23.77
Jan-25	1267	31.68
Feb-25	920	23
Mar-25	1290	32.25
Apr-25	1534	38.36
May-25	1600	40
Jun-25	1813.4	45.33
Average	1397.46	34.93

Source: NGC

During FY 2024-25, the average utilization of HVDC line was 34.93. The monthly analysis of transmission system loading during FY 2024–25 shows a clear seasonal variation in demand. The highest average loading was observed in July 2024 at 2,204.85 MW, corresponding to a utilization rate of 55.12%, which marks the peak system stress during the year. This was followed by August 2024 (1,829.38 MW, 45.73%) and June 2025 (1,813.40 MW, 45.33%), reflecting increased demand during the summer months.

Similarly, the lowest loading was recorded in November 2024 (799.81 MW, 19.99%), indicating a significant dip in system utilization due to reduced seasonal demand. Similarly, February 2025 registered relatively low loading (920 MW, 23%), consistent with the winter season’s lower consumption patterns.

5.5 AC System Requirements for HVDC

5.5.1 Normal and Extreme Voltage Range of Converter Station AC Buses

Table 27: Normal and Extreme Voltage Range of Converter Station AC Buses

Converter Station	Recommended Normal Operating Voltage (kV)	Normal Continuous Operating Voltage Range (kV)	Typical Voltage Variation (kV)	Extreme Continuous Operating Voltage Range (kV)
Matiari	500	475 ~ 540	505 ~ 525	450 ~ 550
Lahore	500	475 ~ 530	490 ~ 510	450 ~ 550

Source: PMLTC

5.5.2. Normal and Post Disturbed Frequency Variations:

The normal frequency variation of the Matiari converter station AC bus is within the range of $50 \pm 0.1\text{Hz}$, the post distribution frequency variation is within the range of 49.4~50.5Hz, and the frequency after fault clearance is within the range of $50 \pm 0.2\text{Hz}$.

The normal frequency variation of the Lahore converter station AC bus is within the range of $50 \pm 0.1\text{Hz}$, the post distribution frequency variation is within the range of 49.5~50.5Hz, and the frequency after fault clearance is within the range of $50 \pm 0.2\text{Hz}$.

5.6. System Interruption:

5.6.1. Frequent Line Tripping Events:

The HVDC system, connected to 10 Nos. 500kV transmission lines at Matiari converter station and 6 Nos. 500kV Transmission lines at Lahore converter station, recorded total 45 times line-tripping events at the Matiari converter Station and 04 time at Lahore Converter Station due to AC network instability (i.e. conductor broken, tower collapsed and Foggy weather as intimated by ISMO). These frequent tripping incidents significantly affected AC voltage and frequency stability and further induced abrupt “jerks” in the HVDC system, which forced the ISMO to reduce power flows on both the HVDC and AC networks to maintain stability.

Quarterly & Cumulative DC Power Transmission by $\pm 660\text{kV}$ HVDC Transmission Line:

Table 28: HVDC Quarterly Transmission & Cumulative Transmission

Quarters FY 2024-25	Quarterly Transmission (billion kWh)	Cumulative Transmission (billion kWh)
Jul-Sep, 2024	4.059	45.576
Oct-Dec, 2024	2.102	47.678

Quarters FY 2024-25	Quarterly Transmission (billion kWh)	Cumulative Transmission (billion kWh)
Jan-Mar, 2025	2.524	50.202
Apr-Jun, 2025	3.605	53.87
Total	12.29	-

Source: PMLTC

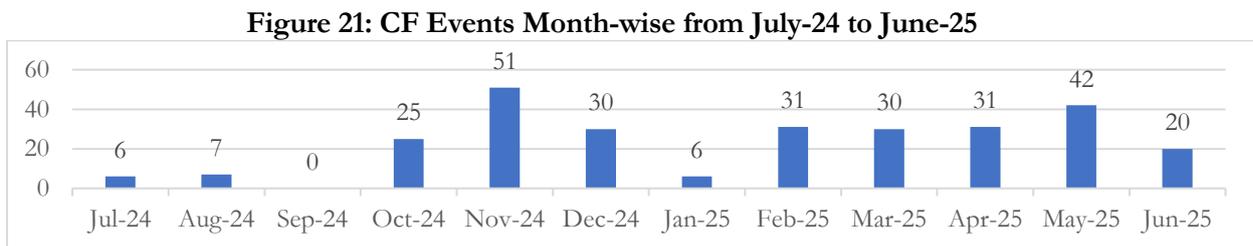
As it can be seen in the above table, the quarterly transmission statistics for FY 2024–25 show a total of 53.87 billion kWh transmitted across the network by the end of the fiscal year.

During the first quarter (Jul–Sep 2024), the system transmitted 4.059 billion kWh, bringing the cumulative total to 45.576 billion kWh. Transmission volumes declined in the second quarter (Oct–Dec 2024) to 2.102 billion kWh, reflecting reduced demand during the winter season. The cumulative transmission at this stage reached 47.678 billion kWh.

In the third quarter (Jan–Mar 2025), a slight recovery was observed with 2.524 billion kWh transmitted, pushing the cumulative figure to 50.202 billion kWh. The system experienced a significant rise in the fourth quarter (Apr–Jun 2025), with 3.605 billion kWh transmitted, raising the final cumulative total to 53.87 billion kWh for the year.

5.6.2. HVDC Commutation Failure (CF) Events:

During FY 2024-25, HVDC line experienced a total of 279 number of commutation failure events. The following graph provides month-wise number of CF Events occurred during FY 2024-25:



Source: NGC/ISMO

The highest number of commutation failures was recorded in November 2024, with 51 instances, followed by May 2025 (42) and February–April 2025 (31 each). These months reflect periods of heightened stress on the network, possibly due to increased demand fluctuations, equipment limitations, or operational constraints.

In contrast, September 2024 recorded no commutation failures, representing the most stable month of the year. Relatively low figures were also observed in July 2024 (6), January 2025 (6), and June 2025 (20), showing comparatively better stability in these periods.

SECTION V

PROVINCIAL GRID COMPANIES

**SINDH TRANSMISSION & DISPATCH
COMPANY (PVT) LIMITED
(ST&DCPL)**

6. Introduction of ST&DCPL:

Sindh Transmission & Dispatch Company (Pvt.) Limited (ST&DCPL) was established on January 7, 2015, under the Companies Ordinance, 1984, and registered with the Securities & Exchange Commission of Pakistan (SECP). The company’s core mandate is to develop, operate, and maintain electric power transmission infrastructure within the region.

ST&DCPL plays a key role in supporting Pakistan’s energy sector by transmitting 100 MW of electricity from the Sindh Nooriabad Power Company to K-Electric. Since achieving commercial operations in January 2018, the company has focused on delivering reliable and uninterrupted power. It maintains a strong operation and maintenance regime aimed at ensuring the efficiency, safety, and stability of its transmission network.

6.1 License:

In accordance with Section 19 of the NEPRA Act, 1997, the National Electric Power Regulatory Authority (NEPRA) granted a Special Purpose Transmission Line (SPTL) license to Sindh Transmission & Dispatch Company (Pvt.) Ltd (ST&DCPL) on December 17, 2015, authorizing the company to carry out power transmission for a term of thirty (30) years.

After the 2018 amendment to the NEPRA Act, NEPRA further granted ST&DCPL a Provincial Grid Company License under Section 18-A on November 5, 2019. This license, also valid for thirty (30) years, enables ST&DCPL to function as a transmission service provider within the province, reinforcing its role in the regional power transmission network.

6.2 Transmission Network:

Sindh Transmission & Dispatch Company (Pvt.) Ltd (ST&DCPL) manages a transmission network totaling 95.4 kilometers of 132 kV double-circuit lines. This network is linked to the K-Electric grid through two 132 kV transmission line circuits, ensuring dependable power exchange between the two systems.

6.3 Performance of STDC under PSTR - 2005:

The Annual Performance Report (APR) submitted by Sindh Transmission & Dispatch Company (Pvt.) Ltd (ST&DCPL) has been comprehensively assessed following the guidelines specified in PSTR 2005. The evaluation details are provided below:

6.4. System Reliability:

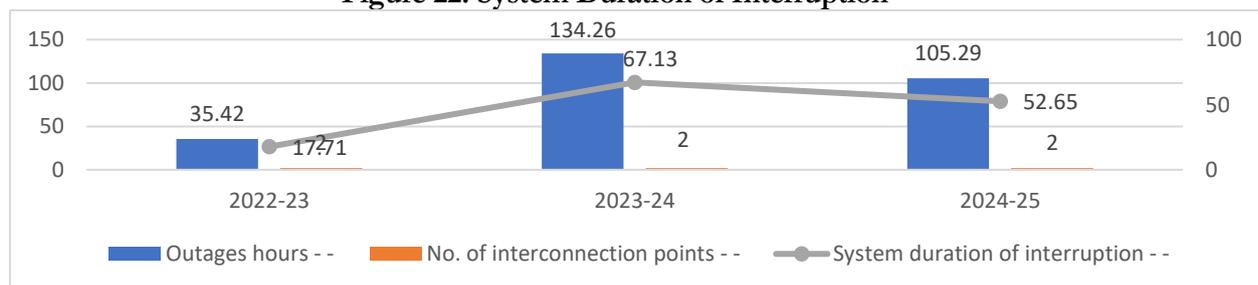
6.4.1. System Duration of Interruption:

- (a) Total outage hours recorded at all interconnection points = 105.29 hours
- (b) Total number of interconnection points: 2
- (c) Average system duration of interruption: 52.65 hours per point

Source: STDC

The interconnection points reported an average interruption duration of 52.65 hours per point which has been decreased as compare to the previous year when it was 67.13 hours per point.

Figure 22: System Duration of Interruption



Source: STDC

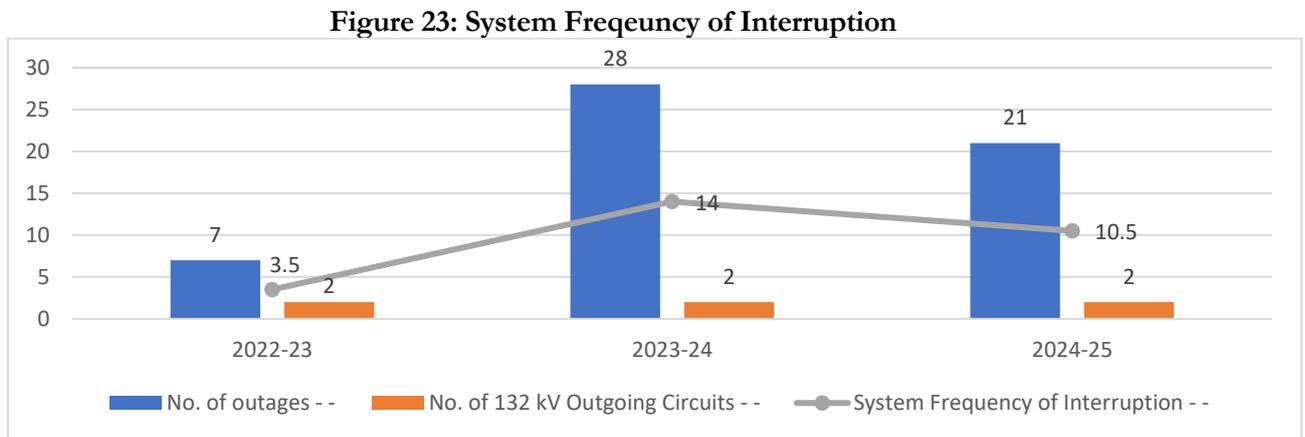
During FY 2024-25 STDC reported a total of 105.29 outage hours which shows a decrease as compared to the figure of 134.26 outage hours previous year showing an overall improvement in the system reliability of STDC. The interconnection points remain the same as it was in the previous year. Moreover, a graphical comparison of the values reported by STDC in past three years have been shown.

6.4.2 System Frequency of Interruption:

- (a) Total number of outages recorded at all 132 kV outgoing circuits (excluding 132 kV line tripping)= 21
- (b) Total number of 132 kV circuits: 2
- (c) System frequency of interruption: 10.50 outages per circuit

Source: STDC

As shown in the figure below, the total number of outages are 21 during the FY 2024-25 in comparison to the previous year when it was reported as 28 during FY 2023-24 showing a decrease in the loss of supply incidents. The number of outgoing circuits remains the same as it was in the previous year.



Source: STDC

The system frequency of interruption was reported as 10.50 outages per circuit which has been decreased in comparison to the previous year 2023-24 when it was reported as 14 outages per circuit. In the above figure, a three yearly comparison has been represented graphically based on the values reported by STDC.

6.5 Tie lines Reliability:

All three parties (STDC, SNPCL & KE) have worked simultaneously during outage / maintenance period to maximize the efficiency of the system and minimize the losses of availability based on work being carried out by parties on their assets.

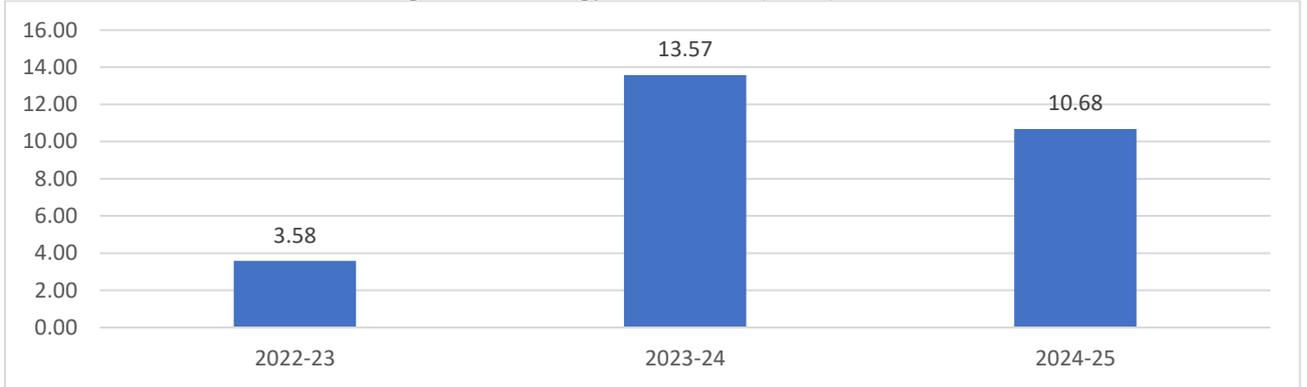
6.6. System Security:

6.6.1. Energy not served:

- (a) Total ENS = 10.68 M kWh
- (b) Number of incidents, where there has been a loss of supply = 21
- (c) Average ENS per incident = 0.51 M kWh
- (d) Average duration per incident = 5.01 hrs

Source: STDC

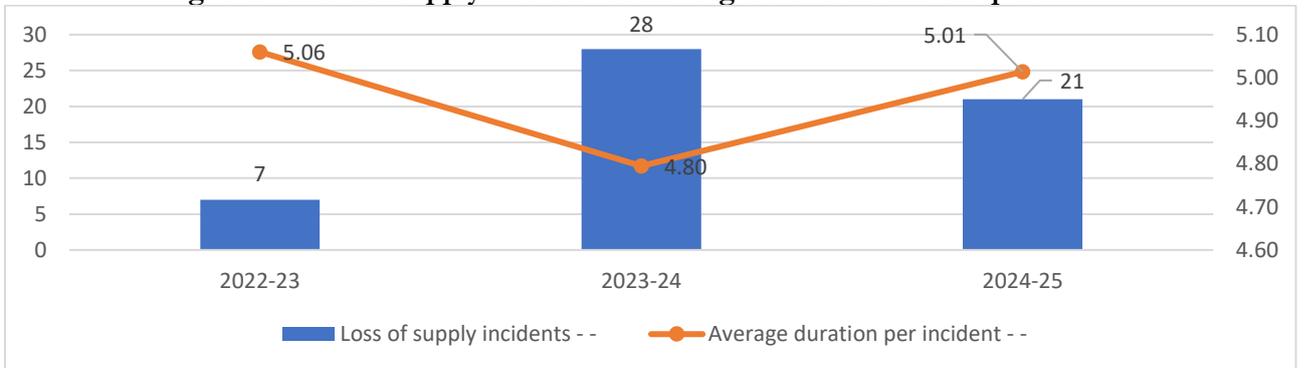
Figure 24: Energy not served (GWh)



Source: STDC

As shown in the figure above, STDC reported the total ENS for FY 2024-25 as 10.68 million kWh which has been decreased in comparison to the previous year when it was reported as 13.57 million kWh. In the graph below a three years comparison of ENS has been shown.

Figure 25: Loss of supply incidents & Average duration of interruption



Source: STDC

The Figure above shows graphical representation of the three years comparison of loss of supply incidents and average duration of interruption. The loss of supply incidents decreased to 21 in comparison to the previous year when it was reported as 28. Moreover, the average duration of interruption was reported as 5.01 in comparison to the number value of 4.80 previous year.

6.7. Quality of Supply (QoS):

The quality of supply (QoS) is assessed based on system voltage and frequency parameters. Below is the analysis of the QoS data as reported by ST&DCPL:

6.7.1 System Voltage

The table below shows the voltage violations occurred in Normal and N-1 condition in the last three years:

Table 29: Voltage violations

Sr. No.	Time Period	Total number of violations under Normal conditions	Total number of violations under N-1 conditions
1	2022-23	Nil	Nil
2	2023-24	Nil	Nil
3	2024-25	2	Nil

Source: STDC

A review of system performance over the past three fiscal years highlights a consistent improvement in maintaining voltage stability across the transmission network. For FY 2020–21 and 2021–22, no records of violations were maintained. In both 2022–23 and 2023–24, the system recorded no voltage violations under either normal or N-1 operating conditions, reflecting stable network performance.

In FY 2024–25, however, two violations were observed under normal operating conditions, while no violations occurred under N-1 conditions. This indicates that while the system generally performed reliably, minor instances of voltage excursions were experienced under normal operations.

6.7.2 System Frequency:

The table below shows the frequency violations occurred both on highest and lowest side during last three years:

Table 30: Frequency violations

Sr. No.	Time Period	Highest Frequency (Hz) violations	Lowest Frequency (Hz) violations	Total Number of frequency violations
1	2022-23	1	3	4
2	2023-24	Nil	Nil	Nil
3	2024-25	Nil	Nil	Nil

Source: STDC

The historical record of frequency violations over the past three fiscal years shows that in FY 2022–23, a total of four violations were reported, consisting of one instance of frequency exceeding the upper limit and three instances of frequency falling below the lower limit.

However, during FY 2023–24 and FY 2024–25, the system recorded no frequency violations, either on the higher or lower side.

**KHYBER PAKHTUNKHAWA
TRANSMISSION & GRID SYSTEM
COMPANY
(KHYBER PAKHTUNKHWA T&GSC)**

7. Introduction of KPT&GSC:

The Khyber Pakhtunkhwa Transmission and Grid System Company (Pvt.) Limited (Khyber Pakhtunkhwa T&GSC) was incorporated on September 9, 2020, under the Securities & Exchange Commission of Pakistan (SECP) Companies Ordinance, 1984, to develop and operate transmission infrastructure in the province of Khyber Pakhtunkhwa. Khyber Pakhtunkhwa T&GSC was granted its Provincial Grid Company (PGC) license by the National Electric Power Regulatory Authority (NEPRA) on February 26, 2021, for a term of 30 years.

7.1 Asset Transfer from PEDO to Khyber Pakhtunkhwa T&GSC:

The process for transferring selected transmission line assets from the Pakhtunkhwa Energy Development Organization (PEDO) to KPT&GSC has officially been initiated. The transfer aims to enable Khyber Pakhtunkhwa T&GSC to independently manage and operate key transmission corridors for sustainable revenue generation. It will also improve grid reliability, maintenance response time, and coordination with generation and distribution companies, reducing dependency on external operators. The process is being carried out in compliance with NEPRA guidelines and in coordination with PEDO, NGC, PESCO, and the Energy and Power Department, Khyber Pakhtunkhwa. Khyber Pakhtunkhwa T&GSC is currently working on asset valuation, legal documentation, and technical inspections in collaboration with PEDO and third-party consultants. This strategic handover is expected to be completed by the end of March 2026.

As part of this transfer, the following transmission lines and associated infrastructure will be moved under the ownership and operational control of Khyber Pakhtunkhwa T&GSC:

S.NO	Power Plant	Capacity (MW)	Transmission Line (KV)	Line Length (KM)	O&M
1.	Matiltan	88	132/220	40	KPT&GSC
2.	Ranolia	17	132	1.5	NGC
3.	Jabori	10.2	132	14	PESCO
4.	Karora	11.8	132	11	NGC
5.	Koto	40.8	132	1.2	KPT&GSC
6.	Darar Khwar	36.6	132	10	PESCO
7.	Pehur	18	132	0.8	PESCO
8.	Malakand-III HPP	81	132	2.1	PEDO

Source: KPT & GSC

7.2 Ongoing Feasibility Studies:

The following feasibility studies are under process in association and support of Khyber Pakhtunkhwa Department of Planning and Development and are planned to be executed in the next six months:

- 220KV Transmission line from Madyan-Chakdara Transmission Line (Lot-02): For power evacuation of PEDO 11HPPs.
- 132 KV OHTL ring to loop evacuated Power: From PEDO running HPPs and in close proximity to Khyber Pakhtunkhwa Economic Zones & Special Economic Zones.
- Direct Power Dispersal from 18MW PEHUR HPC: To Gadoon Amazai Industrial Units.
- Feasibility Study and Dispersal of Power (Approx-3000MW): With proposed 500KV OHTL from Chitral to Chakdara with terminal Grid Station of 500/220/132 at Chakdara.
- Preparation of a Business Plan for Khyber Pakhtunkhwa Transmission and Grid System Company: The business plan will envisage integration of existing and upcoming public and private HPPs with various current and future provisional load centres and export of surplus power to the NGC.
- The budget for the bankable feasibility study of 220 KV (Lot-II) from Madyan to Chakdara has been approved by Khyber Pakhtunkhwa Department of Planning & Development (P&D).

7.3 Upcoming Projects:

- **SWAT Corridor HPPs** - Proposed O/H transmission network construction activities on the 220kV OHTL (Lot-01) are under progress. The project is scheduled to be completed by May 2026.
- **Establishment of 132kV looping network of PEDO running HPPs:** This project aims to connect various PEDO HPPs (Matiltan 84MW, Dara Khwar 36.6MW, Lavi HPP 69MW, Koto 40MW, HPP Karora 11.8MW, HPP Ranolia 17MW, HPP Jabori 10.2MW, Malakand 80MW, Pehur 18MW) to key industrial zones and special economic zones like Chakdara GS, Gadoon Industrial Zone, Peshawar EZ, Rashakai SEZ, and Hattar SEZ.
- **Feasibility Studies Completion:** Feasibility studies for 220 KV (Lot-II) from Madyan to Chakdara is expected to be completed within the next six months.
- **Asset Transfer Completion:** Full operational handover of assets from PEDO is expected by March 30, 2026.
- **Capital Disbursement:** Timely disbursement of the enhanced paid-up capital from the Finance Department Khyber Pakhtunkhwa is crucial for commencement of procurement, recruitment, and preparatory activities for infrastructure deployment.
- **Consultant Engagement:** Floating of RFP and engagement of domestic and international consultants for various feasibility studies is anticipated within six months.
- **Projected Study Outcomes:** The feasibility studies aim to develop a smooth, reliable, and economical power evacuation plan for the construction/upgradation of transmission lines and allied infrastructure to supply power to operational economic zones. This includes identifying feasible options, preparing basic design data, preparing bankable documents, encouraging private investment, and developing a mechanism for tariff approval.

7.4 Financial Performance:

In accordance with the decision of the Provincial Cabinet under Agenda Item No. 28, the paid-up capital for the Khyber Pakhtunkhwa T&GSC has been revised and enhanced from PKR 100 million to PKR 500 million. This increase reflects the strategic importance of the company in implementing and managing the province's growing transmission infrastructure portfolio. To facilitate the necessary regulatory procedures, the matter has been formally taken up with the Securities and Exchange Commission of Pakistan (SECP) through the designated corporate consultant, Khilji Rahat Waheed Chartered Accountants (KRW). A formal request was submitted to the relevant department, requesting onward submission to SECP for compliance and incorporation.

PUNJAB GRID COMPANY LIMITED (PGCL)

8. Introduction of PGCL:

Punjab Grid Company Limited (PGCL), a wholly owned subsidiary of the Government of the Punjab (GoPb), was incorporated with the Securities and Exchange Commission of Pakistan (SECP) on January 3, 2023. NEPRA awarded PGCL a Transmission License on November 8, 2023, authorizing the company to transmit electric energy within its designated territorial limits for a period of thirty (30) years.

8.1 Ongoing Initiatives:

- Engagement with public and private stakeholders to commence operations.
- Coordination meetings with KPT&GSC and STDC management.
- Appointment of PGCL’s first external auditor.
- Recruitment of a legal advisor.
- Preparation of a Transmission Line Investment Policy.

8.2 Proposed Projects by PGCL:

Table 31: Proposed projects

Sr. No.	Project Name	Status
Project 01	Construction of 132 kV OHTL Lahore Region - 132 kV line 33-KM Multan Road to Sundar Industrial (Estimated Cost: PKR 1.3 Billion)	(Approval of Standard Security Documents for Watse to Energy Power Projects in Punjab including Tripartite Transmission Service Agreement by Punjab cabinet is under process)
Project 02	Construction of 132 kV OHTL South Punjab Region - 132 kV line having length of 80 kMs from Taunsa HPP to Multan Industrial Estate (Estimated Cost: PKR 6.23 Billion).	(GoPb is planning to develop Taunsa Hydropower project in Captive Mode)
Project 03	Construction of 132 kV line from 250 MW Chishtian Solar Power Plant to Nearest 132 kV Grid Station having length of 20 kMs (Estimated Cost: PKR 1.5 Billion)	Planned

Source: PGCL

PART B:
CRITICAL ISSUES /
CHALLENGES OF
TRANSMISSION SECTOR

1. Transmission System Constraints:

To address growing challenges in the power transmission system, NEPRA has introduced a series of proactive regulatory measures including effective monitoring and enforcement mechanism aimed at ensuring that the Transmission Licensees prudently manage and accelerate the implementation of critical infrastructure projects. These initiatives are designed to alleviate network congestion, improve grid reliability, and support the integration of economical generation sources.

By enhancing regulatory oversight, NEPRA is strengthening its role in project governance and ensuring adherence to approved timelines and technical standards. The Authority has also introduced more rigorous reporting protocols, requiring transmission licensees to provide regular updates on project milestones, risks, and mitigation strategies. Additionally, NEPRA is enforcing greater accountability by closely tracking performance indicators and intervening where progress is unsatisfactory.

These steps are part of a broader effort to modernize Pakistan's transmission infrastructure, reduce bottlenecks, and enhance system resilience. Through these reforms, NEPRA aims to foster a more transparent, responsive, and efficient transmission network, while specifically targeting the following key constraints:

i. South-to-North Power Transfer Constraints:

The South-to-North transmission constraints represent a significant bottleneck within NGC network, restricting the efficient flow of cost-effective electricity generated in the southern regions—primarily from coal, nuclear, and gas sources—to high-demand load centers in Punjab and Khyber Pakhtunkhwa. As a result, the system is forced to depend on costly RFO/RLNG-based power plants in the north, leading to increased generation costs and higher electricity tariffs.

To address these constraints and enable smooth power evacuation from South to North, the development of 500 kV Lahore North Grid Station and its associated transmission lines was initiated, with an original completion date of September 2021. However, under NGC's current investment plan, the revised completion timeline has been extended to August 2025. As of June 2025, the project has achieved a physical progress around 96%.

Following are the key challenges and bottlenecks due to delay in completion of the Lahore North grid station resulted in the following:

a. Limited Capacity of Existing NGC's HVAC Transmission Lines:

The existing overloaded 500 kV Jamshoro and 500 kV Matiari Grid Stations, along with their associated transmission lines, constrained power flow to only 1,800 MW under normal operating conditions—significantly below the available system capacity of 4,500 MW (1,800 MW AC + 2,700 MW DC). This bottleneck led to frequent load-shedding, voltage stability issues, and the curtailment of up to 1,750 MW of cheaper/economical available power.

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

The full operational capacity of 4,000 MW for the 878 km HVDC transmission line—commissioned in September 2021—remains unachieved due to several factors, most notably the delay in completing the 500 kV Lahore North substation and its associated 500 kV and 220 kV transmission lines. This underutilization of the HVDC infrastructure has resulted in a significant financial burden on end-consumers since its commissioning.

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

The limited current carrying capacity of the 500 kV Dadu–Shikarpur, 500 kV Shikarpur–Guddu, and 500 kV Moro–Rahim Yar Khan transmission lines compel NGC to curtail cost-effective southern generation from the Port Qasim and Hub China power plants, even under normal (N-0) operating

conditions. This constraint hampers the full utilization of least-cost generation potential, adversely affecting overall system efficiency and economics.

2. Delays in Construction of 500 kV Lahore North Grid Station:

The 500 kV Lahore North Grid Station is a critical project under NGC's broader strategy to reinforce the transmission network in Punjab, particularly for LESCO and GEPCO regions. The project, financed by the Asian Development Bank (ADB), aims to address supply constraints and improve voltage profiles in the area. Despite its importance, the project has experienced significant delays, primarily due to land acquisition disputes and pending court cases.

NEPRA, cognizant of such repeated delays, raised concerns in execution and completion of the 500kV Lahore North Grid Station & its associated transmission lines under contract No. ABD-300 AR 2021. As per the available record, the said grid station was required to get operative before or along-with the commissioning (September 2021) of 660kV HVDC transmission line (PMLTC).

Thereon, as per the tariff determination of the Authority for FY 2019-20, FY 2020-21 and FY 2021-2022 dated November 04, 2021, NGC was obligated to complete the construction of 500kV Lahore North Grid Station by FY 2022-2023, however, NGC failed to commission the said grid station within the stipulated time period. Later-on, as per the decision of the Authority in the matter of revised Transmission Investment Plan and losses assessment of NGC for tariff control period from FY 2022-23 to FY 2024-25 dated September 26, 2024, NGC was obligated to complete the construction of 500kV Lahore North Grid Station in August 2024, 500kV transmission lines in February 2024 & 220kV transmission lines in March 2024. Later on, NGC submitted that now the subject grid station is expected to be commissioned by April 2025.

It is matter of fact that the delay in timely completion of the said grid station has rendered System Operator/CPPA unable to evacuate cheap and economic power supply from the south, resulting in reliance on expensive generation sources, increasing the cost of electricity for consumers and burdening the national economy. Moreover, such delay in completing this critical project has rendered the HVDC transmission line (PMLTC) unable to operate at its maximum capacity of 4000 MW, further exacerbating the issue of unutilized infrastructure and lost opportunity for efficient power transfer. Moreover, the continued delays in such critical infrastructure projects undermine the goals of ensuring reliable and cost-effective electricity for consumers and optimizing the utilization of national resources.

During the reporting period, the Authority has issued an explanation to NGC on such delays under Regulation 4 of NEPRA Fine Regulations, 2021 which are under process.

3. Delays in Construction of 500 kV K2/K3 – Port Qasim Transmission Line:

According to the PC-I scope and timeline approved by the Executive Committee of the National Economic Council (ECNEC) in April 2017, the 500 kV dedicated K2/K3–Port Qasim transmission line project was conceived as a critical infrastructure scheme for evacuating electricity from the K2 and K3 nuclear power plants. The project design provided for evacuation of power through an in-out configuration at the 500 kV KKI Grid Station, thereby ensuring stable integration of the nuclear power plants into the National Grid and enhancing reliability of supply for the southern region of the country.

As per the approved implementation plan, the transmission line was originally scheduled for completion in April 2022, aligned with the commissioning timelines of the K2/K3 nuclear power units. However, despite the strategic importance of the project, its execution faced repeated delays due to various technical, administrative, and coordination bottlenecks. Consequently, the transmission line could not be completed within the approved timeframe and the evacuation of power from the nuclear units had to be managed through interim arrangements for nearly three years. These makeshift measures, while temporarily mitigating supply risks, were not in line with the long-term system planning objectives and exposed the power sector to operational vulnerabilities.

NEPRA took notice of these protracted delays, particularly in light of the critical role of nuclear generation in ensuring affordable, reliable, and sustainable electricity supply. Viewing the matter as a breach of implementation commitments, NEPRA initiated proceedings under the applicable regulatory framework and pursued the legal course available to it. The Authority’s intervention underscored its resolve to enforce timely project completion, hold responsible entities accountable, and safeguard the interests of electricity consumers.

As a result of NEPRA’s continued monitoring and regulatory pressure, NGC expedited pending works and achieved a key milestone by successfully energizing the 500 kV dedicated K2/K3–Port Qasim transmission line in July 2025. The energization of this long-awaited transmission corridor not only ensures secure and reliable evacuation of nuclear power into the grid but also strengthens the transmission network in the southern region. This development marks the closure of a prolonged delay, while also serving as a reminder of the importance of strict project governance, regulatory oversight, and adherence to approved timelines in the execution of critical national infrastructure projects.

4. Delays in completion of SCADA-III Project:

4.1 Project Overview:

The original SCADA system, operational since 1992, became outdated due to the absence of essential hardware and software upgrades, significantly impairing its functionality. To modernize the system and expand its scope nationwide for real-time data acquisition, enhanced grid visibility, and improved operational control, the SCADA-III project—sponsored by the Asian Development Bank (ADB)—was initiated. The project aims to enable efficient monitoring of power plants and Common Delivery Points (CDPs). The Supervisory Control and Data Acquisition (SCADA-III) project has been undertaken by NGC to modernize the Independent System and Market Operator (ISMO) and its regional operations in line with emerging grid requirements, renewable integration, and global best practices. The project aims to replace obsolete systems with advanced SCADA/EMS platforms, establish a robust telecom backbone, and enhance grid visibility, reliability, and cybersecurity. It also provides redundancy through the establishment of a Backup Control Centre (BCC) at Jamshoro, ensuring continuity of national grid operations in contingency situations.

Approved in 2018, SCADA-III was initially scheduled for completion by June 2022. However, the project remains incomplete, facing a delay of nearly three years. According to NGC, the revised completion date is now set for October 2025.

4.2 Current Project Progress:

After NEPRA’s intervention, the SCADA-III project is progressing steadily with notable achievements across key components. In OPGW installations, as per the revised scope, 3,503 km out of 3,583 km have been completed, with the remaining expected to be finalized within the current month. In telecom equipment, 92 out of 131 SDH nodes, 39 out of 66 DPLCs, and 23 out of 25 PABX telecom panels have been installed at various stations. For microwave huts, civil works have been completed at 52 out of 57 sites, while two out of four shipment lots of microwave equipment have already reached the warehouse. SMS integration works have been completed at 131 out of 188 stations, ensuring improved reporting at ISMO and BCC Jamshoro. At ISMO and BCC, control room renovation, along with VPS and UPS installation, has been successfully completed, while SCADA server installation at both sites has also been finalized. In RTU works, point-to-point testing has been completed at 86 out of 173 stations, and missing signal rectification has been carried out at 20 out of 46 stations.

4.3 Project Milestones:

Table 32: Project Milestones

SCADA-Go-Live	At ISMO on 26-Feb-2025
	At BCC on 10-Apr-2025

OPGW Live Line Installations	Completion during Apr-2025.
Microwave Installation Works	By Oct-2025 (Subject to funds)
SCADA EMS-GMS	By Oct-2025

Source: NGC/ISMO

4.4 Implications of Delays:

- a. **Operational Impact:** The limited real-time monitoring capabilities significantly hinders NGC ability to efficiently manage power flows and optimize grid operations. This affects overall system reliability and the ability to respond swiftly to network disturbances.
- b. **Financial Burden:** Project delays have increased reliance on manual interventions and outdated systems, leading to higher operational and maintenance costs.
- c. **Strategic Importance:** The timely completion of the SCADA-III project is critical to enhancing power dispatch efficiency, reducing network vulnerabilities, and strengthening the overall resilience of the national transmission system

5. Inadequate NGC & KE Interconnection:

To strengthen the transmission and distribution network in Karachi’s eastern corridor, K-Electric successfully completed the 220 kV/132 kV/11 kV Dhabeji-2 Grid Station during FY 2024-25. This strategic development enhances the utility’s capacity to meet growing industrial and residential demand in the Dhabeji and adjoining areas. Complementing this effort, the Dhabeji-2–NGC Interconnection Project, including both overhead and underground transmission segments, was fully energized and brought on load on March 6, 2025. The project marks a critical milestone in improving system reliability, enabling inter-regional power exchange, and bolstering grid stability for the southern zone.

The development of the 500/220 kV KKI Grid Station mark a significant step in strengthening the interconnection between KE and NGC network. As of the end of the first quarter of FY 2025, the grid station was in the final stages of completion and was subsequently commissioned under an interim arrangement, with an approved import limit of 1,600 MW. This provisional setup allowed KE to draw power via 500 kV KKI–K2/K3 and 500 kV KKI–Jamshoro transmission lines until the originally planned 500 kV double circuit transmission line—linking KKI to the NGC grid through K2/K3 and Port Qasim Electric Power Company Limited (PQEPCL)—is completed. According to NGC, this critical transmission infrastructure has been commissioned in July 2025.

In parallel, load flow studies to assess KE’s maximum off-take capability from the national grid for the spot year 2025 have been completed, while evaluations for 2026 and 2028 scenarios are currently underway and are anticipated to conclude by July/August 2025. The commissioning of the full configuration will enable more reliable and flexible power exchanges between KE and the national grid, contributing to overall system efficiency and energy security.

6. Progress of System Constraints Removal Projects:

In order to overcome the challenges affecting the efficient evacuation of power from various generation plants, NEPRA has introduced proactive measures to ensure timely and effective action by the NGC. These measures include the institution of regular monthly and quarterly review meetings, complemented by continuous correspondence, to closely monitor the progress of projects aimed at addressing transmission constraints.

Through this consistent oversight and follow-up, a number of issues have already been resolved. However, some critical constraints remain unaddressed and continue to hinder system reliability. The details of these outstanding challenges relating to the 500 kV and 220 kV transmission lines and transformers are outlined below:

6.1. Overloading constraints of 500/220 kV Transformers:

- i. **500 kV Rawat Grid Station:** Overloaded auto transformers since 2023 resulting in use of expensive power generation from Attock Gen limited.
Plan: Islamabad West G/S (13%), Expected to be completed by January 2027.
- ii. **500kV Lahore Sheikhpura Grid Station:** Overloading of 4x600 MVA transformers since 2018 reliance on generation from Halmore & Sapphire plants.
Plan: (i) Augmentation of 5th 450 MVA, 500/220 kV Autotransformer with 600 MVA Autotransformer at 500 kV Sheikhpura Grid Station, Expected to be completed by June, 2026, the material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.
(ii) 500/220/132 kV Lahore North Grid Station T/L: Completed, G/S: Priority Portion: Energized on 15.04.2025. Complete G/S: 30.08.2025 / 96.47%
- iii. **500 kV Gatti Grid station:** 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) In/Out of 220 kV Trimmu RLNG – Faisalabad West T/L at Sammudri Road, Completed (21.10.2024), Line is complete. Extension at Samundari is pending and expected to complete by 30.06.2027
(ii) 220 kV D/C T/L from Faisalabad West to Lalian, T/L: 31.12.2025 / 91.79%, Extension Works Faisalabad West: July, 2026, Extension Works Lalian: 31.12.2025
- iv. **500 kV Multan Grid station:** Overloading of 500/220 kV (2x450 MVA) T/Fs, (T-1,T-2) Auto T/Fs since August 2022 & June 2021
Plan: (i) Replacement of existing 3rd 450 MVA, 500/220 kV Autotransformer with new one at 500 kV Multan Grid Station, Expected to be completed by June, 2026, Material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.
(ii) Addition of 3rd 600 MVA, 500/220 kV Autotransformer at 500 kV Muzaffargarh Grid Station, Expected to be completed by June 2027.
(iii) Upgradation of Vehari Grid Station from 220 kV to 500 kV level, Expected to be completed by December 2027, Material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.
- v. **500 kV Muzaffargarh Grid station:** Overloading of 500/220 kV (2x600 MVA) Auto T/Fs since August 2022 & June 2021
Plan: (i) Addition of 3rd 600 MVA, 500/220 kV Autotransformer at 500 kV Muzaffargarh Grid Station, Expected to be completed by June 2027, The subject project is included in draft TSEP. PC-I not prepared yet due to non finalization/approval of TSEP and non-availability of financing
(ii) Upgradation of Vehari Grid Station from 220 kV to 500 kV level, Expected to be completed by December 2027, Material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.
- vi. **500 kV Yousafwala Grid Station:** Overloading of 500/220 kV (3x600 MVA) Auto T/Fs since 2023 and 500 kV Yousafwala – Sahiwal Coal CFPP circuit since 2023
Plan: (i) Upgradation of Vehari Grid Station from 220 kV to 500 kV level, Expected to be completed by Dec 2027, Material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.
(ii) New 500 kV Sahiwal – Sahiwal CFPP S/C T/L, Expected to be completed by 2026-27, The subject project is included in draft TSEP. PC-I not prepared yet due to non finalization/approval of TSEP and non-availability of financing.

- vii. **500 kV Jamshoro Grid Station:** Overloading of 220/132kV T/Fs T-3,T-7 (2x160MVA+500/220kV (3x450MVA) Auto T/Fs, Power flow from LV to HV due to High WIND, Power flow from HV to LV due to Low WIND since June 2017

Plan: (i) Addition of 3rd 160 MVA T/F, Expected to be completed by 30.09.2025, Progress: 67.35%

(ii) 500 kV KKI Substation, Completed

(iii) 220 kV Dhabeji SEZ Substation alongwith T/L, G/S: Expected to be completed by 31.08.2025/ Progress: 66.6%, T/L: Expected to be completed by 31.08.2025 / Progress: 79.23%

(iv) 220 kV Mirpur Khas Substation Alongwith T/L, T/L: Expected to be completed by 05.04.2026/ Progress: 34.25%, G/S: Expected to be completed by 29.08.2025/ Progress: 89.74%.

6.2. Overloading constraints of 220/132 kV Transformers:

- i. **220 kV Sarfraz Nagar:** Overloading of 220/132 kV T/Fs T-1,2,3,4 (4x160 MVA) since June 2018.

Plan: (i) 1x160 MVA, 220/132 kV Autotransformer has already been augmented with 1x250 MVA in June 2024

(ii) 96 MVAR Switched Shunt Capacitors at 132 kV Sarfraz Nagar and Raiwind Grid Stations, Expected to be complete by June 2027, The subject project is included in draft TSEP. PC-I not prepared yet due to non finalization/approval of TSEP and non-availability of financing.

6.3. Power Evacuation Issues at 500 kV Transmission Lines:

- i. **Constraint:** 500kV Jamshoro Grid Station: Overloading in Jamshoro-China Hub-HUBCO-K2K3 loop prevents full load Despatch.

Plan: (i) Lahore North G/S, T/L: Completed, G/S: Priority Portion: Energized on 15.04.2025. Complete G/S: 30.08.2025 / Progress: 96.47%,

(ii) Dhabeji SEZ G/S: Expected to be completed by 31.08.2025 / Progress: 66.6%, T/L: Expected to be completed by 31.08.2025 / Progress: 79.23%

(iii) Mirpur Khas T/L: Expected to be completed by 05.04.2026/ Progress: 34.25%, G/S: Expected to be completed by 29.08.2025/ Progress: 89.74%.

- 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 Sheikh Muhammadi-Tarbela Line: Overloading reduces operational flexibility and load management by NPCC.

Plan: Second supply source (June 2026). Progress: PC-I preparation underway.

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

6.4. Overloaded 220 kV Transmission Lines:

- i. **Overloading of 220 kV Gakkhar – Sialkot & Nokhar - Gakkhar Circuits:** Overloading of Circuit since June 2014
Plan: (i) 02 No. 132 kV T/Ls from 220 kV Gujrat Grid has been energized on 04-06-2025 at 20:40hrs but no significant impact has been observed. Therefore, the constraint still persists in network
(ii) 500/220/132 kV Sialkot Grid Station, expected to be completed by December, 2027. The material tenders (including Transformer) are under award process. The Civil works tender is yet to be awarded.

7. Delayed Power Evacuation Projects within NGC Networks:

Overloading at both the 500 kV and 220 kV voltage levels continues to pose serious challenges to efficient power dispatch. To address these concerns, NGC has proposed a series of mitigation measures, including the development of new grid stations and the upgrading of existing transmission infrastructure. However, several key power evacuation projects are facing delays, which are worsening system congestion and limiting the integration of new generation capacity. For instance, one major project, intended to evacuate power from a large generation source, has been delayed due to persistent right-of-way issues and contractor-related setbacks. Another project, critical for decongesting the 220 kV corridor in a high-demand area, has encountered delays due to environmental permitting and funding constraints. Additionally, a project aimed at strengthening interconnection between grid segments is behind schedule due to land acquisition challenges and slow progress in construction. These delays, which have significant implications for grid stability and reliability, are discussed in greater detail in the following sections of this report.

a. Delayed Project North

Table 33: Delayed Projects North

S. No.	Project	Reason of Delay (if any)
1	Augmentation at 220 kV Samundri Road and Ghakkhar G/S	<ul style="list-style-type: none"> • Delay in LC establishment due to cash foreign exchange constraints amid prevailing economic conditions. • Resultant delay in procurement and delivery of material. • Non-availability of shutdown during summer season owing to heavy load on NGC network.
2	Augmentation at 220 kV WAPDA Town and 500 kV Sheikhpura G/S	Change of Manufacturer for 250 MVA, 220/ 132 kV ATR from M/s. TBEA Hengyang Transformer to M/s. XIAN XD Transformer Co. China Pvt. Ltd is main issue of delay.
3	Augmentation Works at 220 kV Ludewala G/S and Extension Works at	<ul style="list-style-type: none"> • Delay in LC establishment due to cash foreign exchange constraints amid prevailing economic conditions. • Resultant delay in procurement and delivery of material.

S. No.	Project	Reason of Delay (if any)
	New Kot Lakhpat G/S	
4	765/220kV Mansehra Grid Station (LOT-3)	<ul style="list-style-type: none"> • Extra time involved in the design & engineering approval of equipment and its impact on subsequent activities for procurement, manufacturing, FATs of equipment etc. • Site social issues and security concerns for movement/deployment of Chinese nationals e.g, Construction Manager at site
5	500 kV T/L for Nowshera (HVAC) G/S	<ul style="list-style-type: none"> • LC opening issues • ROW issues
6	500 kV Maira Switching Station	<ul style="list-style-type: none"> • Change in foundation design • delay in approval of connector/hardware by contractor
7	500 kV Tarbela-Islamabad West Transmission Line for Evacuation of Power from Tarbela 5th Extension	<ul style="list-style-type: none"> • ROW issues followed by court cases on several number of tower locations. • Persistent Right of Way issues as transmission line is passing through Housing Societies near Islamabad.
8	Extension Works at 220kV University	<ul style="list-style-type: none"> • LC opening issues • Non-availability of shut down
9.	500kV HVDC Converter Station Nowshera & Electrode Station Charsadda	<p>The delay in the project is attributable to land acquisition of Converter station in Nowshera mainly:</p> <ul style="list-style-type: none"> • Due to hindrances created by local inhabitants and political influence to delay the land acquisition by threatening the survey team at site. • Persistent transfer of Land Acquisition Collector (LAC). • Moreover, COVID-19 also caused a major set-back in disbursement of payments to the landowners due to restrictions on gathering of people imposed by the Govt. of Pakistan during the lockdown period. There was a ban on holding any kind of public meetings/gatherings. • As per contract the safe and secure site was to be handed over to EPC Contractor in Feb 2019 however due to above mentioned reasons the site was handed over to contractor on 3rd April 2021 causing delay of 766 days.
10.	500kV HVDC Transmission Line & Electrode Line	<ul style="list-style-type: none"> • Delay in confirmation of Earth Electrode Site. • Delay in establishing of LCs of Towers, Conductor, Insulator etc. • Delay in Type testing due to testing COVID – 19 Pandemic • Possession of Site. • Delay in Shipment of Insulators due to Port congestion • Force Majeure declared by Employer on 66kV Electrode Line. • Right of way issues in Tribal area due to demands related to PCSP programs • Blasting/explosive NOC required in Jamrud and Landikotal area from LEAs for excavation. • Stringing withheld by Ministry for a long duration due to stoppage of work in Afghanistan.

S. No.	Project	Reason of Delay (if any)
		<ul style="list-style-type: none"> • Delay in finalization of Electrode line Variation order due to conversion of 57 Nos of Conventional foundation to Pile due to Electrode Station Site. • Shifting of Netracon Crews from project site to other NGCs important T/Line projects on the direction of management of NGC
11.	500kV HVAC Grid Station Nowshera	<ul style="list-style-type: none"> • Late Hiring of Sub-Contractor by Main Contractor. • Late approval of change of Manufacturers • Delay in Finalization of System Designers for Protection and Control and SCADA and Telecom System. • Late Approval of NGC Inspectors from Competent Authority. • Restriction in movement of Chinese Engineers from China to Pakistan and within Pakistan. • 6. Change in International Shipping routes due to Geo-Political Situation in Gulf.

Source: NGC

b. Delayed Project South

Table 34: Delayed Projects South

S. No.	Project	Reason of Delay (if any)
1	500 kV K2/K3-Port Qasim T/L (102km)	<ul style="list-style-type: none"> • The Severe ROW problems in Balochistan (District Hub) area and in Gaddap (District MalirKarachi) by the landowners • ROW issues in Bahria Town Karachi (BTK-I) under the jurisdiction of District Jamshoro. • Litigation Matters • Material Shortage Issues • Delay in approval of shutdown.
2	Extension and Augmentation Works at 220 kV Rohri, Daharki & Bahawalpur G/S	<ul style="list-style-type: none"> • Delay In Establishment of LC • Delay related to Design Consultant • Delay due to non-availability of Existing System/Drawing by the Employer • Delay in approval of Design ATR
3	Augmentation Works at 220 kV TMK G/S, 220 kV HR G/S & Ext. Works at 500 kV Jamshoro G/S	<ul style="list-style-type: none"> • Change of Scope due to unforeseen site conditions • Non-availability of shutdown • Change of Manufacturer of ATRs
4	Extension Works at 220 kV Sibbi G/S & 220 kV Loralai G/S	<ul style="list-style-type: none"> • Delay in establishment of LC to complete procurement / supply of material. • Security situation in the Baluchistan province.
5	Augmentation at 220 kV Quetta Industrial G/S	<ul style="list-style-type: none"> • Delay in establishment of LC to complete procurement / supply of material. • Security situation in the Baluchistan province.

Source: NGC

8. Delayed Power Evacuation Projects within KE Networks:

Several key power evacuation projects of KE have been delayed, posing risks to the timely strengthening of Karachi’s transmission system. The affected projects include the 220 kV GIS Landhi Grid and Transmission Line, the 132 kV GIS Site 2 Grid and Transmission Line, the 132 kV GIS K-Central 1 Grid and Transmission Line, and the HVUB Grid and Transmission Line.

For the first three projects, KE has reported that work could not commence due to pending issuance of No Objection Certificates (NOCs) from the Sindh Government related to land acquisition and development. The absence of these administrative approvals has stalled progress on projects that are critical for meeting Karachi’s growing demand and strengthening evacuation pathways.

In the case of the HVUB Grid and Transmission Line, KE has sought facilitation from NEPRA, requesting the Authority’s intervention to help resolve procedural hurdles and enable timely execution.

These delays have significant implications: they hinder the evacuation of additional generation capacity, constrain the reliability of KE’s transmission network, and increase operational risks such as congestion and voltage instability during peak demand. Unless resolved, they may lead to continued reliance on the existing overstretched infrastructure, negatively impacting the quality and reliability of power supply to consumers in Karachi.

Proactive resolution of land acquisition issues, stronger inter-agency coordination, and timely regulatory facilitation will be essential to move these projects forward and ensure the sustainable development of KE’s transmission network.

Table 35: Delayed power evacuation projects KE

Sr. No.	Projects	Reasons of delay (if any)
Growth		
1	220 kV GIS Landhi Grid and TL	Projects could not be started as KE awaits investment plan review decision.
2	132 kV GIS Site 2 Grid and TL	Projects could not be started as KE awaits investment plan review decision.
3	132 kV GIS K-Central 1 Grid and TL	Projects could not be started as KE awaits investment plan review decision.
4	HVUB Grid and TL	KE has requested the Honorable NEPRA Authority through its e-mail dated 30 August 2024 to accord approval on latest bids for HVUB for Grid and TL so that KE can proceed with award of Contract. The approval from the Honorable NEPRA Authority is awaited.
5	132 kV GIS LILO STDC	Projects could not be started as KE awaits investment plan review decision.
6	ATR Addition at Surjani	Projects could not be started as KE awaits investment plan review decision.
7	PTR Addition at Jail	Projects could not be started as KE awaits investment plan review decision.
8	PTR Addition at KESC Hospital	Projects could not be started as KE awaits investment plan review decision.
NGC interconnection		
9	1x600 MVA ATR at NKI with TL	Projects could not be started as KE awaits investment plan review decision.

Sr. No.	Projects	Reasons of delay (if any)
10	500kV KKI Grid	The project was completed and energized in November 2024 and KE interconnection capacity was increased to 1,600 MW.
11	220kV KKI Transmission Line	The project was substantially completed and energized in November 2024 i.e. 2 circuits which were part of the plan were completed, and KE interconnection capacity was increased to 1,600 MW. The remaining 2 circuits have also been energized in January 2025.
12	500 KV KKI - NGC Interconnection	The project was successfully completed and energized in October 2024.
13	220KV Dhabeji - NGC Interconnection	For OH: The project was substantially completed while the remaining works are only pending due to a delay in arrangement of ROW from Railway.
14		For UG: The project has been substantially completed as Circuit -2 was taken on load on March 06, 2025, while Circuit -1 has been successfully tested.
IPP Interconnection		
15	350 MW Renewable Interconnection, OH 20 km	Projects could not be started as KE awaits investment plan review decision
16	220 kV Step up grid at Gharo, 3x250 MVA	Projects could not be started as KE awaits investment plan review decision

Source: KE

9. Interim Arrangements in NGC's Transmission Network:

The 500 kV dedicated K2/K3–Port Qasim transmission line project, approved by the Executive Committee of the National Economic Council (ECNEC) in April 2017 under the PC-I scope, was conceived as a critical infrastructure initiative for evacuating electricity from the K2 and K3 nuclear power plants via an in-out configuration at the 500 kV KKI Grid Station, with an original completion target of April 2022. Owing to persistent execution delays, however, the project could not be commissioned on schedule, compelling the system operator to resort to interim arrangements through several 500 kV and 220 kV circuits, including the 500 kV Nokhar–Lahore North, 220 kV Lahore (Sheikhupura)–Ravi, 220 kV Kala Shah Kaku–Ravi, 220 kV Kala Shah Kaku–Ghazi, and the evacuation line from the Suki Kinari Hydropower Station. These makeshift measures, though essential for maintaining grid stability and meeting immediate evacuation needs, were neither technically sustainable nor consistent with the long-term transmission development plan. Progress reports for FY 2024–25 indicate that construction of the 500 kV Lahore North Grid Station reached 96.5% completion, while tangible progress on the 220 kV circuits remains limited, and the complete scope of the Suki Kinari interconnection, including its grid station, is expected to conclude only by June 2027, with partial material already delivered and the construction tender awarded.

The NEPRA, taking notice of the prolonged delays and the extended reliance on interim arrangements, initiated legal and regulatory proceedings under the applicable framework to enforce accountability and ensure the timely execution of critical transmission projects. As a result of NEPRA's intervention and sustained monitoring, the NGC accelerated its efforts and successfully energized the long-delayed K2/K3–Port Qasim transmission line in July 2025, thereby securing the reliable evacuation of nuclear generation into the National Grid, reducing dependence on ad-hoc circuits, and reinforcing the stability of the southern transmission network. While this milestone represents a significant achievement, the

outstanding timelines for associated projects such as the Suki Kinari evacuation line highlight the continued importance of regulatory oversight, strict adherence to project schedules, and improved coordination among stakeholders to avoid recurrence of such protracted delays in the execution of vital national infrastructure.

Table 36: Interim Arrangements within NGC transmission network

Detail of 500kV & 220kV Circuits on Interim Arrangement under Asset Management (North)		Timeline for Removal of Interim Arrangement	Progress in % as per the FY 2024-25 (July 24 to June 25)
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 August-2025.	For 500kV Lahore North G/S: 96.5%
2	220kV Lahore (Sheikhupura) - Ravi CCT		
3	220kV Kala Shah Kaku-Ravi CCT		
4	220kV Kala Shah Kaku-Ghazi CCT		
5	Suki Kinari Hydro Power Station to interconnection point of existing Neelum- Jehlum 500kV D/C Quad Bundle T/line	June-2027 The complete scope of work included evacuation of power from Suki Kinari to Maira Switching Station however presently the section from Suki Kinari to Neelum Jehlum interconnection point has been completed and energized whereas the section from Neelum Jehlum interconnection to Maira Switching Station is under procurement.	Partial material delivered Construction tenders are under approval of BoD.
Interim Arrangements Present in South Region of Asset Management (NGC)			
1.	500kV K2K3-Hub Circuit	19-06-2025 Interim arrangement removed during approved shutdown on 500kV KKI-Jamshoro Circuit and 500kV K-2/K-3-CPHGC Circuit availed from 15-06-2025 to 19-06-2025 and following Circuit as per permanent arrangement is energized 500kV Transmission Line CPHGC-Jamshoro Circuit-II on 19-06-2025.	Overall Physical Progress: 99.03% (upto 30-June-2025)
2	500kV Jamshoro-K2K3 Circuit-II	27-07-2025 KKI-NGC interconnection with existing K-2/K-3 to Jamshoro Ckt-II energized as per below arrangements: <i>Energization of 500kV K-2/K-3- KKI Transmission Line on dated 25-09-2024</i> <i>Energization of 500kV Jamshoro-KKI Transmission Line on dated 25-09-2024</i>	Existing interim arrangement of 500kV Jamshoro-KKI will be 500kV KKI-Port Qasim T/Line which is expected to be completed by July 27, 2025 subject to the availability of shutdown as rescheduled by ISMO from July 14, 2025.
3.	220kV Transmission Line from Pak-Iran border (Gabd) to 132kV Jiwani Gwadar interconnection point	220kV Transmission Line from Pak-Iran border (Gabd) to existing Jiwani Gwadar (132kV)	2 nd phase will start, once financing is finalized as per contract agreement

Detail of 500kV & 220kV Circuits on Interim Arrangement under Asset Management (North)	Timeline for Removal of Interim Arrangement	Progress in % as per the FY 2024-25 (July 24 to June 25)
	Transmission Line was completed on 08/02/2023.	

Source: NGC

10. Loading Position in Transmission Networks of NGC:

The loading position of the NGC transmission network highlights critical stress on system assets across various voltage levels. At the 500/220 kV level, there are 20 grid stations equipped with 48 power transformers, of which 41 units are operating at more than 80% of their rated capacity, reflecting significant loading pressure at the backbone of the transmission system. Similarly, at the 220/132 kV level, 49 grid stations house 187 power transformers, with 87 units loaded beyond 80%, indicating vulnerabilities in the sub-transmission segment.

Furthermore, at the 132 kV level, 53 power transformers exist, out of which 8 are operating above the 80% threshold. In total, NGC manages 69 grid stations and 288 power transformers nationwide, of which 136 are critically loaded, raising concerns over system reliability, risk of overloading, and the urgent need for capacity augmentation and reinforcement measures.

Table 37: Loading position within NGC transmission network

Voltage Level	Number of Grid Stations	Number of Power Transformers	Transformers Loaded >80%
500/220 kV	20	48	41
220/132 kV	49	187	87
132kV	0	53	8
Total	69	288	136

Source: NGC

11. Loading Position in Transmission Networks of KE:

During the FY 2024-25, the 500/220 kV interconnection point is represented by only a single grid station and the 220/132 kV level comprises 12 grid stations, no critical loading has been reported at these upper tiers. However, the situation is considerably different at the 132 kV and below levels, which form the backbone of Karachi's urban supply system.

At the 132 kV/66 & 11 kV level, KE operates 62 grid stations with 180 power transformers, out of which 62 transformers are already loaded above 80% of their rated capacity. Similarly, at the 66/11 kV level, 2 out of 4 transformers are experiencing critical loading conditions. This means that a total of 64 transformers—representing nearly 35% of the network's installed fleet—are operating under stressed conditions. Operating transformers beyond 80% of their rated capacity leaves very limited headroom for system contingencies, peak demand surges, or integration of new generation.

Table 38: Loading Position of KE for FY 2024-25

Voltage Level	Number of Grid Stations	Number of Power Transformers	Transformers Loaded >80%
500/220 kV	1	-	-
220/132 kV	12	-	-
132kV/66 & 11kV	62	180	62

Voltage Level	Number of Grid Stations	Number of Power Transformers	Transformers Loaded >80%
66kV/11kV	3	4	2
Total	78	184	64

Source: KE

12. Fatal/ Non-Fatal Accidents reported by NGC & KE:

In the fiscal year 2024–25, both NGC and KE recorded an equal number of fatal accidents, with two cases each; however, the overall accident landscape reveals a notable contrast between the two entities. NGC reported two non-fatal incidents throughout the year. On the other hand, KE presented a different pattern, recording a total of 23 non-fatal accidents.

Table 39: Fatal and Non Fatal Accidents

Quarters of FY 2024-25	NGC		KE	
	Fatal Accident	Non-Fatal Accidents	Fatal Accident	Non-Fatal Accidents
Quarter 1	1	1	1	12
Quarter 2	0	0	0	6
Quarter 3	1	0	1	3
Quarter 4	0	1	0	2
Total	2	2	2	23

Source: NGC/KE

13. Tower Collapse at 500kV & 220kV Levels of NGC & KE:

Between 2020–21 and 2024–25, the data on tower collapses reveals varying trends across NGC regions and KE. In the North Region (Islamabad, Lahore, and Multan), collapses increased sharply from 11 in 2020–21 to 23 in 2021–22 and peaked at 33 in 2022–23, before dropping to 26 in 2023–24 and further down to 9 in 2024–25, suggesting that significant corrective measures may have been implemented after years of rising incidents. The South Region (Hyderabad and Quetta) recorded comparatively fewer collapses, with 2 in 2020–21 and 3 in 2021–22, followed by a spike to 9 in 2022–23, a sharp decline to just 1 in 2023–24, and then another increase to 7 in 2024–25, indicating more fluctuating and localized risks. Combined, NGC experienced a total of 13 collapses in 2020–21, rising to 26 in 2021–22 and peaking at 42 in 2022–23, before stabilizing at 27 in 2023–24 and reducing to 16 in 2024–25.

KE, on the other hand, showed a different pattern, beginning with 15 collapses in 2020–21, then dropping sharply to 2 in 2021–22, recording 4 in 2022–23, rising again to 9 in 2023–24, and finally falling back to 4 in 2024–25. Overall, the figures highlight that while KE maintained relatively lower incident numbers, NGC—particularly the North Region—faced major challenges until recent improvements brought collapses down to their lowest levels in five years. The details of the tower collapse incidents occurred during the last 5-years are as follows:

Table 40: Tower collapse statistics

Region	2020-21	2021-22	2022-23	2023-24	2024-25
South Region (Hyderabad & Quetta)	11	23	33	26	9
North Region (Islamabad, Lahore & Multan)	2	3	9	1	7

Region	2020-21	2021-22	2022-23	2023-24	2024-25
Total NGC	13	26	42	27	16
KE	15	2	4	9	4

Source: NGC/KE

14. Deterioration of NGC Assets due to Environment Pollution:

To address the issues of recurring tripping of transmission lines and the accelerated deterioration of switchyard equipment in the NGC network, NPERA taken up the matter with NGC, and it was observed that these problems are primarily caused by environmental pollution affecting insulators and other switchyard equipment.

Notably, during FY 2024-25, fire incident at 220kV Band Road grid station also highlighted similar challenges, where it was further observed that a sewerage drain/canal flowing beside the grid is contributing to corrosion and the rapid deterioration of grid equipment, also pollution-related deposits on insulators were noted and disrupted system reliability. NEPRA emphasized that transmission licensees to must adopt rigorous environmental control measures to prevent asset deterioration caused by pollution. This includes the use of anti-pollution insulators, regular cleaning of equipment in high-pollution areas, and strict enforcement of periodic maintenance standards.

In response, NGC has initiated the installation of RTV-coated insulators on critical transmission lines in high-pollution zones, which enhance performance by reducing contamination-related flashovers and extending maintenance intervals. NGC also carried out systematic washing and cleaning of grid station equipment in accordance with SOPs prepared by its Technical Services Group. Furthermore, NGC has undertaken a comprehensive pollution study and mapping exercise across Pakistan, in collaboration with NESPAK’s research platform and consultants. The objective of this project is to optimize the existing insulation and insulator string design to mitigate the impact of insulation failures on transmission lines and improve the reliability of the NGC’s transmission networks.

15. Cyber-Security Threats and Mitigation Measures:

To strengthen network security and comply with evolving regulatory requirements, NEPRA directed NGC that, with increasing cyber threats, to must comply with NEPRA’s Cyber-Security Regulations and establish a robust cyber-security framework. This includes conducting regular vulnerability assessments, ensuring compliance with ISO/IEC 27001 standards, and undergoing regular audits.

In response, NGC confirmed that the ISMO IT network fully complies with the directives outlined in NEPRA’s Security of IT and OT Regulations, 2022. NGC further explained that although the ISMO IT network is not yet ISO/IEC 27001 certified, its OT/SCADA network remains fully isolated from the IT network, with no physical connectivity between the two, ensuring robust security. This segregation was verified by NEPRA in July 2024.

Furthermore, ISMO’s network security team serves as an active member of Power - Computer Emergency Response Team (Power - CERT), reflecting ISMO’s commitment to collaboration and compliance, while ISMO continues to strictly follow cyber-security advisories issued by NTISB. To ensure compliance with aforesaid NEPRA’s regulations, NGC has also constituted an internal Cyber Security Team of five members. On the technical side, NGC has initiated regular Vulnerability Assessment and Penetration Testing (VAPT) to identify and address potential risks. In March 2025, NGC’s IT Cyber Security team conducted another VAPT using an open-source vulnerability assessment tool.

NGC is currently in the process of arranging a fresh third-party VAPT to ensure independent validation. Going forward, it has been planned to conduct VAPT on a bi-annual basis to ensure continuous monitoring and resilience against emerging cyber threats. These measures collectively

represent significant progress in aligning NGC with NEPRA's cyber-security directives, ensuring stronger safeguards for Pakistan's power transmission infrastructure.

16. Renewable Energy Integration Plan:

The issue of Renewable Energy (RE) integration with the national grid faces multiple challenges including technical limitations (intermittency, transmission bottlenecks, lack of storage), operational issues (system flexibility, monitoring), and regulatory/financial barriers, all of which must be addressed to achieve reliable and cost-effective clean energy transition. NEPRA being cognizant of the crucial issue put pressure on NGC to develop RE integration plan which ensure effectively absorbed, transmitted, and utilized without undermining grid stability, while simultaneously supporting Pakistan's clean energy transition in a cost-efficient manner.

To this regards, NGC has engaged the Asian Development Bank (ADB) to conduct techno-economic studies to determine the requirements and optimal locations for Battery Energy Storage System (BESS) installations. These studies are currently underway and are expected to be finalized by the end of 2025. Furthermore, under the project "System Studies for Review of the Grid System Performance and Proposals for System Stability Improvement", M/s CESI has recommended the installation of ± 400 MVAR STATCOMs at five NGC grid stations to enhance system stability and voltage support.

In addition, a new 500 kV double-circuit transmission line (Matiari–Moro–Rahim Yar Khan) has been proposed to strengthen South–North power transfer capability. M/s CESI is also conducting assessment studies on the application of Dynamic Line Rating (DLR), which will enable more efficient utilization of transmission assets. These studies are expected to be completed by 2025.

17. Cross-Border Electricity Trade:

Pakistan is currently pursuing two major cross-border power exchange projects to strengthen regional energy cooperation and address local demand. The first is the 1,000 MW CASA-1000 Project (Central Asia–South Asia Electricity Transmission and Trade Project), which aims to transfer surplus hydropower from Kyrgyzstan and Tajikistan to Afghanistan and Pakistan. While the project holds significant regional importance, its progress has been hampered by delays due to various challenges.

The second project namely TAVANIR IRAN involves power imports from Iran to Gwadar. Since 2003, Pakistan has been importing 70–90 MW from Iran through the 132 kV Jackigor–Mand transmission line. In 2023, a new 132 kV link between Polan (Iran) and Gwadar (Pakistan) became operational, with a capacity of up to 100 MW. Plans are underway to upgrade this connection to 220 kV by 2027–28, which will include the development of a 220 kV transmission line and GIS substation at Gwadar, substantially improving supply reliability and meeting the region's growing electricity demand.

18. Approval of Policies by NGC w.r.t Transmission Line Security & Right of Way:

The Policy for Transmission Line Security has been duly approved by BOD of NGC, reflecting the organization's commitment to strengthening safeguards for critical transmission infrastructure. While the approval has been granted, the formal notification is yet to be issued. The same will be circulated to all relevant stakeholders immediately upon issuance, so that its provisions may be formally implemented in the field.

The NGC Compensation Policy for RoW was formally approved by the BOD of the NGC in November 2023. The policy is aimed at reducing disputes, ensuring equitable treatment of affected landowners, and facilitating the timely execution of transmission infrastructure by streamlining compensation-related processes. However, a draft legislation is under review by NGC's legal consultant. Once the review process is completed, the draft will be subjected to extensive consultations with key stakeholders, including Distribution Companies (DISCOs), provincial authorities, and relevant government bodies, to ensure that all perspectives are duly incorporated. Following these

consultations, the legislation will be formally submitted to the Ministry of Energy (Power Division) for onward submission to the competent authorities for enactment.

19. Delay in Construction of Dedicated TSG Training Center:

A tender was floated for the execution of the subject project in accordance with the approved procurement plan. However, despite following the due process of advertisement and solicitation, only a single bidder responded within the stipulated timelines. As per standard procurement rules and procedures, cases involving single bids require careful scrutiny to ensure compliance with principles of transparency, fairness, and cost-effectiveness. Accordingly, the case for approval of the single bidder was submitted to the BoD of NGC for its consideration. Upon review, the BoD decided not to approve the award of contract to the sole bidder and instead scrapped.

20. Status of Legal Proceedings:

The following section provides a detailed account of the status of legal proceedings pertaining to the financial year 2024–25.

- A fine of Rs. 10 million was imposed on NGC in the matter on account of fatal accidents involving Mr. Zain ul Abideen & Mr. Khair bux.

20.1 Legal proceedings challenged in NEPRA Appellate Tribunal:

- A fine of 10 million was imposed on NGC in the matter of Tower Collapse in Wake of Cyclonic Winds at South region. NGC has filed an appeal against the decision of the Authority.
- A fine of 10 million was imposed on NGC w.r.t fatal accident, however, the decision of the Authority was challenged by NGC in NEPRA Tribunal.
- A fine of Rs. 10 million was imposed on NGC in the matter of partial blackout occurred on Sep 2021 due to the fault at 500 kV Jamshoro grid station. NGC has filed an appeal against the decision of the Authority.

20.2 Legal Proceedings in process during the FY 2024-25:

- An Explanation was issued to the NGC regarding the delay in completing the Lahore North Grid Station.
- An Explanation was issued to NGC regarding fire erupted at the 220 kV Band (Bund) Road Grid Station in Lahore on May, 2024.
- An Explanation notice was issued to NGC regarding non-compliance of the Authority's direction by NGC in the matter of payment dispute of 697.10 million rupees between NGC and NPGCL.
- An Explanation notice was issued to NGC regarding non submission of reply w.r.t violations of NGC Specification P44:2018 and acting on its own direction.
- A Show Cause Notice was issued to NGC on May, 2025 regarding violation of NGC Specification P44:2018.
- A Show Cause Notice was issued to NGC regarding visit of Jamshoro Grid Station & Other Areas of South Region of NGC by NEPRA team (Jhimpir-II)

21. Monitoring & Investigations conducted against NGC & KE:

During FY 2024-25 following monitoring activities and investigations were carried out:

- Investigation regarding violation of NGC Specification P44: 2018 with respect to usage of unsafe 11kV VCBs.
- Monitoring of 500kV Jamshoro Grid Station & Other Areas of South Region of NGC (Jhimpir-II).

- Monitoring of the progress of interconnection (NGC-KE) arrangements & System Constraints / under construction KE 500kV KKI G/S & 220kV Dhabeji G/S along with reliability issues of BQPS-III power plant of KE.
- Monitoring of the updated status / progress of SCADA-III project of NGC.
- Monitoring of Approved Investment Plan of NGC pertaining to 2022 to 2025.

22. CONCLUSION:

22.1. System Reliability:

In FY 2024-25, NGC achieved notable improvements in system reliability, with a reduction in both the System Duration of Interruption (0.03 hrs/point) and System Frequency of Interruptions (0.09 no./circuit), marking the lowest values in the past five years. Additionally, the tie line system showed no duration of interruption and system frequency of interruption.

KE's 220 kV transmission network also demonstrated high reliability, with a System Duration of Interruption of 0.35 hrs/point and a System Frequency of Interruptions of 0.05 no./circuit. However, at the 132 kV and 66 kV levels, the System Duration was 3.65 hrs/point and the System Frequency was 2.60 interruptions per circuit. For tie lines, the System Duration was 8.45 hrs/point, with a frequency of 2 interruptions per circuit.

FTCL reported System Duration of interruption of 41.11 hrs/point and System Frequency of interruption 3.5 no./circuit.

For ST&DCPL, the System Duration of interruptions reported was 52.65 hrs/point and System Frequency of interruption 10.5 no./circuit.

22.2. System Security:

In FY 2024-25, NGC's Energy Not Served (ENS) decreased significantly to 2.77 GWh, a sharp reduction from the previous year's 4.48 GWh. Notably, no blackouts or major breakdowns occurred during the reporting period.

KE reported an ENS of 0.654 GWh on its 220 kV network, with no ENS on its 132 kV and 66 kV networks. KE's tie lines also reported zero ENS. However, three outages with a total duration of 3.82 hours were recorded, while NGC maintained tie lines experienced no outages.

FTCL reported an increase in ENS, with a total of 3.14 GWh in FY 2024-25 compared to 0.886 GWh the previous year. In contrast, STDC saw a decrease in ENS, rising to 10.68 GWh from 13.57 GWh the previous year.

22.3. Quality of Supply:

Frequency:

- During FY 2024-25, NGC's system frequency exceeded permissible limits eight times on the higher side, with no instances of low-frequency violations.
- KE recorded five instances of high-frequency violation but no low-frequency violations during the same period.
- FTCL experienced 159 instances of frequency violations, both high and low, totaling 367 minutes.
- STDC reported nil frequency violations during FY 2024-25.

Voltage:

- During FY 2024-25, NGC reported 107,012 voltage violations, a decrease from the previous year, with 157,692 violations under normal conditions and 563 under N-1 conditions.
- KE recorded 13 voltage violations under normal conditions, with no high voltage violations under N-1 conditions.

- FTCL's highest voltage violation was 144.2 kV under normal conditions, with no violations under N-1. No low voltage violations were recorded for either condition.
- STDC reported two voltage violations under both normal and N-1 conditions.

23. Recommendations:

Based on the above, following are the recommendations to improve the system conditions at NGC, KE and rest of the transmission network:

1. **Reduction of Forced Outages and Reliability Enhancement:**

Transmission licensees to conduct periodic preventive maintenance and condition assessment of critical transmission and interconnection points to minimize unplanned outages. Implement real-time monitoring and early-warning systems to detect equipment stress, replace or refurbish aged or frequently failing equipment at high-risk stations to ensure System Reliability and reduce forced outages contributing to ENS.

2. **Enhanced Fault Detection and Isolation:**

Transmission Licensees shall implement advanced fault detection, isolation, and automated sectionalizing mechanisms across the transmission network to quickly identify and isolate faulted sections. This will reduce the extent of outage, prevent cascading failures, and enable faster restoration of supply to unaffected areas

3. **Reactive Power Management Enhancement:**

Transmission Licensees to expedite the installation and effective utilization of reactive power compensation equipment (such as shunt reactors, capacitor banks, and STATCOMs) at critical grid stations experiencing repeated voltage violations.

4. **Priority Intervention at Chronically Weak Grid Stations:**

The Transmission licensees shall prioritize reinforcement of weak and congested grid stations through timely augmentation of transformation capacity, transmission lines, to enhance system reliability and reduce forced outages contributing to ENS.

5. **Regular Performance Review of High-Violation Stations:**

Transmission Licensees are required to submit grid-station-wise corrective action plans for grid stations with persistent voltage violations, including timelines for implementation of network reinforcement, equipment upgrades, and operational improvements. Monthly performance reviews shall be conducted for high-risk grid stations, with progress reports submitted to the Authority highlighting reduction trends and remaining challenges.

6. **Strengthening Primary and Secondary Frequency Control:**

Transmission Licensees to ensure effective operation and periodic testing of primary and secondary frequency control mechanisms, particularly during low-load conditions, to avoid recurrence of high-frequency excursions beyond the upper permissible limit of 50.50 Hz as stipulated under Rule-8 of PSTR-2005.

7. **Analysis and Reporting of Frequency Events:**

Detailed root-cause analysis of each frequency violation shall be carried out by the transmission licensees and shared with the Authority, highlighting contributing factors, corrective actions taken, and preventive measures planned.

8. **Urgent Completion of Critical NGC Projects:**

The completion of key projects under the NGC is of utmost priority to enhance South-to-North power flow capability, minimize dependence on high-cost generation sources, and ensure optimal utilization of the HVDC Matiari-Lahore transmission line. Timely execution of these projects is essential to avoid additional financial burden on the national exchequer.

9. Acceleration of SCADA-III and Key Augmentation Projects:

Expeditious implementation of the SCADA-III project including critical grid augmentation projects is crucial to strengthen grid monitoring through real time system visibility and enhance operational reliability across the national transmission network.

10. Resolution of Right-of-Way & Security Challenges

It is imperative that all Right-of-Way (ROW) and security constraints be resolved in a timely manner by both NGC and KE to ensure the achievement of project completion targets and facilitate efficient, affordable and reliable power delivery.

11. Coordination Enhancement for Project Facilitation

Effective and sustained coordination among all stake holders is critical for expediting statutory approvals, securing financial closures, and addressing ROW and land acquisition challenges associated with priority transmission projects.

12. Strict Compliance with Safety and Regulatory Standards

All transmission licensees are required to strictly adhere to the provisions of the NEPRA Act, Rules, Regulations, Grid Code, Safety Code, and other applicable regulatory instruments to prevent fatal and non-fatal incidents, ensuring a safe and compliant working environment across all transmission activities.

13. Implementation of Preventive Environmental and Reliability Measures

To ensure long-term network reliability and environmental resilience, transmission licensees must adopt preventive environmental and technical measures, including the deployment of pollution-resistant insulators, optimization of insulator string design, and execution of comprehensive maintenance and inspection programs.



Voltage violations data - detailed circuit wise analysis

NGC Islamabad Region

1. 500 kV Rawat
2. 220 kV Bannu
3. 220 kV Burhan
4. 220 kV Daudkhel
5. 220 kV ISPR (Sangiani)
6. 220 kV Mardan
7. 220 kV Nowshera
8. 220 kV Shahibagh
9. 220 kV University
10. 500kV Sheikh Muhammadi Peshawar
11. 220kV Manshara
12. 220 kV Chakdara
13. 220kV D.I. Khan

1. 500kV Grid Station Rawat

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Rawat - Barotha Ckt I & II	195	60	Nil	Nil	Nil	539	120	542	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Rawat - Tarbela	195	Nil	Nil	Nil	Nil	539	120	542	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Rawat - Neelum Jehlum	195	60	Nil	Nil	NP	539	120	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP
N-1		Nil	Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP
Normal	500 kV Rawat - Nokhar	195	60	Nil	Nil	Nil	539	120	542	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Rawat - ISPR Ckt I & II	879	821	512	539	262	245	240	248	120	246	60	248	60	245	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Rawat - Mangla Ckt I & II	879	821	512	539	262	245	240	248	90	246	60	248	60	245	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Rawat - Bahria Town Ckt I & II	881	821	512	539	262	245	240	248	120	246	60	248	60	245	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Rawat - University Ckt I & II	879	821	512	539	262	245	240	248	120	246	60	248	60	245	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	4,298	3,464	2,048	2,156	1,048
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	4,298	3,464	2,048	2,156	1,048

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

2. 220 kV Grid Station Bannu

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Daudkhel - Bannu Ckt I & II	332	1,238	1,893	983	591	241	60	240	60	242	60	243	1,440	243	1,440	Nil	Nil	Nil	Nil	Nil	Nil	200	60	200	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Chashma - Bannu Ckt I & II	332	677	1,894	983	737	241	60	240	60	242	60	243	1,440	243	1,440	Nil	Nil	Nil	Nil	Nil	Nil	200	60	200	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	664	1,915	3,787	1,966	1,328
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	664	1,915	3,787	1,966	1,328

Highest Voltage Under Normal Condition @220kV level

Lowest Voltage Under Normal Condition @220kV level

3. 220 kV Grid Station Burhan

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Burhan - ISPR Ckt I & II	322	234	36	8	10	238	180	242	60	241	60	240	60	239	120	204	60	201	60	Nil	Nil	Nil	Nil	207	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Burhan - Tarbela Ckt I, II & III	322	234	36	8	12	238	180	242	60	241	60	240	60	239	120	204	60	201	60	Nil	Nil	Nil	Nil	207	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	644	468	72	16	22
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	644	468	72	16	22

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

4. 220 kV Grid Station Daudkhel

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Daudkhel - Peshawar Ckt I & 2	81	4	137	62	54	238	540	234	240	243	120	238	60	238	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Daudkhel - Chashma Ckt I & II	81	4	130	62	54	238	540	234	240	243	120	238	60	238	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Daudkhel - Bannu Ckt I & II	81	4	132	62	54	238	540	234	240	243	120	238	60	238	720	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	243	12	399	186	162
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	243	12	399	186	162

 Highest Voltage Under Normal Condition @220kV level

5. 220kV Grid Station ISPR (SANGJANI)

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV ISPR - Burhan	102	306	124	89	140	Nil	Nil	236	60	Nil	Nil	Nil	Nil	Nil	Nil	196	60	195	180	200	120	202	240	200	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV ISPR - Tarbela	168	284	22	24	101	240	240	242	60	239	120	238	180	241	242	196	60	196	60	206	180	204	60	195	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV ISPR - Bahria Town	84	266	178	59	38	234	120	234	60	Nil	Nil	240	240	241	242	195	60	192	180	202	120	202	60	204	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV ISPR - Rawat	84	266	177	59	38	232	120	Nil	Nil	Nil	Nil	240	240	241	242	195	60	192	180	202	120	202	60	204	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV ISPR - Mansehra	144	300	32	46	41	236	180	240	60	Nil	Nil	240	60	Nil	Nil	198	60	195	180	205	60	204	60	204	180
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	582	1,422	533	277	358
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	582	1,422	533	277	358

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

6. 220kV Grid Station Mardan

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Tarbela - Mardan Ckt I & II	1,333	2,093	1,953	958	133	Nil	Nil	Nil	Nil	235	60	236	300	237	420	185	60	185	60	194	60	194	60	193	360
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Mardan - Nowshera Ckt I & II	1,333	2,093	977	479	145	Nil	Nil	Nil	Nil	235	60	236	300	237	420	185	60	185	60	194	60	194	60	193	360
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Mardan - Chakdara Ckt	1,333	2,093	977	479	145	Nil	Nil	Nil	Nil	235	60	236	300	237	420	185	60	185	60	194	60	194	60	193	360
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	3,999	6,279	3,907	1,916	423
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	3,999	6,279	3,907	1,916	423

Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

7. 220kV Grid Station Nowshera

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Nowshera - Mardan	215	767	316	113	112	238	60	238	60	238	60	237	60	236	300	200	60	195	60	201	60	Nil	Nil	205	90
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Nowshera - Barotha 1 & 2	215	767	632	113	112	238	60	238	60	238	60	237	60	236	300	200	60	195	60	201	60	Nil	Nil	205	90
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Nowshera - S. M Peshawar	198	767	316	113	112	238	60	238	60	238	60	237	60	236	300	200	60	195	60	201	60	133	180	205	90
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	628	2,301	1,264	339	336
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	628	2,301	1,264	339	336

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level

8. 220kV Grid Station NEW SHAHIBAGH PESHAWAR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Shahibagh - Peshawar Ckt II	2,954	3,067	1,347	607	475	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	184	120	182	60	190	120	193	60	194	180
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shahibagh - Chakdara	1,396	1,703	367	479	362	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	185	60	187	60	190	90	190	60	194	420
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	4,350	4,770	1,714	1,086	837
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	4,350	4,770	1,714	1,086	837

 Lowest Voltage Under Normal Condition @220kV level

9. 220kV Grid Station UNIVERSITY

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV University - Rawat Ckt I & II	2,363	1,469	618	257	159	249	120	249	60	244	120	245	300	244	330	Nil	Nil	203	120	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	2,363	1,469	618	257	159
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	2,363	1,469	618	257	159

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

10. 500kV Grid Station SHEIKH MUHAMMADI PESHAWAR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Tarbela - Peshawar	172	632	1,407	612	676	536	60	553	60	545	60	543	180	556	660	473	60	469	60	473	60	473	60	470	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Peshawar - Daudkhel Ckt 1 & 2	415	1,244	1,042	437	127	234	60	239	60	238	60	236	300	236	120	199	60	192	60	202	60	203	60	202	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Peshawar - Nowshera	415	1,240	521	221	127	234	60	239	239	238	60	236	300	236	120	199	60	192	60	202	60	203	60	202	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Peshawar - Shahibagh	415	1,241	521	224	127	234	60	Nil	Nil	238	60	236	300	236	120	199	60	Nil	Nil	204	60	203	60	202	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1,417	4,357	3,491	1,494	1,057
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1,417	4,357	3,491	1,494	1,057

	Highest Voltage Under Normal Condition @500kV level
	Lowest Voltage Under Normal Condition @500kV level
	Lowest Voltage Under Normal Condition @500kV level
	Lowest Voltage Under Normal Condition @200kV level

11. 220kV Grid Station MANSEHRA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Manshra - Allai Khwar 1 & 2	156	92	27	77	136	238	180	242	60	242	60	241	120	240	420	198	50	200	60	205	60	Nil	Nil	197	240
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Manshra - ISPR 1 & 2	156	86	27	77	136	238	180	242	60	242	60	241	120	240	420	198	50	Nil	Nil	205	60	Nil	Nil	197	240
		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	312	178	54	154	272
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	312	178	54	154	272

Highest Voltage Under Normal Condition @220kV level

Lowest Voltage Under Normal Condition @220kV level

12. 220kV Grid Station CHAKDARA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Chakdara - Shahibagh	169	183	85	41	33	Nil	Nil	235	90	233	90	237	90	233	120	190	90	180	60	193	60	200	60	200	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NIL	NIL	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Chakdara - Mardan	199	183	85	41	34	Nil	Nil	235	90	233	90	237	90	233	120	190	90	180	60	193	60	200	60	200	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NIL	NIL	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	368	366	170	82	67
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	368	366	170	82	67

Highest Voltage Under Normal Condition @220kV level

Lowest Voltage Under Normal Condition @220kV level

13. 220kV Grid Station D. I. KHAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV D. I. Khan - Chashma 1 &2	1,842	1,146	44	138	35	240	180	242	120	244	60	241	60	238	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1,842	1,146	44	138	35
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1,842	1,146	44	138	35

 Highest Voltage Under Normal Condition @220kV level



Voltage violations data - detailed circuit wise analysis

NGC Lahore Region

1. 500 kV Gatti
2. 500 kV West Faisalaabad
3. 500 kV Sheikhupura
4. 220 kV Bandala
5. 220 kV Ludewala
6. 220 kV Lalian
7. 220 kV Toba Tek Singh
8. 220 kV Nishatabad
9. 220 kV Samundri Road
10. 220 kV Jaranwala
11. 220 kV Bund Road Lahore
12. 220 kV Kala Shah Kaku
13. 220 kV Ghazi Road
14. 220 kV Gakkhar
15. 220 kV Gujrat
16. 500 kV New Lahore
17. 220 kV New Kot Lakhpat
18. 500 kV Nokhar
19. 220 kV Ravi
20. 220 kV Sialkot
21. 220 kV Shalamar
22. 220 kV Sarfraz Nagar
23. 220 kV WAPDA Town
24. 500 kV Yousafwala
25. 220 kV Okara
26. 220 kV Kassowal

1. 500kV Grid Station Gatti Faisalabad

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500KV Gatti - Barotha CCT-I & II	Nil	1	1	2	41	Nil	Nil	530	60	530	90	528	180	535	180	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500kV Gatti-Roush	30	12	213	226	4	540	360	540	270	540	240	545	180	530	480	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV Gatti - H.B Shah 1	7	12	Nil	Nil	NP	535	90	540	240	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV Gatti - H.B Shah 2	18	39	Nil	Nil	NP	540	390	540	570	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV Gatti - Bhikhi Line	1	38	97	64	22	530	150	540	330	540	60	535	360	540	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500kV Gatti-West FSD	Nil	78	307	231	42	Nil	Nil	540	240	550	60	540	300	540	90	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Gatti-Nishatabad CCT-I & II	18	64	15	7	6	236	240	236	70	234	210	233	270	240	120	207	60	204	120	205	180	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

1. 500kV Grid Station Gatti Faisalabad

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Gatti - Jaranwala Road CCT I & II	56	194	21	Nil	4	235	240	236	270	232	210	Nil	Nil	239	120	204	60	201	180	205	120	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Gatti- Yousafwala CCT-I & II	NP	454	21	Nil	4	NP	NP	235	270	Nil	Nil	Nil	Nil	238	120	NP	NP	195	390	204	540	Nil	Nil	Nil	Nil
N-1		NP	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Gatti- Ludewala CCT-I & II	82	316	61	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	203	120	200	180	202	540	Nil	Nil	NP	NP
N-1		Nil	Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP
Normal	220KV Gatti - Bandala CCT-I & II	42	156	19	39	10	232	300	240	120	234	240	235	90	240	120	204	120	202	180	205	180	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Gatti-Lalian CCT	Nil	39	79	Nil	10	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	204	180	202	540	Nil	Nil	205	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	254	1,403	834	569	143
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	254	1,403	834	569	143

	Highest Voltage Under Normal Condition 500kV level
	Highest Voltage Under Normal Condition 220kV level
	Lowest Voltage Under Normal Condition 220kV level

2. 500kV Grid West Faisalabad

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit						Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
								Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500KV WFSD-Gatti	-	Nil	738	2,314	928	1,044	Nil	Nil	542	60	548	120	546	540	548	540	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		-	Nil	Nil	Nil	Nil	2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	554	180	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV WFSD-HBS	-	Nil	738	2,313	952	1,044	Nil	Nil	542	60	548	120	546	540	548	540	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		-	Nil	Nil	Nil	Nil	2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	554	180	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV WFSD-PTPL	-	Nil	Nil	Nil	Nil	290	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	243	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		-	Nil	Nil	Nil	Nil	104	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	252	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV WFSD-TTS	-	Nil	10	3,355	644	290	Nil	Nil	235	180	249	60	249	600	243	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		-	Nil	Nil	Nil	Nil	25	104	Nil	Nil	Nil	Nil	Nil	Nil	244	60	252	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV WFSD-Trimmu	-	Nil	10	NP	406	0	Nil	Nil	235	180	NP	NP	249	600	NP	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP
N-1		-	Nil	Nil	NP	NP	22	0	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP

Total No. of Variations (Normal)	-	Nil	1,496	7,982	2,930	2,668
Total No. of Variations (N-1)	-	Nil	Nil	Nil	47	212
Total (Normal & N-1)	-	Nil	1,496	7,982	2,977	2,880

	Highest Voltage Under Normal Condition 500kV level
	Highest Voltage Under N-1 Condition 500kV level
	Highest Voltage Under Normal Condition 220kV level
	Highest Voltage Under N-1 Condition 220kV level

3. 500kV Grid Station Sheikhpura

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500KV SKP - Nokhar	7	NA	1	3	5	528	90	NA	NA	528	120	529	60	535	150	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	NA	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV SKP - Bhiki	5	NA	1	13	38	526	120	NA	NA	527	60	531	60	549	180	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	NA	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV SKP - New Lahore	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil
N-1		NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Normal	500KV SKP - HVDC	7	2	4	23	22	526	90	525	60	529	60	532	60	547	180	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV SKP - WAPDA TOWN	17	52	7	2	6	Nil	Nil	230	60	232	120	232	60	237	180	202	60	197	60	203	120	207	180	203	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV SKP - NKLP	6	91	31	3	11	Nil	Nil	Nil	Nil	234	180	233	60	238	90	202	60	193	120	190	60	205	60	204	90
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV SKP - Bund Road CCT-I, II, III & IV	57	156	38	98	203	Nil	Nil	232	60	238	150	240	90	240	60	202	90	200	90	199	60	201	90	199	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV SKP - RAVI ROAD.	42	31	1	3	9	Nil	Nil	Nil	Nil	232	90	232	60	238	60	204	90	196	150	Nil	Nil	205	90	204	150
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV SKP - Ravi II ATLAS P/H.	27	24	17	32	42	237	120	Nil	Nil	239	180	Nil	Nil	204	120	196	150	201	270	200	90	201	90		
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	168	356	100	177	336
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	168	356	100	177	336

	Highest Voltage Under Normal Condition 500kV level
	Lowest Voltage Under Normal Condition 220kV level
	Highest Voltage Under Normal Condition 220kV level

4. 220kV Grid Station Bandala

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220kV T/L Bandala-KSK I & II	520	228	67	245	296	240	120	Nil	Nil	237	120	238	60	241	90	201	180	190	60	203	90	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220kV T/L Bandala-Gatti I & II	136	228	67	245	296	Nil	Nil	Nil	Nil	237	120	238	60	241	90	201	180	190	60	203	90	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	656	456	134	490	592
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	656	456	134	490	592

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

5. 220kV Grid Station Ludewala

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Ludewala-Gatti	75	402	2	Nil	30	240	240	239	60	Nil	Nil	Nil	Nil	235	360	204	120	200	60	203	120	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 KV CHASHMA-LUDEWALA CCT-1&2	82	354	144	100	140	240	210	238	120	240	90	241	90	237	150	202	60	199	60	204	90	203	90	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Ludewala-Lalian	Nil	1	139	78	122	Nil	Nil	Nil	Nil	241	90	240	90	236	180	Nil	Nil	208	60	205	90	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	157	757	285	178	292
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	157	757	285	178	292

Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

6. 220kV Grid Station Lalian

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Lalian-Gatti	Nil	Nil	5	10	42	Nil	Nil	Nil	Nil	Nil	Nil	236	60	235	360	Nil	Nil	Nil	Nil	203	180	Nil	Nil	207	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Lalian-Ludewala	Nil	Nil	5	71	102	Nil	Nil	Nil	Nil	239	120	240	90	237	300	Nil	Nil	Nil	Nil	203	180	Nil	Nil	208	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	Nil	Nil	10	81	144
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	10	81	144



Highest Voltage Under Normal Condition @220kV level

Lowest Voltage Under Normal Condition @220kV level

7. 220kV Grid Station Toba tek singh

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Multan - Toba Tek Singh Circuit # 1&2	224	906	490	793	636	247	1,110	251	570	247	330	250	1,410	241	450	182	540	176	1260	206	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	26	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	250	150	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Toba Tek Singh-West FSD Circuit'	Nil	Nil	Nil	-	262	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	241	450	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	-	13	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	250	150	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Toba Tek Singh-Samundri Road Circuit #1&2	224	906	490	793	636	247	1,110	251	570	247	330	250	1,410	241	450	182	540	176	1260	206	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	26	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	250	150	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Toba Tek Singh-PTPL Circuit #1,2,3&4.	Nil	Nil	490	1035	1077	Nil	Nil	Nil	Nil	247	330	250	1,410	241	450	Nil	Nil	Nil	Nil	206	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	28	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	250	150	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	448	1,882	1470	2663	2569
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	93
Total (Normal & N-1)	448	1,812	1470	2663	2662

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level

8. 220kV Grid Station Nishatabad

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Gatti-Nishatabad Circuit # I, II	28	6	3	Nil	Nil	235	90	235	60	234	60	Nil	Nil	Nil	Nil	203	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Samundri Road-Nishatabad Circuit # I & II	Nil	6	3	Nil	Nil	Nil	Nil	235	60	234	60	Nil	Nil	Nil	Nil	203	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	28	12	6	Nil	Nil
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	28	12	6	Nil	Nil

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

9. 220kV Grid Station Samundri

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV SAMUNDRI ROAD - NISHATABAD CCT. NO. I&II	200	576	175	40	272	241	210	242	180	238	60	235	180	247	180	204	90	204	210	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220KV T.T.SINGH - SAMUNDRI ROAD CCT. NO. I&II	24	976	175	43	284	238	120	242	180	238	60	235	300	248	180	204	90	204	210	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	224	1,552	350	83	556
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	224	1,552	350	83	556

 Highest Voltage Under Normal Condition @220kV level

10. 220kV Grid Station Jaranwala

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Gatti - JWR CCT-I & II.	52	268	3	Nil	Nil	234	35	Nil	Nil	233	57	Nil	Nil	Nil	Nil	206	159	202	70	208	206	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	52	268	3	Nil	Nil
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	52	268	3	Nil	Nil

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level

11. 220kV Grid Station BUND ROAD LAHORE

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Bund Road - NKLP I & II	841	2,070	562	381	163	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	198	90	184	90	194	150	194	150	195	1,170	
N-1		Nil	22	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	191	90	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Bund Road - KSK I & II	904	2,114	562	381	163	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	197	90	184	90	194	150	194	150	195	1,170	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Bund Road - SKP I & II	833	2,114	562	441	163	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	198	90	184	90	194	150	194	150	195	1,170	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Bund Road - SKP III & IV	842	2,114	562	321	163	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	198	90	184	90	194	150	194	150	195	1,170	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	3,420	8,412	2,248	1,524	652
Total No. of Variations (N-1)	Nil	22	Nil	Nil	Nil
Total (Normal & N-1)	3,420	8,434	2,248	1,524	652

 Lowest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under N-1 condition @220kV level

12. 220kV Grid Station KALA SHAH KAKU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Kala Shah Kaku - Mangla - I,II&III	859	1,860	109	209	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	184	150	181	150	199	60	199	90	198	1,410
N-1		Nil	153	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	185	90	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Kala Shah Kaku - Bund Road - I & II	622	1,110	108	199	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	188	60	188	90	199	60	199	90	198	1,410
N-1		Nil	62	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	189	150	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Kala Shah Kaku - Ravi	972	638	105	210	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	173	90	174	150	199	60	199	90	198	1,410
N-1		Nil	57	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	184	90	Nil	Nil	NP	NP	Nil	Nil
Normal	220 kV Kala Shah Kaku - Sialkot	628	579	102	196	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	188	90	150	90	199	60	199	90	198	1,410
N-1		Nil	44	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	188	90	Nil	Nil	NP	NP	Nil	Nil
Normal	Kala Shah Kaku - Bandala I & II	600	1,115	105	212	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	189	150	185	60	199	60	NP	NP	198	1,410
N-1		Nil	31	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	189	90	Nil	Nil	NP	NP	Nil	Nil
Normal	220 kV Kala Shah Kaku - Ghazi Road	773	751	110	211	121	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	60	150	90	199	60	199	90	198	1,410
N-1		Nil	71	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	185	90	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	4454	6053	639	1237	726
Total No. of Variations (N-1)	Nil	418	Nil	Nil	Nil
Total (Normal & N-1)	4454	6471	639	1237	726

	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

13. 220kV Grid Station GHAZI ROAD LAHORE

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Ghazi - Shalamar	3,225	3,037	2,211	1,726	327	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	120	176	60	188	60	188	60	187	1440
N-1		Nil	Nil	3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	196	60	Nil	Nil	Nil	Nil	
Normal	220 kV Ghazi - KSK	3,225	3,037	2,196	1,684	327	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	120	176	60	188	60	188	60	187	1440
N-1		Nil	Nil	2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	197	120	Nil	Nil	Nil	Nil	
Normal	220 kV Ghazi Road - New Lahore	3,201	3,035	2,211	1,539	327	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	120	176	60	188	60	188	60	187	1440
N-1		Nil	Nil	3	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	196	60	Nil	Nil	Nil	Nil
Normal	220 kV Ghazi - Sarfaraznagar	3,211	2,976	2,179	1,725	326	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	120	176	60	188	60	188	60	187	1440
N-1		Nil	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	196	60	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	12,862	12,085	8,797	6,674	1307
Total No. of Variations (N-1)	Nil	Nil	9	Nil	Nil
Total (Normal & N-1)	12,862	12,085	8,806	6,674	1307

 Lowest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under N-1 Condition @220kV level

14. 220kV Grid Station GAKKHAR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	220 kV Gakkhar - Mangla Ckt	756	60	60	6	123	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	191	120	200	60	200	60	206	180	197	840	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Gakkhar - Sialkot	770	60	60	24	123	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	191	120	200	60	200	60	204	60	197	840	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Old Gakkhar - New Gakkhar (Nokhar)	1,000	NP	NP	Nil	131	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	189	120	NP	NP	NP	NP	NP	NP	NP	197	840
N-1		Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	Nil	Nil
Normal	220 kV Gakkhar - Gujrat	1,000	NP	NP	Nil	131	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	189	120	NP	NP	NP	NP	NP	NP	NP	197	840
N-1		Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	Nil	Nil
Normal	220KV Bus Bar - I & II	Nil	116	116	59	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	198	60	198	60	202	60	NP	NP	
N-1		Nil	Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	

Total No. of Variations (Normal)	3526	236	236	89	508
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	3526	236	236	89	508

 Lowest Voltage Under Normal Condition @220kV level

15.220kV Grid Station GUJRAT

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	220 kV Gujrat - Old Gakkhar	1087	924	617	317	198	239	60	239	60	241	30	242	360	245	210	191	150	187	30	200	60	204	60	200	210	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Gujrat - New Gakkhar	1084	924	617	317	198	239	60	239	60	241	30	242	360	245	210	191	150	187	30	200	60	204	60	200	210	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Gujrat - Mangla 1 & 2	1,123	1848	617	317	198	239	60	239	60	241	30	242	360	245	210	189	60	187	30	200	60	204	60	200	210	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	3294	3696	1,851	951	594
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	3294	3696	1,851	951	594

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level

16. 500kV Grid Station NEW LAHORE

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	500 kV New Lahore - Balloki	94	226	416	185	67	534	120	540	120	540	60	538	180	548	120	473	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV New Lahore - GAKKHAR	94	113	416	179	67	534	120	540	120	540	60	538	180	548	120	472	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV New Lahore - CFPP Sahiwal	93	113	416	185	67	534	120	540	120	540	60	538	180	548	120	473	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV New Lahore - HVDC Conv 1 & 2	93	226	416	185	67	534	120	540	120	540	60	538	180	548	120	473	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV New Lahore - Ghazi Road	202	222	294	122	22	235	60	237	60	237	60	236	270	243	90	202	60	200	60	206	60	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV New Lahore - New Kot Lakhpat-I&II	201	444	294	122	32	235	60	237	60	236	60	236	270	243	90	202	60	200	60	206	60	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV New Lahore - SNR	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP
N-1		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP

16. 500kV Grid Station NEW LAHORE

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	220 kV New Lahore - Wapda Town	202	222	293	121	32	235	60	237	60	237	60	236	270	243	120	202	60	200	60	206	60	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	979	1,566	2,545	1,099	354
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	979	1,566	2,545	1,099	354

	Highest Voltage Under Normal Condition @ 500kV level
	Highest Voltage Under Normal Condition @ 220kV level
	Lowest Voltage Under Normal Condition @ 500kV level
	Lowest Voltage Under Normal Condition @ 220kV level

17. 220kV Grid Station NEW KOT LAKHPAT

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV NKLP - BDR - 1 & 2	2294	1778	562	415	231	Nil	Nil	Nil	Nil	Nil	Nil	232	90	Nil	Nil	185	90	180	150	193	210	195	150	197	1,410
N-1		Nil	Nil	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	197	90	Nil	Nil
Normal	220 kV NKLP - SKP Ckt	1059	975	609	502	266	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	186	90	182	90	190	90	196	90	192	690
N-1		Nil	Nil	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	197	90	Nil	Nil
Normal	220 kV NKLP - SNR Ckt	691	582	281	186	158	Nil	Nil	Nil	Nil	232	90	Nil	Nil	Nil	Nil	187	150	185	90	198	210	198	90	196	####
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV NKLP - New Lahore Ckt I & II	691	1,302	335	285	129	Nil	Nil	Nil	Nil	233	90	238	90	Nil	Nil	188	90	181	90	196	270	196	690	196	1,110
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	4735	4637	1,787	1,388	784
Total No. of Variations (N-1)	Nil	Nil	Nil	2	Nil
Total (Normal & N-1)	4735	4637	1787	1388	784

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

18. 500 kV Grid Station Nokhar

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV New Gakkhar - Rawat I & II	56	42	45	103	80	536	120	534	180	531	120	538	240	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV New Gakkhar - Lahore (SKP)	28	21	136	103	80	536	120	534	180	538	120	538	240	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV New Gakkhar - New Lahore	28	21	136	103	80	536	120	534	180	538	120	538	240	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV New Gakkhar - Neelum Jhelum	Nil	42	136	103	53	Nil	Nil	534	180	538	120	538	240	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV New Gakkhar - Karot P P	Nil	Nil	6	91	77	Nil	Nil	Nil	Nil	538	120	538	240	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Nokhar - HVDC I & II	NP	NP	NP	NP	62	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	541	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV New Gakkhar - Old Gakkhar	245	161	533	513	348	240	120	238	180	240	120	242	360	243	180	202	270	201	120	Nil	Nil	195	150	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV New	Nil	161	533	512	348	Nil	Nil	238	120	240	120	242	360	243	180	Nil	Nil	201	120	Nil	Nil	195	150	Nil	Nil

18. 500 kV Grid Station Nokhar

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1	Gakkhar - Gujrat	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV New Gakkhar - Lahore North	Nil	Nil	Nil	Nil	7	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	535	240	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	357	448	1525	1528	1,135
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	357	448	1525	1528	1,135

	Highest Voltage Under Normal Condition @500kV level
	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level

19. 220kV Grid Station Ravi

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Ravi - Atlas Power House	492	743	97	59	15	Nil	Nil	Nil	Nil	Nil	Nil	232	90	Nil	Nil	194	90	191	150	199	210	200	90	202	180
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Ravi - Kala Shah Kaku	697	994	205	172	51	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	193	90	190	210	195	90	200	210	202	1440
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Ravi - Sheikhpura	406	710	59	29	32	Nil	Nil	Nil	Nil	Nil	Nil	233	90	Nil	Nil	192	210	188	150	200	330	201	60	202	570
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Ravi - Lahore North	Nil	Nil	Nil	Nil	2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	202	240
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Ravi - Shalamar	620	1046	177	85	69	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	195	90	186	90	198	270	200	150	202	1440
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	2215	3493	538	345	169
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	2215	3493	538	345	169

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level

20. 220kV Grid Station Sialkot

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit						Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	220 kV Sialkot - Gakkhar	1,174	1,410	721	429	186	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	330	180	330	190	210	198	210	191	1,410	
N-1		Nil	4	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	190	150	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Sialkot - Kala Shah Kaku	1,176	1,409	733	415	186	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	210	180	330	190	210	198	210	191	1,410	
N-1		Nil	10	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	190	540	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	2,350	2,819	1,454	844	372
Total No. of Variations (N-1)	Nil	14	Nil	Nil	Nil
Total (Normal & N-1)	2,350	2,833	1,454	844	372

	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

21. 220kV Grid Station Shalamar

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Shalamar - Ravi	949	996	614	454	307	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	182	120	178	90	190	90	192	90	186	990
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shalamar - Ghazi Road	953	901	618	458	313	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	182	120	180	60	190	90	192	90	186	990
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	196

Total No. of Variations (Normal)	1,902	1,897	1,232	912	620
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1,902	1,897	1,232	912	620



Lowest Voltage Under Normal Condition @220kV level

Lowest Voltage Under N-1 Condition @220kV level

22. 220kV Grid Station Sarfraznagar

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Sarfraz Nagar - New Kot Lakhpat	1,556	1,853	1,445	1,067	310	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	176	210	172	120	185	60	189	60	188	1,440
N-1		Nil	Nil	5	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	190	420	Nil	Nil	194	720
Normal	220 kV Sarfraz Nagar - Okara-I&II	1,518	1,877	1,498	1,065	321	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	176	210	172	120	185	60	191	60	188	1,440
N-1		Nil	Nil	17	Nil	2	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	184	30	Nil	Nil	193	300
Normal	Sarfraz Nagar-Ghazi Road	1,532	1,853	1,464	1,051	308	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	176	210	172	120	185	60	189	60	188	1,440
N-1		Nil	Nil	12	Nil	1	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	184	30	Nil	Nil	193	300

Total No. of Variations (Normal)	4,606	5,583	4,407	3,183	939
Total No. of Variations (N-1)	Nil	Nil	34	Nil	4
Total (Normal & N-1)	4,606	5,583	4,441	3,183	943

	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

23. 220kV Grid Station WAPDA TOWN LAHORE

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Wapda Town - Sheikhpura	639	485	210	65	42	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	190	90	187	90	196	150	202	30	200	390
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Wapda Town - New Lahore	599	452	202	71	43	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	190	90	188	90	196	150	202	90	200	390
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1,238	937	412	136	85
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1,238	937	412	136	85

Lowest Voltage Under Normal Condition @220kV level

24. 220kV Grid Station YOUSAFWALA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Yousafwala - Lahore	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
N-1		NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
Normal	500 kV Yousafwala - Multan	NP	441	826	344	370	NP	NP	539	60	545	60	544	90	555	150	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Yousafwala - CFPP	NP	NP	1,117	436	455	Nil	Nil	NP	NP	542	60	546	90	557	150	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Yousafwala - SNR	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
N-1		NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
Normal	220 kV Yousafwala-Gatti - I & II	NP	1,680	329	211	89	NP	NP	239	60	237	60	240	240	244	90	NP	NP	196	120	198	120	202	120	200	150
N-1		NP	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Yousafwala-Kassowal - I & II	NP	1,726	398	217	105	NP	NP	237	60	235	60	238	240	242	90	NP	NP	194	120	198	120	199	120	198	150
N-1		NP	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Yousafwala - CFPP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
N-1		NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP
Normal	220 kV Yousafwala-	NP	1,606	323	209	67	NP	NP	238	60	236	60	239	300	243	90	NP	NP	195	120	198	120	200	120	199	150

24. 220kV Grid Station YOUSAFWALA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1	Okara - I & II	NP	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

NP: Not Provided

Total No. of Variations (Normal)	Nil	5,453	2,993	1,417	1,086
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	5,453	2,993	1,417	1,086

	Highest Voltage Under Normal Condition 500kV level
	Highest Voltage Under Normal Condition 220kV level
	Lowest Voltage Under Normal Condition 220kV level

25. 220kV Grid Station OKARA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220kV Okara - Sarfraz Nagar CCT I & II	100	300	303	321	205	Nil	Nil	237	240	239	30	239	390	243	150	195	1,440	186	1,440	191	1,200	194	600	194	480
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220kV Okara - Yousafwala CCT I & II	104	306	303	288	205	Nil	Nil	237	240	239	30	239	300	243	150	195	1440	186	1440	191	1200	194	600	194	480
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	204	606	606	609	410
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	204	606	606	609	410

Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

26. 220kV Grid Station KASSOWAL

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Kassowal-Vehari Circuits I & II	72	600	260	239	422	239	60	244	60	241	60	242	120	249	150	197	60	188	60	182	60	195	60	185	210
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Kassowal-Yousafwala - I & II	72	600	260	238	422	239	60	244	60	241	60	242	120	249	150	197	60	188	60	182	60	195	60	185	210
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	144	1,200	520	477	844
Total No. of Variations (N-1)	0	Nil	Nil	Nil	Nil
Total (Normal & N-1)	144	1,200	520	477	844

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level



Voltage violations data - detailed circuit wise analysis

NGC Multan Region

1. 500 kV D. G. Khan
2. 500 kV Multan
3. 500 kV Muzaffargarh
4. 220 kV Muzaffargarh
5. 500 kV Rahim Yar Khan
6. 220 kV Bahawalpur
7. 220 kV Chishtian
8. 220 kV Lal Sohanra
9. 220 kV Vehari
10. 500 kV TPS Muzaffargarh
11. 220 kV NGPS

1. 500kV Grid Station D.G. KHAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	500 kV D.G. Khan - Guddu	21	18	15	307	467	560	60	564	60	566	60	558	#####	555	1,440	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	NIL	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
Normal	220 kV D.G. Khan - Loralai cct I & II	156	200	117	428	496	250	60	252	60	247	180	250	600	251	240	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
N-1		Nil	Nil	Nil	NIL	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil		
Normal	500 kV D.G. Khan - Muzaffargarh	Added in 2021-22	5	1	317	467	Added in 2021-22		559	60	553	60	559	#####	555	1,440	Added in 2021-22		Nil	Nil	Nil	Nil	Nil	Nil	Nil		
N-1		Nil	Nil	NIL	Nil	Nil			Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil			Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Added in 2021-22		\																									

Total No. of Variations (Normal)	177	223	133	1,052	1,430
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	177	223	133	1,052	1,430

Highest Voltage Under Normal Condition @500kV level

Highest Voltage Under Normal Condition @200kV level

2. 500kV Grid Station MULTAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Multan - Muzaffargarh	NA	NIL	NIL	654	889	NA	NA	NIL	NIL	NIL	NIL	545	#####	558	360	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NA	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	500 kV Multan - Yousafwala	NP	NP	826	NIL	NP	NP	NP	NP	NP	545	60	NP	NP	NP	NP	NP	NP	NP	NP	NP	NIL	NIL	NP	NP	NP
N-1		NP	NP	NIL	NIL	NP	NP	NP	NP	NP	NIL	NIL	NP	NP	NP	NP	NP	NP	NP	NP	NP	NIL	NIL	NP	NP	NP
Normal	500 kV Multan - Rousch	NP	NP	Nil	394	458	NP	NP	NP	NP	Nil	Nil	580	180	558	1,140	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	Nil	NIL	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Multan - R Y Khan	NA	NIL	NIL	411	645	NA	NA	NIL	NIL	NIL	NIL	547	1080	558	360	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NA	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	500 kV Multan - HBS	NP	NP	Nil	128	683	NP	NP	NP	NP	Nil	Nil	540	180	550	240	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	Nil	NIL	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Multan - Sahiwal	Nil	Nil	Nil	Nil	133	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	551	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Multan - Muzaffargarh 1	NA	NIL	NIL	201	32	NA	NA	NIL	NIL	NIL	NIL	240	690	242	1,440	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NA	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	220 kV Multan -	6	6	19	263	644	252	180	249	240	249	60	246	#####	NP	NP	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil

2. 500kV Grid Station MULTAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1	Muzaffargarh 2	NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	NP	NP	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	220 kV Multan - Muzaffargarh 3	3	4	1	271	382	246	120	NIL	NIL	246	120	244	#####	240	1,440	NA	NA	208	450	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	220 kV Multan - Muzaffargarh 4	NA	NIL	NIL	86	32	NA	NA	NIL	NIL	NIL	NIL	240	150	242	1,440	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NA	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	220 kV Multan - New Mgarh	NIL	NIL	NIL	NIL	454	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	248	1,440	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil
Normal	220 kV Multan - Kapco 3 & 4	28	NIL	5	293	558	252	150	NIL	NIL	246	60	248	#####	245	1,440	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil
Normal	220 kV Multan - Kapco 5 & 6	NA	2	NIL	280	131	NA	NA	247	270	NIL	NIL	NIL	NIL	244	1,440	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NA	NIL	NIL	NIL	Nil	NA	NA	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
Normal	220 kV Multan - NGPS 1 & 2	2	NIL	NIL	523	914	246	90	NIL	NIL	NIL	NIL	244	#####	248	1,440	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil
Normal	220 kV Multan - Vehari 1 & 2	12	6	NIL	583	872	250	290	250	240	NIL	NIL	246	240	242	180	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil

2. 500kV Grid Station MULTAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Multan - T.T. Singh 1 & 2	4	6	NIL	566	855	246	90	245	300	NIL	NIL	245	450	248	1,440	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil
N-1		NIL	NIL	NIL	NIL	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil	NIL	NIL	NIL	NIL	NIL	NIL	Nil	Nil	Nil	Nil

NP: Not Provided

Total No. of Variations (Normal)	55	24	851	4,653	7,682
Total No. of Variations (N-1)	NIL	NIL	NIL	NIL	NIL
Total (Normal & N-1)	55	24	851	4,653	7,682

	Highest Voltage Under Normal Condition @500kV level
	Highest Voltage Under Normal Condition @200kV level

3. 500kV Grid Station MUZAFFARGARH

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Muzaffargarh - HBS	NA	NIL	NP	NP	72	NA	NA	NIL	NIL	NP	NP	NP	NP	546	60	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil
N-1		NA	NIL	NP	NP	Nil	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil
Normal	500 kV Muzaffargarh - Guddu	Nil	Nil	Nil	NP	85	Nil	Nil	Nil	Nil	Nil	NP	NP	548	60	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	
N-1		Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	
Normal	500 kV Muzaffargarh - Multan	NA	NIL	NIL	NP	170	NA	NA	NIL	NIL	NIL	NP	NP	545	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	
Normal	500 kV Muzaffargarh - Guddu 747	NA	NIL	NIL	NP	76	NA	NA	NIL	NIL	NIL	NP	NP	547	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	
Normal	220 kV Muzaffargarh-D.G Khan	NA	NIL	NIL	NP	82	NA	NA	NIL	NIL	NIL	NP	NP	547	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	

NP: Not Provided NA: Not Applicable

Total No. of Variations (Normal)	NIL	NIL	NIL	NIL	485
Total No. of Variations (N-1)	NIL	NIL	NIL	NIL	NIL
Total (Normal & N-1)	NIL	NIL	NIL	NIL	485

 Highest Voltage Under Normal Condition @500kV level

4. 220kV Grid Station MUZAFFARGARH

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV Muzaffargarh - TPS Phase	165	162	166	126	17	248	60	247	540	249	600	248	180	241	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	69	9	10	16	Nil	Nil	250	300	248	180	249	90	248	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Muzaffargarh - Multan	164	150	188	55	20	248	60	241	540	241	720	241	420	241	60	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil
N-1		Nil	81	8	NIL	15	Nil	Nil	250	300	250	420	Nil	Nil	248	60	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil

Total No. of Variations (Normal)	329	312	354	181	37
Total No. of Variations (N-1)	Nil	150	17	10	31
Total (Normal & N-1)	329	462	371	191	68

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level

5. 500kV Grid Station RAHIM YAR KHAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Guddu 747 - RY Khan	NA	Nil	Nil	132	309	NA	NA	Nil	Nil	Nil	Nil	549	570	553	1,380	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NA	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV Multan - RY Khan	NA	Nil	Nil	300	309	NA	NA	Nil	Nil	Nil	Nil	549	1,350	553	1,380	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NA	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV RY Khan - Moro	Added in 2022-23		Nil	134	309	Added in 2022-23				Nil	Nil	552	1,350	553	1,380	Added in 2022-23				1,350	Nil	Nil	Nil	Nil	Nil
N-1				Nil	1	Nil					Nil	Nil	Nil	Nil	Nil	Nil					Nil	Nil	Nil	Nil	Nil	Nil

NA: Not applicable

Total No. of Variations (Normal)	Nil	Nil	Nil	566	927
Total No. of Variations (N-1)	Nil	Nil	Nil	1	Nil
Total (Normal & N-1)	Nil	Nil	Nil	567	927

 Highest Voltage Under Normal Condition @500kV level

6. 220kV Grid Station BAHAWALPUR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Bahawalpur - TPS Muzaffargarh Ckt I & II	660	948	473	166	164	252	30	242	120	243	60	242	30	247	150	Nil	Nil	195	30	199	30	199	30	Nil	Nil
N-1		108	200	3	Nil	2	247	60	250	120	244	30	Nil	Nil	245	1,380	192	30	196	60	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Bahawalpur - Lal Sohanra Ckt I & II	59	306	161	12	108	240	60	241	90	242	30	238	90	239	480	201	60	195	30	Nil	Nil	Nil	Nil	Nil	Nil
N-1		6	48	4	Nil	0	245	30	Nil	Nil	244	30	Nil	Nil	241	570	195	30	196	60	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	719	1254	634	178	272
Total No. of Variations (N-1)	114	248	7	Nil	2
Total (Normal & N-1)	833	1502	641	178	274

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

7. 220kV Grid Station CHISHTIAN

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Chishtian - Vehari Ckt I & II	2,389	4,192	2,898	1,496	438	249	150	246	120	244	30	242	540	242	480	194	120	182	30	199	120	199	120	198	1,140
N-1		83	862	312	171	8	247	30	245	30	247	30	243	180	Nil	Nil	Nil	Nil	179	60	164	30	176	30	180	180

Total No. of Variations (Normal)	2,389	4,192	2,898	1,496	438
Total No. of Variations (N-1)	83	862	312	171	8
Total (Normal & N-1)	2,472	5,054	3,210	1,667	446

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

8. 220kV Grid Station LAL SOHANRA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Lal Sohanra - BWP Ckt I & II	167	188	93	54	332	250	60	248	30	241	60	242	90	251	1,110	Nil	Nil	202	60	205	60	Nil	Nil	Nil	Nil
N-1		41	14	6	1	77	250	30	245	60	248	60	247	60	252	270	194	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	167	188	93	54	332
Total No. of Variations (N-1)	41	14	6	1	77
Total (Normal & N-1)	208	202	99	55	409

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

9. 220kV Grid Station VEHARI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Vehari - Multan Ckt I & II	639	616	689	569	491	249	270	241	270	241	150	246	90	242	510	Nil	Nil	190	210	200	90	200	90	195	150
N-1		3	257	64	2	Nil	241	270	246	150	246	270	244	90	Nil	Nil	Nil	Nil	190	210	185	60	Nil	Nil	Nil	Nil
Normal	220 kV Vehari - Kassowal Ckt I & II	633	668	726	468	270	249	270	242	270	241	150	244	60	242	510	Nil	Nil	190	210	200	330	200	90	185	60
N-1		5	213	86	1	Nil	241	270	247	150	246	270	244	90	Nil	Nil	Nil	Nil	Nil	Nil	180	90	Nil	Nil	Nil	Nil
Normal	220 kV Vehari - Chishtian Ckt I & II	377	464	427	292	87	249	270	241	270	241	150	241	600	237	150	Nil	Nil	190	210	200	330	200	90	185	60
N-1		2	61	56	Nil	Nil	241	41	247	150	246	270	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	180	90	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1649	1,748	1,842	1,329	848
Total No. of Variations (N-1)	10	531	206	3	Nil
Total (Normal & N-1)	1,659	2,279	2,048	1,332	848

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

10. 500kV Grid Station MUZAFFARGARH

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Muzaffargarh - HBS	NA	NIL	NP	NP	72	NA	NA	NIL	NIL	NP	NP	NP	NP	546	60	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil
N-1		NA	NIL	NP	NP	Nil	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NP	NP	NP	NP	Nil	Nil
Normal	500 kV Muzaffargarh - Guddu	Nil	Nil	Nil	NP	85	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	548	60	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil
N-1		Nil	Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil
Normal	500 kV Muzaffargarh - Multan	NA	NIL	NIL	NP	170	NA	NA	NIL	NIL	NIL	NIL	NP	NP	545	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil
Normal	500 kV Muzaffargarh - Guddu 747	NA	NIL	NIL	NP	76	NA	NA	NIL	NIL	NIL	NIL	NP	NP	547	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil
Normal	220 kV Muzaffargarh-D.G Khan	NA	NIL	NIL	NP	82	NA	NA	NIL	NIL	NIL	NIL	NP	NP	547	60	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil
N-1		NA	NIL	NIL	NP	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil	NA	NA	NIL	NIL	NIL	NIL	NP	NP	Nil	Nil

NP: Not Provided NA: Not Applicable

Total No. of Variations (Normal)	NIL	NIL	NIL	NIL	485
Total No. of Variations (N-1)	NIL	NIL	NIL	NIL	NIL
Total (Normal & N-1)	NIL	NIL	NIL	NIL	485

 Highest Voltage Under Normal Condition @500kV level

11. 220kV Grid Station NGPS Multan

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220KV NGPS - Multan I & II	Nil	Nil	Nil	Nil	857	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	249	360	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	Nil	Nil	Nil	Nil	857
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	Nil	Nil	857

 Highest Voltage Under Normal Condition @220kV level



APPENDIX 4

Voltage violations data - detailed circuit wise analysis

NGC Hyderabad Region

1. 500 kV Dadu
2. 500 kV Guddu
3. 500 kV 747 MW Guddu
4. 500 kV Jamshoro
5. 500 kV NKI
6. 500 kV Shikarpur
7. 220 kV Daharki
8. 220 kV Hala Road
9. 220 kV Rohri
10. 220 kV T. M. Khan Road
11. 220 kV Jhampir-I
12. 220 kV Jhampir-II
13. 220 kV kV Switchyard Guddu
14. 500kV Grid Station Moro

1. 500kV Grid Station DADU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Dadu - Jamshoro	3	1	6	330	55	535	60	530	60	535	120	545	60	538	270	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Dadu - Guddu I	NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil
N-1		NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil
Normal	500 kV Dadu - Guddu II	NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil
N-1		NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil
Normal	500 kV Dadu - Shikarpur I	3	1	6	338	55	535	60	530	60	535	120	545	60	538	270	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Dadu - Shikarpur II	3	1	6	334	55	535	60	530	60	535	120	545	60	538	270	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Dadu - Port Qasim	2	NP	NP	NP	Nil	530	60	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	Nil
N-1		Nil	NP	NP	NP	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	Nil
Normal	500 kV Dadu - Moro	3	1	6	339	55	535	60	530	60	535	120	545	60	538	270	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Dadu - Khuzdar I	19	3	7	154	20	240	240	240	60	240	60	240	180	235	90	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

1. 500kV Grid Station DADU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Dadu - Khuzdar II	19	3	7	87	25	240	240	240	60	240	60	240	90	235	90	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV Dadu - Matiari	1	NP	6	333	54	535	60	NP	NP	535	120	545	60	538	270	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	NP	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	
NP:	Not provided																										

Total No. of Variations (Normal)	53	10	44	1,915	319
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	53	10	44	1,915	319

 Highest Voltage Under Normal Condition @500kV level
 Highest Voltage Under Normal Condition @220kV level

2. 500kV Grid Station GUDDU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	500 kV Guddu - Dadu I	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
N-1		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Normal	500 kV Guddu - Dadu II	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
N-1		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Normal	500 kV Guddu - D.G. Khan (Old Multan)	33	41	333	1,041	880	538	360	540	60	540	960	543	300	544	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Guddu - 747 MW CCPP Guddu	9	30	341	3,203	878	538	180	539	120	540	960	549	60	544	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Guddu - Muzaffargarh	23	29	320	1,030	933	538	360	538	360	540	240	544	120	543	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Guddu - Shikarpur I	20	18	306	1,018	900	538	120	538	120	540	540	544	180	543	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Guddu - Shikarpur II	29	47	346	1,146	888	538	120	539	120	540	960	542	300	544	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Guddu -	NP	NP	375	NP	NP	NP	NP	NP	NP	241	120	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP

2. 500kV Grid Station GUDDU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)											
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25			
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1	Sibbi (D/Ckt)	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP		
Normal	220 kV Guddu - Uch (P/H)	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP		
N-1		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP		
NP:	Not provided																											

Total No. of Variations (Normal)	114	165	2,021	7,438	4,479
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	114	165	2,021	7,438	4,479



Highest Voltage Under Normal Condition @500kV level

3. 500kV Grid Station 747 MW GUDDU

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)																														
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25																						
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time																			
Normal	500KV 747MW Guddu-OLD Guddu	Added in 2023	4,181	5,882	5143	Added in 2023																																									
N-1			Nil	Nil	Nil																						Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV 747MW Guddu - Muzaffargarh		2,960	4,924	4355																						546	60	551	60	548	60	Nil														
N-1			Nil	Nil	Nil																						Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500KV 747MW Guddu- Rahim yar Khan		2,988	7,444	5065																						546	60	551	60	548	60	Nil														
N-1			Nil	Nil	Nil																						Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Added in 2023																																															

Total No. of Variations (Normal)	Nil	Nil	10,129	18,250	14,563
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	10,129	18,250	14,563

 Highest Voltage Under Normal Condition @500kV level

4. 500kV Grid Station JAMSHORO

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2022-23		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Jamshoro - Dadu I	8	12	NP	Nil	NP	530	60	539	30	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	NP	Nil	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Dadu II	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Dadu New	Nil	Nil	143	1,222	602	Nil	Nil	Nil	Nil	537	90	543	60	539	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 KV Jamshoro-NKI	3	7	49	671	315	531	60	540	30	533	90	541	120	536	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Hub (D/Ckt)	3	11	NP	Nil	NP	525	60	528	30	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	NP	Nil	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Port Qasim	6	NP	NP	Nil	NP	534	60	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	NP	NP	Nil	NP	Nil	Nil	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Thar Engro	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500kV K2/K3 - Jamshoro	1	6	206	2,200	754	529	60	530	60	538	30	543	60	539	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

4. 500kV Grid Station JAMSHORO

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2022-23		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500kV CPHGC - Jamshoro	3	4	167	1,541	599	530	60	530	60	538	30	545	30	539	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Jamshoro - KDA33 - I	928	2,049	NP	Nil	NP	242	60	242	60	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	NP	Nil	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Jamshoro - KDA33 - II	928	2,049	NP	Nil	NP	242	60	242	60	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	NP	Nil	NP	Nil	Nil	Nil	Nil	NP	NP	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220kV Jamshoro-Hala Road- I & II	2,268	5,093	1,493	2,017	653	244	60	250	30	254	60	253	60	245	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Jamshoro - T.M.Khan Road I & II	1,926	5,972	1,740	2,298	1,128	244	60	245	60	243	180	245	180	245	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Jamshoro - Jhampir 2 Ckt- I & II	Nil	986	1,531	2,309	692	Nil	Nil	240	60	244	60	245	60	262	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Jamshoro - Matiar - I	3	15	206	1,481	586	528	60	540	30	537	30	543	120	540	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

4. 500kV Grid Station JAMSHORO

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2022-23		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV Jamshoro - Matiari - II	9	16	247	1,685	679	532	60	540	30	535	90	544	120	540	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

NP: Not Provided

Total No. of Variations (Normal)	6,086	16,220	5,782	15,424	6,008
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	6,086	16,220	5,782	15,424	6,008

 Highest Voltage Under Normal Condition @500kV level
 Highest Voltage Under Normal Condition @200kV level

5. 500kV Grid Station NKI KARACHI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	500 kV NKI - Hub	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	
N-1		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	
Normal	500 kV NKI - Port Qasim	NA	NP	NP	NP	NP	NA	NA	NP	NP	NP	NP	NP	NP	NP	NP	NA	NA	NP	NP	NP	NP	NP	NP	NP	
N-1		NA	NP	NP	NP	NP	NA	NA	NP	NP	NP	NP	NP	NP	NP	NP	NA	NA	NP	NP	NP	NP	NP	NP	NP	
Normal	500 kV NKI - Jamshoro	NA	NA	46	2,028	15	NA	NA	NA	NA	539	60	543	30	530	90	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
N-1		NA	NA	Nil	NP	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV NKI - Baldia	NA	NA	18	1,051	17	NA	NA	NA	NA	238	300	238	30	234	60	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
N-1		NA	NA	Nil	NP	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV NKI - KDA33	NA	NA	18	1,051	17	NA	NA	NA	NA	238	300	238	30	234	60	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
N-1		NA	NA	Nil	NP	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
Normal	500 kV NKI - K2/K3	NA	NA	41	2,019	14	NA	NA	NA	NA	539	60	543	30	530	90	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	
N-1		NA	NA	Nil	NP	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	NA	NA	Nil	Nil	Nil	Nil	Nil	

NP: Not Provided

Total No. of Variations (Normal)	Nil	Nil	123	6,149	63
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	123	6,149	63

 Highest Voltage Under Normal Condition @500kV level
 Highest Voltage Under Normal Condition @220kV level

6. 500kV Grid Station SHIKARPUR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	500 kV Shikarpur - Guddu Ckt I	827	1,051	822	737	590	550	180	543	120	543	180	549	180	546	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Shikarpur - Guddu Ckt II	828	1,035	845	843	591	550	180	543	120	543	180	549	180	546	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Shikarpur - Dadu Ckt I	832	1,043	849	723	588	550	180	543	120	543	180	549	180	546	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	500 kV Shikarpur - Dadu Ckt II	829	1,034	819	741	583	550	180	543	120	543	180	549	180	546	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Guddu Ckt I	1,249	1,486	1,472	1,853	1,100	245	180	242	150	242	180	247	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Guddu Ckt II	1,099	1,439	125	1,603	1,107	248	120	242	180	241	120	248	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Uch Ckt I	1,278	1,529	1,544	1,591	1,112	245	180	242	150	242	240	248	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Uch Ckt II	1,131	1,595	1,602	1,612	1,116	248	120	242	150	243	120	248	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

6. 500kV Grid Station SHIKARPUR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Rohri I	1,107	1,644	1,595	1,594	1,099	247	120	242	180	243	120	248	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Shikarpur - Rohri II	1,131	1,638	1,601	1,591	1,104	248	120	242	180	243	120	248	120	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	10,311	13,494	11,274	12,888	8,990
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	10,311	13,494	11,274	12,888	8,990

 Highest Voltage Under Normal Condition @500kV level
 Highest Voltage Under Normal Condition @220kV level

7. 220kV Grid Station DAHARKI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	220 kV Dharki - Engro	589	620	620	1,057	1,267	251	60	247	60	254	60	246	180	250	60	NA	NA	200	120	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220 kV Ddharki - FPCDL	589	625	625	1,059	1,267	252	120	247	60	254	60	246	180	250	60	NA	NA	200	120	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	1,178	1,245	1,245	2,116	2,534
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1,178	1,245	1,245	2,116	2,534

Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

8. 220kV Grid Station HALA ROAD

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Jamshoro - Hala Road Ckt I & II	2	NA	1	230	647	240	30	NA	NA	245	90	245	180	240	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	NA	NA	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	2	Nil	1	230	647
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	2	Nil	1	230	647

 Highest Voltage Under Normal Condition @220kV level

9. 220kV Grid Station ROHRI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
		Normal	220 kV Rohri - Shikarpur I&II	1088	2552	1541	1880	1561	247	60	244	120	248	120	246	120	247	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1	Nil	Nil		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Rohri - Engro I & II	412	2552	1525	1896	1561	247	120	244	120	248	120	246	120	247	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1500	5104	3066	3776	3122
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1500	5104	3066	3776	3122

 Highest Voltage Under Normal Condition @220kV level

10. 220kV Grid Station T.M. KHAN ROAD

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV T.M.Khan - Jamshoro I & II	912	1186	707	1008	1134	245	60	242	60	243	60	243	60	242	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV T.M.Khan - Jhimpir I & II	912	1186	722	937	1132	245	60	242	60	243	60	242	60	242	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	1824	2372	1429	1945	2266
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	1824	2372	1429	1945	2266

 Highest Voltage Under Normal Condition @220kV level

11. 220kV Grid Station JHIMPIR-I

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Jhampir - T.M.Khan I & II	202	410	202	4505	2810	249	60	246	60	246	60	245	60	243	120	Nil	Nil	Nil	Nil	202	60	137	60	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV JMP I - JMP-II	Nil	Nil	101	3676	1414	Nil	Nil	Nil	Nil	246	60	245	60	243	120	Nil	Nil	Nil	Nil	202	60	137	60	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	202	410	303	8181	4224
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	202	410	303	8181	4224

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

12. 220kV Grid Station JHIMPIR-II

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Jhimpir II - Jamshoro 1 & 2	Nil	Nil	137	336	234	Nil	Nil	Nil	Nil	248	60	244	60	244	60	Nil	Nil	Nil	Nil	203	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Jhimpir-II-Dhabeji	Nil	Nil	Nil	Nil	11	Nil	Nil	Nil	Nil	Nil	Nil	Nil	244	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV Jhimpir 2 - KDA-1 & 2	Nil	Nil	137	328	234	Nil	Nil	Nil	Nil	248	60	244	60	244	60	Nil	Nil	Nil	Nil	203	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Jhimpir 2 - Jhimpir I	Nil	Nil	122	157	117	Nil	Nil	Nil	Nil	248	60	244	60	244	60	Nil	Nil	Nil	Nil	203	60	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	Nil	Nil	396	821	596
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	396	821	596

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

13. 220kV Grid Station Switchyard Guddu

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit																									
		Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)															
		2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25							
		Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time		
Normal	220kV Guddu-Shikarpur-I	Nil	Nil	1474	1530	1372	Nil	Nil	Nil	Nil	242	240	246	120	244	180	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220kV Guddu-Shikarpur-II	Nil	Nil	125	1378	1530	Nil	Nil	Nil	Nil	241	120	247	210	246	120	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
Normal	220kV Guddu-Sibbi D/Circuit	Nil	Nil	1541	1448	823	Nil	Nil	Nil	Nil	242	240	246	120	243	300	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	

Total No. of Variations (Normal)	Nil	Nil	3,140	4,356	3,725
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	Nil	3,140	4,356	3,725

 Highest Voltage Under Normal Condition @220kV level

14. 500kV Grid Station Moro

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)										
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25		
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage
Normal	500 kV Moro - Matiari	NP	NP	NP	NP	359	NP	NP	NP	NP	NP	NP	NP	NP	NP	545	60	NP	NP								
N-1		NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP								
Normal	500 kV Moro - Dadu	NP	NP	NP	NP	363	NP	NP	NP	NP	NP	NP	NP	NP	NP	545	60	NP	NP								
N-1		NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP								
Normal	500 kV Moro-Rahim yar Khan	NP	NP	NP	NP	266	NP	NP	NP	NP	NP	NP	NP	NP	NP	545	60	NP	NP								
N-1		NP	NP	NP	NP	Nil	NP	NP	NP	NP	NP	NP	NP	NP	NP	Nil	Nil	NP	NP								

Total No. of Variations (Normal)	NP	NP	NP	NP	988
Total No. of Variations (N-1)	NP	NP	NP	NP	Nil
Total (Normal & N-1)	NP	NP	NP	NP	988

 Highest Voltage Under Normal Condition @500kV level



Voltage violations data - detailed circuit wise analysis

NGC Quetta Region

1. 220 kV Dera Murad Jamali
2. 220 kV Khuzdar
3. 220 kV Loralai
4. 220 kV Quetta
5. 220 kV Sibbi

1. 220kV Grid Station Dera Murad Jamali

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
N-1	220 kV D. M. Jamali - Uch	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal		Nil	1671	750	2846	1978	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	248	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV D. M. Jamali - Sibbi	Nil	1604	747	2846	1978	Nil	Nil	241	60	243	60	256	60	248	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

 Highest Voltage Under Normal Condition @220kV level

Total No. of Variations (Normal)	Nil	3275	1497	5692	3956
Total No. of Variations (N-1)	Nil	Nil	Nil	Nil	Nil
Total (Normal & N-1)	Nil	3275	1497	5692	3956

2. 220kV Grid Station KHUZDAR

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Dadu - Khuzdar I & II	2772	3520	1100	755	164	250	60	245	60	248	60	248	60	245	60	Nil	Nil	178	60	175	60	180	35	190	120
N-1		Nil	Nil	Nil	2	6	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	195	30	190	60

Total No. of Variations (Normal)	2,772	3,520	1,100	755	164
Total No. of Variations (N-1)	Nil	Nil	Nil	2	6
Total (Normal & N-1)	2,772	3,520	1,100	757	170

	Highest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

3. 220kV Grid Station LORALAI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Loralai - D.G. Khan I & II	1930	3138	1324	1737	985	245	60	256	120	247	120	270	60	260	120	Nil	Nil	198	60	198	180	137	60	Nil	Nil
N-1		134	128	880	172	78	250	60	255	60	260	60	258	180	258	60	Nil	Nil	190	120	189	60	188	60	195	60

Total No. of Variations (Normal)	1,930	3,138	1,324	1,737	985
Total No. of Variations (N-1)	134	128	880	172	78
Total (Normal & N-1)	2,064	3,266	2,204	1,909	1,063

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220 kV level
	Lowest Voltage Under N-1 Condition @220 kV level

4. 220kV Grid Station QUETTA

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Sibbi - Quetta Ckt I & II	12011	1948	1948	2474	3180	239	60	242	60	248	60	254	60	249	120	180	60	170	60	180	60	175	60	180	60
N-1		3023	Nil	Nil	749	52	245	60	Nil	Nil	Nil	Nil	Nil	Nil	246	120	170	60	168	60	Nil	Nil	175	60	180	60

Total No. of Variations (Normal)	12,011	1,948	1,948	2,474	3,180
Total No. of Variations (N-1)	3,023	Nil	Nil	749	52
Total (Normal & N-1)	15,034	1,948	1,948	3,223	3,232

	Highest Voltage Under Normal Condition @220kV level
	Highest Voltage Under N-1 Condition @220kV level
	Lowest Voltage Under Normal Condition @220kV level
	Lowest Voltage Under N-1 Condition @220kV level

5. 220kV Grid Station SIBBI

Condition	Name of Transmission Circuit(s) violating the voltage criteria	Total Number / Times violating the limit					Highest Voltage Recorded (kV) / Time (Min)										Lowest Voltage Recorded (kV) / Time (Min)									
		2020-21	2021-22	2022-23	2023-24	2024-25	2020-21		2021-22		2022-23		2023-24		2024-25		2020-21		2021-22		2022-23		2023-24		2024-25	
							Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time	Voltage	Time
Normal	220 kV Sibbi Nil Quetta Ckt I&II	1400	1622	1600	3042	1281	243	60	244	60	245	60	245	60	246	60	Nil	Nil	200	120	Nil	Nil	Nil	Nil	206	120
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV UchNilSibbiNil	1160	1557	1355	3095	2385	245	60	246	60	247	60	247	60	248	60	Nil	Nil	200	120	Nil	Nil	Nil	Nil	202	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Sibbi Nil Uch DC Ckt II	1160	1557	NP	Nil	1100	245	60	246	60	NP	NP	NP	NP	248	60	Nil	Nil	200	120	NP	NP	Nil	Nil	Nil	Nil
N-1		Nil	Nil	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	NP	NP	Nil	Nil	Nil	Nil	Nil	Nil	NP	NP	Nil	Nil	Nil	Nil
Normal	220KV GudduNilSibbi	1160	1557	1355	2727	1259	245	60	246	60	247	60	247	60	248	60	Nil	Nil	200	120	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220 kV Sibbi Nil Uch DC Ckt	1160	1557	Nil	Nil	Nil	245	60	246	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	200	120	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV D.M.JamaliNilSibbi	1160	1557	1355	2946	2380	245	60	246	60	247	60	247	60	248	60	Nil	Nil	200	120	Nil	Nil	Nil	Nil	202	60
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV UchNilIII CktNilII	Nil	Nil	1355	2068	Nil	Nil	Nil	Nil	Nil	247	60	247	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Normal	220KV UchNilIII CktNilII	Nil	Nil	1355	1907	Nil	Nil	Nil	Nil	Nil	247	60	247	60	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
N-1		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Total No. of Variations (Normal)	7,200	9,407	8,375	15,785	8,405
Total No. of Variations (NNilI)	Nil	Nil	Nil	Nil	Nil
Total (Normal & NNilI)	7,200	9,407	8,375	15,785	8,405

 Highest Voltage Under Normal Condition @220kV level
 Lowest Voltage Under Normal Condition @220kV level

