



USAID
FROM THE AMERICAN PEOPLE



USAID ENERGY POLICY PROGRAM

PESCO TECHNICAL AUDIT

FINAL REPORT

June 2015

This program is made possible by the support of the American people through the United States Agency for International Development (USAID)

USAID ENERGY POLICY PROGRAM

PESCO TECHNICAL AUDIT

FINAL REPORT

Submission Date: June 22, 2015

Contract No: AID-EPP-I-00-03-00004

Order No: AID-391-TO-12-00002

©USAID Energy Policy Program
House 4, Street 88, Sector G-6/3
Ataturk Avenue, Islamabad, Pakistan
Tel: +92 (51) 835 7072, Fax: +92 (51) 835 7071
Email: tjaved@ep-ep.com.pk

DISCLAIMER

The contents of this report are the sole responsibility of Advanced Engineering Associates International, Inc. (AEAI) and do not necessarily reflect the views of USAID or the United States Government.

CONTENTS

| | |
|---------------------------------|----|
| ACRONYMS..... | 11 |
| INTRODUCTION | 1 |
| FINDINGS..... | 2 |
| Grid Stations..... | 2 |
| Transmission Lines | 3 |
| System Protection | 3 |
| General..... | 4 |
| Training | 4 |
| RECOMMENDATIONS..... | 5 |
| ANNEX I: DETAILED FINDINGS..... | 6 |

LIST OF ANNEX TABLES

| | |
|---|----|
| Table 1: Transformer Loading Overview (132/11.5kV & 132/66kV)..... | 6 |
| Table 2: Transformer Loading Overview (66/11.5kV)..... | 16 |
| Table 3: Transformer Loading Overview (33/11.5kV)..... | 17 |
| Table 4: Transmission Line Loading Overview (132/66kV)..... | 19 |
| Table 5: Transmission Line Loading Overview (66/33kV)..... | 26 |
| Table 6: 132kV and 66kV Circuit Breakers (CB) Overview | 27 |
| Table 7: 66kV and 33kV Circuit Breakers Overview..... | 31 |
| Table 8: Essential Protection Relays for 132kV Power Transformers..... | 32 |
| Table 9: Essential Protection Relays for 66 kV Power Transformers..... | 35 |
| Table 10: Essential Protection Relays for 132kV Transmission Lines..... | 37 |
| Table 11: Essential Protection Relays for 66kV Transmission Lines | 41 |

ACRONYMS

| | |
|-------|---|
| AEAI | Advanced Engineering Associates International, Inc. |
| C&DF | Capacitance and Dissipation Factor |
| CB | Circuit Breaker |
| EPP | Energy Policy Program |
| GOP | Government of Pakistan |
| GS | Grid Station |
| kV | Kilovolt |
| LCM | Leakage Current Measurement |
| NEPRA | National Electric Power Regulatory Authority |
| PESCO | Peshawar Electric Supply Company |
| RPC | Reactive Power Compensation |
| SVC | Static Var Compensator |
| TL | Transmission Line |
| USAID | United States Agency for International Development |

INTRODUCTION

The Energy Policy Program (EPP) is a multi-year, United States Agency for International Development (USAID) funded initiative to increase power generation, diversify the fuel supply, and improve transmission capacity and reliability across Pakistan. EPP works with selected energy enterprises to assist the Government of Pakistan's (GOP) sector reform efforts. The EPP supports the joint goals of the United States Government and GOP in reforming the power sector and is designed to address Pakistan's chronic electricity shortage.

This technical audit report presents the findings observed during detailed inspections of the overall status of Peshawar Electric Supply Company's (PESCO) transmission and grid system components. EPP's team of grid system experts conducted inspections at 82 of the 85 PESCO 132kV, 66kV, and 33kV grid stations and their associated transmission lines. One active grid station (Kurram Garhi 66kV GS) could not be inspected due to security concerns, and two grid stations (Tank 66kV and Abbottabad 66kV) could not be inspected because they had been dismantled by PESCO. The experts performed a detailed technical review and assessment from which this report was prepared. Audits were conducted over the period of January 2013 through November 2014. A questionnaire was developed to gather the information on critical equipment, including power transformers, capacitor banks, circuit breakers, isolators, and their associated essential protection systems. Each grid station was visited by a team of engineers and each piece of equipment was inspected; the data was collected and logged into the form. These forms were designed to identify and record the problems and status of each grid station at the time of the inspection.

The findings of these inspections are intended to be a source for developing asset improvement action plans that include identification of specific improvement projects and the capacity building needs at PESCO.

The objectives of this technical audit were to:

- Determine the existing technical and operational status of the 132kV, 66kV, and 33kV grid stations of PESCO and their associated network components;
- Consolidate the findings, including shortcomings, with relevant data in a report; and
- Recommend improvements in the PESCO network.

FINDINGS

After carrying out the technical audit of PESCO's distribution system, the EPP team prepared a detailed report with recommendations for each grid station along with its associated transmission lines. Details of these findings are provided in the attached Annex Tables I-11. The major findings are summarized and presented below.

GRID STATIONS

- Ninety-one of 156 power transformers (132/11kV) are loaded above 80% and 16 are loaded 100% or above during peak loading hours.
- Four of 11 power transformers (132/66kV) are loaded above 80% and one is loaded above 100% for some period during peak loading hours.
- Nine of 27 power transformers (66/11kV) are loaded above 80% and eight are loaded 100% or above for some period during peak loading hours.
- There is seepage of oil either in the top plate, bushings, or radiator junctions of about 12% of power transformers in the PESCO network.
- Major maintenance and overhauling of almost all circuit breakers (132kV and 66kV) is pending due to unavailability of spare parts.
- Some of the 132kV & 66kV circuit breakers are bypassed or not available. For transformer breakers the results are:
 - 132kV circuit breakers: none out of 167
 - 66kV circuit breakers: 1 out of 17

For transmission line circuit breakers, the results are:

- 132kV circuit breakers: 18 out of 135
- 66kV circuit breakers: 4 out of 24
- Many of the circuit breakers are in deteriorated condition having oil and gas leakage and problematic operating mechanism; they are very old and almost outdated. The results for transformer circuit breakers are:
 - 132kV circuit breakers: 39 out of 167
 - 66kV circuit breakers: 11 out of 17

For transmission line circuit breakers, the results are:

- 132kV circuit breakers: 20 out of 135
- 66kV circuit breakers: 7 out of 24

In addition, 22 of the 132kV and 4 of the 66kV circuit breakers have defective remote control systems and can only be operated in the switchyard.

- At most grid stations, the following tests are not being performed as per standard operating procedures for grid system operation and maintenance:
 - Contact resistance, opening/closing time test, SF6 purity and dew point test for circuit breakers;
 - Capacitance and dissipation factor (C&DF), dissolved gas analysis, and detailed oil testing of transformers;
 - Leakage current monitoring (LCM) test of lightning arresters; and
 - C&DF test of current transformers, potential transformers, and capacitor voltage transformers.

All of these tests are essential to ascertain quality of the physical condition of the equipment.

- Six out of nine capacitor banks installed at 132kV level in PESCO grid stations had been inoperative causing low voltage problems and increased system losses. These six 132kV inoperative capacitor banks located at different grid stations have been recently rehabilitated under USAID-EPP, and as a result some transmission lines were relieved of overloading. However, the system still needs more capacitor banks and three Static VAR Compensators (SVCs) at the proposed locations identified through Reactive Power Compensation (RPC) study carried out for PESCO under the EPP.
- Cooling fans for most of the transformers had been defective or missing, thus full capacity of the transformers was not utilized and transformers were running overloaded considering the transformer's capacity upper limits. However, this issue has been resolved by installing 477 cooling fans at grid stations in the respective the Sub-Station and Transmission Line (SS&TL) divisions of the PESCO network.
- Proper metering equipment is not available on most of the transmission lines and power transformers and most of the existing ones are defective.
- Most of the transformer auxiliary control panels are in deteriorated condition regarding remote operation of the tap changer, cooling fans, annunciators, and metering.
- At some of the grid stations, including the 132kV grid stations at Shangla, Noseri, and Hattian, there is no bus bar facility available, as the incoming line is directly feeding the high voltage side of the transformer. This scenario can lead to a dangerous situation in case of inadvertent energization at the remote end.
- At some grid stations, including Abbottabad 132kV, Balakot 132kV, and others, lightning arresters are damaged and thus the transformers are at risk of high voltage lightning or switching surges.

At most of the grid stations, 11kV capacitor banks are out of service either due to damaged capacitor cells or racks or unavailability of the 11kV capacitor panel. This causes low voltage problems at the 11kV distribution end and increases system losses.

TRANSMISSION LINES

- Fourteen of 166 transmission circuits (132kV) are loaded above 100%, i.e., loaded above their full capacity. The details for transmission overloading are listed in Annex Table 4-5.
- Twenty-two of 166 circuits (132kV) and five of 19 circuits (66kV) are loaded above 80%, which is the prescribed limit under the National Electric Power Regulatory Authority (NEPRA) grid code. The details are also given in Annex Table 4-5.
- Thermo-vision survey of almost all the transmission lines has not been carried out as required by standard operating procedures.
- There are various other transmission line issues, including inadequate ground clearance, foundations needing repair, tower deterioration due to age, instability due to erosion of earth, and general lack of maintenance. This issue has been resolved to some extent recently by rehabilitating the transmission towers at 13 different locations under USAID-EPP.

SYSTEM PROTECTION

- Distance protective relays at some of the grid stations are defective or very old and need replacement. The delayed trip timing of old distance relays at one end do not match with the fast trip timing relays at the other end of transmission lines causing failure.
- Differential and overcurrent relays need replacement in most of the older grid stations as they are obsolete, particularly DMH differential relays that have spent their life span.
- In certain grid stations, transformer oil and winding temperature indicators and gauges are defective and inaccurate. Calibration or replacement of this equipment is required so operators in the control room are able to record the correct temperatures and prevent overloading of the transformers.

- The trip circuit supervision relays are missing in some grid stations. This is risky and may cause the protection scheme to not operate properly, thus reducing system reliability and leaving equipment unprotected.
- Trip lockout for differential and Buchholz protection of transformers are missing on some of the transformers.
- Automatic reclosers on circuit breakers that protect 132kV transmission lines are either blocked or defective. Approximately 85% of transmission line faults are transient in nature. If a transmission line trips on transient fault service, it can be restored more expeditiously when the circuit breaker recloses automatically, significantly reducing the outage time and providing higher service continuity to customers.
- Annunciation blocks (Indications) installed for the identifications of the fault are defective at most of the grid stations.

GENERAL

- Adequate standard metering equipment was not available on most of the transmission lines and power transformers. Without adequate metering, actual loading is unknown.
- At most of the grid stations, there is no provision of adequate firefighting equipment and where available, such equipment has expired.
- At most of the grid stations, grounding sets are unavailable. Grounding sets, also known as earthing sets, are used to protect personnel working on de-energized electrical equipment at site before starting the work.
- At some of the grid stations (e.g., Shahibagh, Peshawar City, and Hussai) the water drainage system is in bad condition. The switchyard is at a lower level than the surrounding area, and thus there is no gravity out flow of water during heavy rains. Also there is no proper arrangement to block the inflow of water from the surrounding area.
- Some of the grid station control room buildings are in deteriorated condition and very old. Their roofs leak during heavy rain, which is dangerous for the installed electrical equipment.
- Most sequential event, fault and disturbance, voltage, and power recorders are either not working or not installed. These devices are essential for reliable system operation by recording whether equipment was operated properly or improperly during a system disturbance.

TRAINING

- There exists a knowledge and experience gap in grid maintenance, dead-line maintenance, live-line maintenance, protection and instrumentation, and grid station operations.
- The gap in knowledge and experience has compromised the quality of maintenance of grid station equipment and transmission lines. Under the EPP, 16 persons, selected from all divisions of PESCO, have recently been trained in how to safely carry out maintenance work on live lines. However, an overall training plan is necessary for capacity building and development of existing technical staff.

RECOMMENDATIONS

Several actions must be taken to resolve the issues documented in the technical audits:

- Relieve overloading on transformers, bus bars, and lines by adding transformer capacity, shifting load from overloaded to less loaded transformers, and bringing generation on line in load centers.
- Replace the old and outdated oil and pneumatic 132kV circuit breakers with new SF6 circuit breakers.
- Put in service the existing 132kV capacitor banks through proper care, and also install others as required in the grid stations identified through the RPC study conducted under the EPP.
- Perform necessary maintenance on circuit breakers, transformers, isolators, and other equipment.
- Procure or fabricate necessary parts to keep circuit breakers operating properly, including remote operations.
- Perform routine maintenance following standard operating procedures.
- Repair or replace auxiliary panels for transformers regarding remote operation of tap changer and cooling fans and metering and annunciations.
- Repair and place auto-reclosers in service.
- Replace the defective and old distance relays for better protection of the transmission lines.
- Replace the problematic differential relays particularly DMH relays that are very old and obsolete.
- Sequential event recorders and other recorders should be purchased or repaired and placed in service.
- Provide grounding sets to ensure safety of personnel working on de-energized electrical equipment at grid stations.
- Assess training needs across all PESCO departments.
- Provide separate firefighting equipment to each grid station in order to manage emergencies.
- The damaged lightning arresters at some grid stations need to be replaced to prevent the transformers from damaging effects of high switching and lightning surges.
- The 11kV capacitor banks need to be brought in service by replacing the damaged capacitor cells and repairing the racks where required.

ANNEX I: DETAILED FINDINGS

Table I: Transformer Loading Overview (132/11.5kV & 132/66kV)

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|---------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 1 | Abbottabad 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 2 | AMC Abbottabad 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 3 | Balakot 132kV GS | T-1 | 13 | - | ✓ | - | Defective | Defective | Both oil & winding temperature gauges are defective. |
| 4 | Bannu 132kV GS | T-1 | 15 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-2 | 15 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-5 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 5 | Battal 132kV GS | T-1 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 13 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is not installed. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|---------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 6 | Chakdara 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 7 | Charsadda 132kV GS | T-1 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | - | ✓ | OK | Defective | Auxiliary control panel for transformer is defective. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 8 | DI Khan 132kV GS | T-1 | 26 | - | - | ✓ | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 40 | - | ✓ | - | Defective | Defective | Both oil & winding temperature gauges are defective. |
| | | T-3 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 9 | Daggar 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Both winding and oil remote temp. Indicators are defective. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 10 | Dalazak 132kV GS | T-1 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 11 | Dargai 132kV GS | T-1 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|---------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 12 | Gadoon Amazai 132kV GS | T-1 | 26 | - | ✓ | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | - | - | ✓ | Defective | Defective | Auxiliary control panel for transformer is defective. |
| | | T-3 | 13 | - | ✓ | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 13 | Gumbat 132kV GS | T-1 | 13 | - | ✓ | - | Defective | Defective | Both oil & winding temperature gauges are defective. |
| 14 | Gurguri 132kV GS | T-1 | 6.3 | - | ✓ | - | Defective | Defective | Both oil & winding temperature gauges are defective. |
| 15 | Hangu 132kV GS | T-3 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 16 | Haripur 132kV GS | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 17 | Hattar 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 18 | Hattian (AJK) 132kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 19 | Hayatabad 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|---------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 20 | Hussai 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 21 | Jalala 132kV GS | T-3 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | - | ✓ | - | OK | Defective | Auxiliary control panel for transformer is defective. |
| | | T-5 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 22 | Jamrud 132kV GS | T-1 | 26 | - | ✓ | - | OK | Defective | Winding temperature gauge is defective. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| 23 | Jehangira 132kV GS | T-1 | 15 | - | - | ✓ | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 24 | Karak 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 25 | Katlang 132kV GS | T-1 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 26 | KDA Kohat 132kV GS | T-1 | 13 | ✓ | - | - | Defective | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|---------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 27 | Khwazakhela 132kV GS | T-1 | 26 | - | ✓ | - | Defective | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 12.5 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 28 | Kohat 132kV GS | T-1 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-3 | 37.5 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-4 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| 29 | Lachi 132kV GS | T-1 | 13 | ✓ | - | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 30 | Mansehra 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 31 | Mardan-II 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 32 | Mattani 132kV GS | T-1 | 5.4 | - | - | - | - | - | Running on no load. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 13 | - | □ | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|------------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 33 | Muzaffarabad 132kV GS | T-1 | 15 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is not installed. |
| | | T-3 | 13 | - | ✓ | - | Defective | Defective | Auxiliary control panel for transformer is not installed. |
| | | T-4 | 13 | - | ✓ | - | OK | Defective | Auxiliary control panel for transformer is defective. |
| 34 | Nathia Gali 132kV GS | T-1 | 13 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is defective. |
| 35 | Nishat Tarbela 132kV GS | T-1 | 15 | - | ✓ | - | Defective | Defective | Auxiliary control panel for transformer is not installed. |
| | | T-2 | 13 | - | ✓ | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| 36 | Nizampur 132kV GS | T-1 | 13 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 37 | Noseri (AJK) 132kV GS | T-1 | 13 | ✓ | - | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| 38 | Nowshera City 132kV GS | T-1 | 26 | - | ✓ | - | OK | Defective | Auxiliary control panel for transformer is defective. |
| | | T-2 | 5 | ✓ | - | - | Defective | Defective | Remote temp. Indicators are not working. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 39 | Nowshera Industrial 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is defective. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|------------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 40 | Oghi 132kV GS | T-1 | 13 | ✓ | - | - | Defective | Defective | Auxiliary control panel for transformer is defective. |
| 41 | Pabbi 132kV GS | T-1 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| 42 | Peshawar Cantt 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 43 | Peshawar City 132kV GS | T-1 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 44 | Peshawar Fort 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 45 | Peshawar Industrial 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | - | ✓ | OK | Defective | Remote temp. Indicators are working ok. |
| | | T-3 | 40 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| 46 | Peshawar University 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------|-----------------------------|-----|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 47 | Pezu 132kV GS | T-1 | 13 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| 48 | Prova 132kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 49 | Rehman Baba 132kV GS | T-1 | 13 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| 50 | Rajjar 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 51 | Right Bank Tarbela 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 13 | ✓ | - | - | OK | OK | Auxiliary control panel for transformer is defective. |
| 52 | Sakhi Chashma 132kV GS | T-1 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | - | ✓ | OK | OK | Remote temp. Indicators are working ok. |
| 53 | Sarai Naurang 132kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 54 | Shabqadar 132kV GS | T-1 | 13 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 40 | - | - | ✓ | Defective | Defective | Remote temp. Indicators are not working. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-4 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-5 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | 132/11.5 kV & 132/66kV | | | | | | | |
|--------|---------------------------|------------------------|---|-----------|------------|---------------------------|---------------------|---------|---|
| | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | Remarks | |
| | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | | |
| 55 | Shahibagh 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 37.5 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-3 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-4 | 40 | - | - | - | - | - | Damaged on 04.07.2014 |
| | | T-5 | 40 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 56 | Shangla Par 132kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 57 | Swabi 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-3 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 58 | Swat 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 7.2 | - | - | - | - | - | Running on no load. |
| | | T-5 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 59 | Tajazai 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |

| S. No. | Name of Grid Station (GS) | | 132/11.5 kV & 132/66kV | | | | | | Remarks |
|--------------|---------------------------|------------|------------------------|---|-----------|------------|---------------------------|---------------------|---|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 60 | Tali 132kV GS | T-1 | 37.5 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-3 | 13 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| 61 | Tangi 132kV GS | T-1 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| 62 | Tank 132kV GS | T-4 | 13 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-5 | 40 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| | | T-6 | 26 | - | ✓ | - | OK | OK | Auxiliary control panel for transformer is defective. |
| 63 | Timergara 132kV GS | T-1 | 40 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-3 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| | | T-4 | 26 | ✓ | - | - | OK | OK | Remote temp. Indicators are working ok. |
| 64 | Warsak 132kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 26 | - | ✓ | - | OK | OK | Remote temp. Indicators are working ok. |
| Total | | 159 | | 39 | 99 | 17 | | | |

Table 2: Transformer Loading Overview (66/11.5kV)

| S. No. | Name of Grid Station (GS) | | 66/11.5 kV | | | | | | Remarks |
|--------|---------------------------|-----|--------------------|---|-----------|------------|---------------------------|---------------------|--|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 1 | Badaber 66kV Grid Station | T-1 | 7.5 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 10 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| 2 | Band Kurai 66kV GS | T-1 | 7.5 | - | ✓ | - | OK | Not OK | Remote temp. Indicators are not working. |
| | | T-2 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| 3 | Daggar 66kV GS | T-1 | 13 | - | ✓ | - | OK | Not OK | Auxiliary Panel for this transformer is defective. |
| | | T-2 | 6.3 | - | | | | | Running on no load. |
| | | T-3 | 6.3 | - | | | | | Dismantled. |
| 4 | Daraban 66kV GS | T-1 | 13 | - | - | ✓ | Not OK | Not OK | Remote temp. Indicators are not working. |
| 5 | Dir 66kV GS | T-1 | 13 | - | ✓ | - | OK | Not OK | Auxiliary Panel for this transformer is defective. |
| | | T-2 | 6.3 | ✓ | - | - | OK | Not OK | Remote temp. Indicators are not working. |
| 6 | Haripur 66kV GS | T-1 | 5.6 | - | | | | | Running on no load. |
| | | T-2 | 6.3 | ✓ | - | - | OK | Not OK | Remote temp. Indicators are not working. |
| | | T-3 | 13 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| 7 | Havelain 66kV GS | T-1 | 13 | - | - | ✓ | OK | OK | Remote temp. Indicators are not working. |
| | | T-2 | 13 | ✓ | - | - | Not OK | Not OK | Remote temp. Indicators are not working. |
| 8 | Kheshki 66kV GS | T-1 | 2.5 | ✓ | - | - | Not OK | Not OK | Remote temp. Indicators are not working. |
| 9 | Kohat 66kV GS | T-1 | 6.3 | - | - | ✓ | Not OK | Not OK | Remote temp. Indicators are not working. |
| | | T-2 | 3 | - | ✓ | - | Not OK | OK | Remote temp. Indicators are not working. |
| 10 | Kulachi 66kV GS | T-1 | 13 | - | ✓ | - | Not OK | Not OK | Auxiliary Panel for this transformer is missing. |
| 11 | Tajazai 66kV GS | T-1 | 15 | - | ✓ | - | Not OK | Not OK | Auxiliary Panel for this transformer is missing. |

| S. No. | Name of Grid Station (GS) | | 66/11.5 kV | | | | | | Remarks |
|--------------|---------------------------|-----------|--------------------|---|-----------|------------|---------------------------|---------------------|--|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| | | T-2 | 13 | ✓ | - | - | OK | OK | Remote temp. Indicators are not working. |
| 12 | Timergara 66kV GS | T-1 | 6.9 | - | ✓ | - | OK | Not OK | Remote temp. Indicators are not working. |
| | | T-2 | 13 | - | ✓ | - | OK | OK | Remote temp. Indicators are not working. |
| 13 | Warsak 66kV GS | T-1 | 13 | - | - | ✓ | Not OK | Not OK | Auxiliary Panel for this transformer is missing. |
| | | T-2 | 13 | - | - | ✓ | Not OK | Not OK | Auxiliary Panel for this transformer is missing. |
| 14 | Wari 66kV GS | T-1 | 13 | - | ✓ | - | OK | OK | Auxiliary Panel for this transformer is defective. |
| Total | | 26 | | 6 | 10 | 7 | | | |

Table 3: Transformer Loading Overview (33/11.5kV)

| S. No. | Name of Grid Station (GS) | | 33/11.5 kV | | | | | | Remarks |
|--------|---------------------------|-----|--------------------|---|-----------|------------|---------------------------|---------------------|-----------------------|
| | | | Rating Power (MVA) | Max. Percentage Loading of Transformer Recorded | | | Temperature Gauges Status | | |
| | | | | Below 80% | Above 80% | Above 100% | Oil Temp. Gauge | Winding Temp. Gauge | |
| 1 | Drosh 33kV Grid Station | T-1 | 1.5 | - | - | - | N/A | N/A | Record Not Available. |
| 2 | Jutilasht 33kV GS | T-1 | 4 | - | - | - | N/A | N/A | Record Not Available. |
| | | T-2 | 4 | - | - | - | N/A | N/A | Record Not Available. |
| 3 | Pattan 33kV GS | T-1 | 4 | ✓ | - | - | N/A | N/A | |
| 4 | Thakot 33kV | T-1 | 4 | - | ✓ | - | N/A | N/A | |
| | | T-2 | 4 | - | ✓ | - | N/A | N/A | |

| | | | | | | | | | |
|--------------|--|----------|---|----------|----------|----------|-----|-----|--|
| | | T-3 | 4 | - | ✓ | - | N/A | N/A | |
| Total | | 7 | | 1 | 3 | 0 | | | |

Table 4: Transmission Line Loading Overview (132/66kV)

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|---------------------------|-----------------------|------|--|------|---|------|---|--|---|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 1 | Abbottabad 132kV GS | 4 | 0 | 0 | 0 | 1 | 0 | 132kV Abbottabad-AMC Abbottabad | - | Loading on this line is severe as this single circuit is supplying load of AMC Abbottabad, Mansehra, and Balakot 132kV GSs. |
| 2 | AMC Abbottabad 132kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 132kV AMC Abbottabad-Mansehra | - | |
| 3 | Balakot 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 4 | Bannu 132kV GS | 3 | 2 | 0 | 1 | 0 | 0 | 66kV Bannu-Kurram Garhi | - | |
| 5 | Battal 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 6 | Chakdara 132kV GS | 5 | 2 | 2 | 0 | 1 | 0 | 132kV Dargai-Chakdara 132kV Chakdara-Swat 132kV Chakdara-Jalala | - | 132kV Chakdara-Swat circuit is heavily loaded in summers, about 130% of its full capacity as this single source is supplying load for the whole swat area. This is why this area badly needs another circuit to handle the load demand. |
| 7 | Charsadda 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 8 | D.I Khan 132kV GS | 4 | 3 | 1 | 1 | 0 | 0 | 132kV Chashma-D.I Khan | 66kV DI Khan-Band Kurai 66kV DI Khan-Daraban-Kulachi | |
| 9 | Daggar 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|---------------------------|-----------------------|------|--|------|---|------|---|--|--|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 10 | Dalazak 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 11 | Dargai 132kV GS | 5 | 0 | 2 | 0 | 0 | 0 | 132kV Mardan II-Dargai 132kV Dargai-Chakdara | - | Both of these circuits are loaded above the prescribed loading as per NEPRA code. This loading is observed during summer season for some period, which is acceptable. |
| 12 | Gadoon Amazai 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 13 | Gumbat 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 14 | Gurguri 132kV GS | 3 | 0 | 2 | 0 | 0 | 0 | 132kV Gurguri-Tall 132kV Gurguri-Domail | - | |
| 15 | Hangu 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 16 | Haripur 132kV GS | 5 | 0 | 0 | 0 | 3 | 0 | 132kV Wah-Haripur 132kV Burhan-Tarnawa-Haripur 132kV Burhan-Haripur | - | All of these stations are supplying power to densely populated areas, which is why these circuits are overloaded. New circuits or re-conducting the existing system are recommended. |
| 17 | Hattar 132kV GS | 3 | 0 | 1 | 0 | 0 | 0 | 132kV Wah-Haripur T-off Hattar | - | |
| 18 | Hattian (AJK) 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 19 | Hayatabad 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|---------------------------|-----------------------|------|--|------|---|------|---|--|---------|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 20 | Hussai 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 132kV Mardan-Swabi T-off Hussai | - | |
| 21 | Jalala 132kV GS | 2 | 0 | 1 | | 1 | | 132kV Jalala-Chakdara 132kV Mardan-Jalala | - | |
| 22 | Jamrud 132kV GS | 4 | 0 | 1 | 0 | 0 | 0 | 132kV Warsak-Jamrud | - | |
| 23 | Jehangira 132kV GS | 3 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 24 | Karak 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 25 | Katlang 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 26 | KDA Kohat 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 27 | Khwazakhela 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 28 | Kohat 132kV GS | 10 | 2 | 2 | 0 | 0 | 0 | 132kV Daud Khel-Kohat Cct-1 132kV Daud Khel-Kohat Cct-2 | - | |
| 29 | Lachi 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 30 | Mansehra 132kV GS | 3 | 0 | 1 | 0 | 0 | 0 | 132kV Mansehra-Balakot | - | |
| 31 | Mardan II 132kV GS | 3 | 0 | 0 | 0 | 1 | 0 | 132kV Mardan-Mardan II | - | |
| 32 | Mattani 132kV GS | 2 | 1 | 0 | 0 | 0 | 0 | - | - | |
| 33 | Muzaffarabad 132kV GS | 3 | 0 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|------------------------------|-----------------------|------|--|------|---|------|--|--|---------|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 34 | Nathia Gali 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 35 | Nishat Tarbela 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 36 | Nizampur 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 37 | Noseri (AJK) 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 38 | Nowshera City 132kV GS | 3 | 1 | 1 | 0 | 1 | 0 | 132kV Nowshera City-Nowshera Industrial 132kV Mardan-Nowshera City | - | |
| 39 | Nowshera Industrial 132kV GS | 5 | 0 | 3 | | | | 132kV Nowshera City-Nowshera Industrial 132kV Nowshera Industrial-Pabbi 132kV Mardan-Nowshera Industrial | - | |
| 40 | Oghi 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 41 | Pabbi 132kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 132kV Nowshera Industrial-Pabbi | - | |
| 42 | Peshawar Cantt 132kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 132kV Warsak-Peshawar Cantt | - | |
| 43 | Peshawar City 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 44 | Peshawar Fort 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|------------------------------|-----------------------|------|--|------|---|------|---|--|---------|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 45 | Peshawar Industrial 132kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 132kV Shiekh Muhammadi-Peshawar Industrial | - | |
| 46 | Peshawar University 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 47 | Pezu 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 48 | Prova 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 49 | Rahman Baba 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 50 | Rajjar 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 51 | Right Bank 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 52 | Sakhi Chashma 132KV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 53 | Sarai Naurang 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 54 | Shabqadar 132kV GS | 4 | 1 | 0 | 0 | 1 | 0 | 132kV Shabqadar-Tangi | - | |
| 55 | Shahibagh 132kV GS | 8 | 2 | 0 | 0 | 1 | 0 | 132kV Shahi Bagh New-Shahi Bagh | - | |
| 56 | Shangla Par 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------|---------------------------|-----------------------|------|--|------|---|------|--|--|---|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 57 | Swabi 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 132kV Mardan-Swabi | - | This line is running fully loaded and in summers the load goes beyond its full capacity as this is the only source to district Swabi. Besides Swabi, this line is feeding loads of Hussai, Daggar, and Dobian 132kV GSs. New 132kV line to Swabi GS is recommended to eliminate the overloading and extreme low voltage problem in the locality. |
| 58 | Swat 132kV GS | 2 | 0 | 0 | 0 | 1 | 0 | 132kV Chakdara-Swat | - | This line is also running fully loaded and in summers the load goes beyond its full capacity as this is the only source to district Swat. Besides the Swat 132kV GS, this line is feeding loads of Khwazakhela 132kV and Shangla Par 132kV GSs. There are three 132kV grid stations being fed by only one single circuit which is heavily loaded. |
| 59 | Tajazai 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 60 | Tall 132kV GS | 2 | 1 | 0 | 1 | 0 | 0 | 66kV Tall-Ali Zai 132kV Tall-Parachinar 132kV Tall-Gurguri | - | |
| 61 | Tangi 132kV GS | 2 | 0 | 0 | 0 | 1 | 0 | 132kV Shabqadar-Tangi | - | This line is heavily loaded as it is supplying power to a densely populated area. New circuit or re-conducting of the existing system is recommended. |
| 62 | Tank 132kV GS | 1 | 2 | 0 | 0 | 0 | 0 | - | - | |

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 132kV Circuits Loaded Above 80% During Peak Season | Names of 66kV Circuits Loaded Above 80% During Peak Season | Remarks |
|--------------|---------------------------|-----------------------|-----------|--|----------|---|----------|---|--|---------|
| | | 132kV | 66kV | 132kV | 66kV | 132kV | 66kV | | | |
| 63 | Timergara 132kV GS | 1 | 1 | 0 | 0 | 0 | 0 | - | - | |
| 64 | Warsak 132kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 132kV Warsak-Shahi Bagh | - | |
| Total | | 166 | 18 | 22 | 3 | 14 | 0 | | | |

Table 5: Transmission Line Loading Overview (66/33kV)

| Sr. No | Name of Grid Station (GS) | Total No. of Circuits | | Total No. of Circuits Loaded Above 80% | | Total No. of Circuits Loaded Above 100% | | Names of 66kV Circuits Loaded Above 80% During Peak Season | Names of 33kV Circuits Loaded Above 100% During Peak Season | Remarks |
|--------------|---------------------------|-----------------------|----------|--|----------|---|----------|--|---|---|
| | | 66kV | 33kV | 66kV | 33kV | 66kV | 33kV | | | |
| 1 | Badaber 66kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 2 | Band Kurai 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 3 | Daggar 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 4 | Daraban 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 5 | Dir 66kV GS | 1 | 1 | 0 | 0 | 0 | 0 | - | - | |
| 6 | Haripur 66kV GS | 2 | 0 | 1 | 0 | 0 | 0 | 66kV Haripur-New Wah | - | This circuit is loaded above the prescribed limits as per NEPRA grid code, i.e., 80%, because Haripur 66kV GS also feeds to Havalian and Abbottabad 66kV GSs. Re-conducting or new 66kV circuit is recommended. |
| 7 | Havalian 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 8 | Kheshki 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 9 | Kohat 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 10 | Kulachi 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 11 | Tajazai 66kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 12 | Timergara 66kV GS | 2 | 1 | 1 | 0 | 0 | 0 | 66kV Timergara-Chakdara | - | This circuit is loaded above the prescribed limits as per NEPRA grid code, i.e., 80%; re-conducting or new 66kV circuit is required. |
| 13 | Wari 66kV GS | 2 | 0 | 0 | 0 | 0 | 0 | - | - | |
| 14 | Warsak 66kV GS | 1 | 0 | 0 | 0 | 0 | 0 | - | - | |
| Total | | 19 | 2 | 2 | 0 | 0 | 0 | | - | |

Table 6: 132kV and 66kV Circuit Breakers (CB) Overview

| Sr. No | Name of Grid Station (GS) | Total Number of CB | | No. of CB Bypassed | | Number of CB with Overhauling Due | | No. of CB with Defective Remote Operation | | Remarks |
|--------|---------------------------|--------------------|------|--------------------|------|-----------------------------------|------|---|------|---|
| | | 132k V | 66kV | 132k V | 66kV | 132kV | 66kV | 132kV | 66kV | |
| 1 | Abbottabad 132kV GS | 7 | 0 | 1 | 0 | 6 | 0 | 0 | 0 | One CB is bypassed and overhauling of the other CBs is due. |
| 2 | AMC Abbottabad 132kV GS | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | Overhauling is due. |
| 3 | Balakot 132kV GS | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | One CB is bypassed and overhauling of the other CB is due. |
| 4 | Bannu 132kV GS | 9 | 4 | 1 | 2 | 8 | 2 | 0 | 0 | |
| 5 | Battal 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Very old circuit breaker has severe oil leakage and problematic mechanism, and needs replacement. |
| 6 | Chakdara 132kV GS | 9 | 3 | 0 | 0 | 9 | 3 | 0 | 1 | |
| 7 | Charsadda 132kV GS | 6 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | One CB is de-energized. |
| 8 | D.I Khan 132kV GS | 10 | 3 | 0 | 0 | 10 | 3 | 0 | 0 | |
| 9 | Daggar 132kV GS | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 10 | Dalazak 132kV GS | 4 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | |
| 11 | Dargai 132kV GS | 6 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | |
| 12 | Gadoon Amazai 132kV GS | 6 | 0 | 0 | 0 | 6 | 0 | 2 | 0 | |
| 13 | Gumbat 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 14 | Gurguri 132kV GS | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 15 | Hangu 132kV GS | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 16 | Haripur 132kV GS | 8 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | |
| 17 | Hattar 132kV GS | 5 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 18 | Hattian (AJK) 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 19 | Hayatabad 132kV GS | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 20 | Hussai 132kV GS | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 21 | Jalala 132kV GS | 5 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | |

| Sr. No | Name of Grid Station (GS) | Total Number of CB | | No. of CB Bypassed | | Number of CB with Overhauling Due | | No. of CB with Defective Remote Operation | | Remarks |
|--------|------------------------------|--------------------|------|--------------------|------|-----------------------------------|------|---|------|---------|
| | | 132k V | 66kV | 132k V | 66kV | 132kV | 66kV | 132kV | 66kV | |
| 22 | Jamrud 132kV GS | 8 | 0 | 0 | 0 | 7 | 0 | 2 | 0 | |
| 23 | Jehangira 132kV GS | 7 | 0 | 0 | 0 | 4 | 0 | 1 | 0 | |
| 24 | Karak 132kV GS | 2 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 25 | Katlang 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 26 | KDA Kohat 132kV GS | 6 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | |
| 27 | Khwazakhela 132kV GS | 4 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | |
| 28 | Kohat 132kV GS | 14 | 3 | 4 | 0 | 13 | 2 | 0 | 0 | |
| 29 | Lachi 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 30 | Mansehra 132kV GS | 4 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | |
| 31 | Mardan II 132kV GS | 5 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | |
| 32 | Mattani 132kV GS | 5 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | |
| 33 | Muzaffarabad 132kV GS | 7 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | |
| 34 | Nathia Gali 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 35 | Nishat Tarbela 132kV GS | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | |
| 36 | Nizampur 132kV GS | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 37 | Noseri (AJK) 132kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 38 | Nowshera City 132kV GS | 4 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 39 | Nowshera Industrial 132kV GS | 8 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 40 | Oghi 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 41 | Pabbi 132kV GS | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 42 | Peshawar Cantt 132kV GS | 6 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 43 | Peshawar City 132kV GS | 7 | 0 | 3 | 0 | 4 | 0 | 0 | 0 | |

| Sr. No | Name of Grid Station (GS) | Total Number of CB | | No. of CB Bypassed | | Number of CB with Overhauling Due | | No. of CB with Defective Remote Operation | | Remarks |
|--------|------------------------------|--------------------|------|--------------------|------|-----------------------------------|------|---|------|--|
| | | 132k V | 66kV | 132k V | 66kV | 132kV | 66kV | 132kV | 66kV | |
| 44 | Peshawar Fort 132KV GS | 4 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | |
| 45 | Peshawar Industrial 132kV GS | 5 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | |
| 46 | Peshawar University 132kV GS | 7 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | |
| 47 | Pezu 132kV GS | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 48 | Prova 132kV GS | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 49 | Rahman Baba 132kV GS | 5 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | |
| 50 | Rajjar 132kV GS | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 51 | Right Bank 132kV GS | 3 | 0 | 0 | 0 | 3 | 0 | 2 | 0 | |
| 52 | Sakhi Chashma 132KV GS | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| 53 | Sarai Naurang 132kV GS | 3 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 54 | Shabqadar 132kV GS | 9 | 2 | 0 | 0 | 3 | 2 | 0 | 2 | |
| 55 | Shahibagh 132kV GS | 15 | 3 | 1 | 0 | 15 | 3 | 12 | 1 | All the CBs are very old and problematic, and hence need immediate replacement. |
| 56 | Shangla Par 132kV GS | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 57 | Swabi 132kV GS | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 13 CBs are very old and with problematic operating mechanism; needs replacement. |
| 58 | Swat 132kV GS | 5 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 59 | Tajazai 132kV GS | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 60 | Tall 132kV GS | 6 | 2 | 1 | 0 | 4 | 0 | 0 | 0 | |
| 61 | Tangi 132kV GS | 3 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | |
| 62 | Tank 132kV GS | 5 | 3 | 1 | 1 | 4 | 3 | 0 | 0 | |
| 63 | Timergara 132kV GS | 4 | 2 | 0 | 1 | 2 | 2 | 0 | 0 | |

| Sr. No | Name of Grid Station (GS) | Total Number of CB | | No. of CB Bypassed | | Number of CB with Overhauling Due | | No. of CB with Defective Remote Operation | | Remarks |
|--------------|---------------------------|--------------------|-----------|--------------------|----------|-----------------------------------|-----------|---|----------|---------|
| | | 132k V | 66kV | 132k V | 66kV | 132kV | 66kV | 132kV | 66kV | |
| 64 | Warsak 132kV GS | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | |
| Total | | 301 | 26 | 20 | 4 | 217 | 20 | 22 | 4 | |

Table 7: 66kV and 33kV Circuit Breakers Overview

| Sr. No | Name of Grid Station (GS) | Total Number of CB | | No. of CB Bypassed | | Number of CB with Overhauling Due | | No. of CB with Defective Remote Operation | | Remarks |
|--------------|---------------------------|--------------------|----------|--------------------|----------|-----------------------------------|----------|---|----------|---|
| | | 66kV | 33kV | 66kV | 33kV | 66kV | 33kV | 66kV | 33kV | |
| 1 | Badaber 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | There are no circuit breakers installed at this GS. |
| 2 | Band Kurai 66kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Oil leakage exists from red and blue phase poles. |
| 3 | Daggar 66kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Circuit breaker is very old and severe oil leakage exists; needs replacement. |
| 4 | Daraban 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | There are no circuit breakers, installed at this GS. |
| 5 | Dir 66kV GS | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Overhauling is due. |
| 6 | Haripur 66kV GS | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | One CB is bypassed due to defective operating mechanism. |
| 7 | Havalian 66kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Overhauling is due. |
| 8 | Kheshki 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 9 | Kohat 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 10 | Kulachi 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 11 | Tajazai 66kV GS | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | One CB is bypassed and the other one is very old; needs replacement. |
| 12 | Timergara 66kV GS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 13 | Wari 66kV GS | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | Overhauling is due. |
| 14 | Warsak 66kV GS | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | CB is damaged hence bypassed. |
| Total | | 9 | 1 | 3 | 0 | 6 | 1 | 0 | 0 | |

Table 8: Essential Protection Relays for 132kV Power Transformers

| Sr. No | Name of Grid Station (GS) | No. of Differential Protection Relays Not Installed/ Defective (Main diff) | No. of Over Current Relays Not Installed/ Defective (HV, LV) | No. of Trip Circuit Supervision Relays Not Installed/ Defective | No. of Thermal Overload Protection Not Installed/ Defective (Winding Temp. Gauges) | Remarks |
|--------|---------------------------|--|--|---|--|--|
| 1 | Abbottabad 132kV GS | - | - | - | - | All main protections are working properly. |
| 2 | AMC Abbottabad 132kV GS | - | - | - | - | All main protections are working properly. |
| 3 | Balakot 132kV GS | - | - | - | 2 | Oil and winding temp. gauges of T1 are defective. |
| 4 | Bannu 132kV GS | 1 | - | 1 | 2 | Differential relay is not installed on transformer T1. |
| 5 | Battal 132kV GS | - | - | 1 | - | |
| 6 | Chakdara 132kV GS | - | - | 1 | 2 | Oil and winding temp. gauges of T3 are defective. |
| 7 | Charsadda 132kV GS | - | - | - | 1 | |
| 8 | D.I Khan 132kV GS | - | - | - | 2 | |
| 9 | Daggar 132kV GS | - | - | - | - | All main protections are working properly. |
| 10 | Dalazak 132kV GS | - | - | 1 | - | |
| 11 | Dargai 132kV GS | - | - | - | - | All main protections are working properly. |
| 12 | Gadoon Amazai 132kV GS | - | - | - | 6 | Oil and winding temp. gauges of T1, T2 & T3 are defective. |
| 13 | Gumbat 132kV GS | - | - | - | 2 | Oil and winding temp. gauges of T1 are defective |
| 14 | Gurguri 132kV GS | - | - | - | 1 | Oil temp. gauge on T1 is not available. |
| 15 | Hangu 132kV GS | - | - | - | - | All main protections are working properly. |
| 16 | Haripur 132kV GS | 2 | - | 3 | - | Two DMH differential relays are defective installed for T1 and T2. |
| 17 | Hattar 132kV GS | - | - | - | - | All main protections are working properly. |
| 18 | Hattian (AJK) 132kV GS | - | - | - | - | All main protections are working properly. |
| 19 | Hayatabad 132kV GS | - | - | - | - | All main protections are working properly. |

| Sr. No | Name of Grid Station (GS) | No. of Differential Protection Relays Not Installed/ Defective (Main diff) | No. of Over Current Relays Not Installed/ Defective (HV, LV) | No. of Trip Circuit Supervision Relays Not Installed/ Defective | No. of Thermal Overload Protection Not Installed/ Defective (Winding Temp. Gauges) | Remarks |
|--------|------------------------------|--|--|---|--|---|
| 20 | Hussai 132kV GS | 1 | - | - | - | Differential relay is defective on transformer T1. |
| 21 | Jalala 132kV GS | - | - | - | - | All main protections are working properly. |
| 22 | Jamrud 132kV GS | - | - | 4 | 1 | |
| 23 | Jehangira 132kV GS | - | - | 2 | 1 | |
| 24 | Karak 132kV GS | - | - | - | - | All main protections are working properly. |
| 25 | Katlang 132kV GS | - | - | - | - | All main protections are working properly. |
| 26 | KDA Kohat 132kV GS | - | - | - | 1 | |
| 27 | Khwazakhela 132kV GS | - | - | - | 2 | Oil and winding temp. gauge for T1 is defective. |
| 28 | Kohat 132kV GS | - | - | 4 | - | |
| 29 | Lachi 132kV GS | - | - | - | 2 | Oil and winding temp. gauge for T1 is defective. |
| 30 | Mansehra 132kV GS | - | - | 3 | - | |
| 31 | Mardan II 132kV GS | - | - | - | - | All main protections are working properly. |
| 32 | Mattani 132kV GS | - | - | - | 2 | |
| 33 | Muzaffarabad 132kV GS | - | - | - | 3 | |
| 34 | Nathia Gali 132kV GS | - | - | - | - | |
| 35 | Nishat Tarbela 132kV GS | - | - | 2 | 4 | Oil and winding temp. gauges for T1 & T2 are defective. |
| 36 | Nizampur 132kV GS | - | - | - | - | All main protections are working properly. |
| 37 | Noseri (AJK) 132kV GS | - | - | - | 2 | Oil and winding temp. gauges for T1 are defective. |
| 38 | Nowshera City 132kV GS | - | - | 2 | 1 | |
| 39 | Nowshera Industrial 132kV GS | - | - | - | - | |
| 40 | Oghi 132kV GS | - | - | - | 1 | Oil temp. gauge on T1 is defective. |

| Sr. No | Name of Grid Station (GS) | No. of Differential Protection Relays Not Installed/ Defective (Main diff) | No. of Over Current Relays Not Installed/ Defective (HV, LV) | No. of Trip Circuit Supervision Relays Not Installed/ Defective | No. of Thermal Overload Protection Not Installed/ Defective (Winding Temp. Gauges) | Remarks |
|--------|------------------------------|--|--|---|--|--|
| 41 | Pabbi 132kV GS | - | - | - | - | All main protections are working properly. |
| 42 | Peshawar Cantt 132kV GS | - | - | - | - | All main protections are working properly. |
| 43 | Peshawar City 132kV GS | - | - | 2 | - | |
| 44 | Peshawar Fort 132KV GS | - | - | - | - | All main protections are working properly. |
| 45 | Peshawar Industrial 132kV GS | - | - | 2 | 1 | |
| 46 | Peshawar University 132kV GS | - | - | - | - | All main protections are working properly. |
| 47 | Pezu 132kV GS | - | - | - | - | All main protections are working properly. |
| 48 | Prova 132kV GS | - | - | - | - | All main protections are working properly. |
| 49 | Rahman Baba 132kV GS | - | - | - | - | All main protections are working properly. |
| 50 | Rajjar 132kV GS | - | - | - | - | All main protections are working properly. |
| 51 | Right Bank 132kV GS | - | - | 4 | - | |
| 52 | Sakhi Chashma 132KV GS | - | - | - | - | All main protections are working properly. |
| 53 | Sarai Naurang 132kV GS | - | - | - | - | All main protections are working properly. |
| 54 | Shabqadar 132kV GS | - | - | 2 | - | |
| 55 | Shahibagh 132kV GS | - | - | 4 | - | |
| 56 | Shangla Par 132kV GS | - | - | - | 2 | |
| 57 | Swabi 132kV GS | - | - | 1 | - | |
| 58 | Swat 132kV GS | - | - | - | - | All main protections are working properly. |
| 59 | Tajazai 132kV GS | - | - | - | - | All main protections are working properly. |
| 60 | Tall 132kV GS | - | - | - | - | All main protections are working properly. |
| 61 | Tangi 132kV GS | - | - | - | - | All main protections are working properly. |
| 62 | Tank 132kV GS | - | - | - | - | All main protections are working properly. |

| Sr. No | Name of Grid Station (GS) | No. of Differential Protection Relays Not Installed/ Defective (Main diff) | No. of Over Current Relays Not Installed/ Defective (HV, LV) | No. of Trip Circuit Supervision Relays Not Installed/ Defective | No. of Thermal Overload Protection Not Installed/ Defective (Winding Temp. Gauges) | Remarks |
|--------------|---------------------------|--|--|---|--|---|
| 63 | Timergara 132kV GS | 1 | - | - | - | Differential relay is not available for transformer T1. |
| 64 | Warsak 132kV GS | - | - | - | - | All main protections are working properly. |
| Total | | 5 | 0 | 39 | 41 | |

Table 9: Essential Protection Relays for 66 kV Power Transformers

| Sr. No | Name of Grid Station (GS) | No. of Differential Protection Relays Not Installed/ Defective (Main diff) | No. of Over Current Relays Not Installed/ Defective (HV, LV) | No. of Thermal Overload Protection Relays Not Installed/ Defective (Winding Temp. Gauges) | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------|---------------------------|--|--|---|---|---|
| 1 | Badaber 66kV GS | - | - | 2 | - | Fuse controlled transformers hence no protections. |
| 2 | Band Kurai 66kV GS | 1 | - | - | - | Differential relay is not available for transformer T2. |
| 3 | Daggar 66kV GS | - | - | - | - | Protections are working properly. |
| 4 | Daraban 66kV GS | - | - | - | - | Fuse controlled transformer hence no protections. |
| 5 | Dir 66kV GS | - | - | - | - | Fuse controlled transformers hence no protections. |
| 6 | Haripur 66kV GS | - | - | - | - | Protections are working properly. |
| 7 | Havalian 66kV GS | - | - | - | 2 | |
| 8 | Kheshki 66kV GS | - | - | - | - | Fuse controlled transformer hence no protections. |
| 9 | Kohat 66kV GS | - | - | - | - | Fuse controlled transformers hence no protections. |
| 10 | Kulachi 66kV GS | - | - | - | - | Fuse controlled transformer hence no protections. |
| 11 | Tajazai 66kV GS | - | - | - | - | Fuse operated transformers hence no protections. |

| | | | | | | |
|--------------|-------------------|----------|----------|----------|----------|---|
| 12 | Timergara 66kV GS | 1 | - | 2 | - | Differential relay is defective for transformer T2. |
| 13 | Wari 66kV GS | - | - | - | - | Protections are working properly. |
| 14 | Warsak 66kV GS | - | - | - | - | Fuse operated transformers hence no protections. |
| Total | | 2 | 0 | 4 | 2 | |

Table 10: Essential Protection Relays for 132kV Transmission Lines

| Sr. No | Name of Grid Station (GS) | No. of Distance Protection Relays Not Installed/ Defective | No. of Backup O/C-E/F Relays Not Installed/ Defective | No. of Auto-recloser Relay Not Installed/Defective | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------|---------------------------|--|---|--|---|---|
| 1 | Abbottabad 132kV GS | - | - | 4 | - | |
| 2 | AMC Abbottabad 132kV GS | - | - | - | - | All main protections are working properly. |
| 3 | Balakot 132kV GS | - | - | 1 | - | |
| 4 | Bannu 132kV GS | 1 | - | 2 | - | Distance relay for BNU-3 is defective. |
| 5 | Battal 132kV GS | - | - | - | - | There is no line circuit breaker, hence no protection. |
| 6 | Chakdara 132kV GS | 2 | - | 3 | 5 | Distance relays for CKD-4 and CKD-5 are defective; needs replacement. |
| 7 | Charsadda 132kV GS | 1 | - | 1 | 3 | Distance relay for CSD-3 is defective. |
| 8 | D.I Khan 132kV GS | 2 | - | 4 | 4 | Distance relays on both 66kV outgoing circuits are defective. |
| 9 | Daggar 132kV GS | - | - | - | - | There is no line circuit breaker, hence no protection. |
| 10 | Dalazak 132kV GS | - | - | 2 | - | |
| 11 | Dargai 132kV GS | - | - | 1 | 2 | |
| 12 | Gadoon Amazai 132kV GS | - | - | 2 | - | |
| 13 | Gumbat 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 14 | Gurguri 132kV GS | 2 | - | - | - | Distance relay for GRI-1 & GRI-2 is defective. |
| 15 | Hangu 132kV GS | - | - | 2 | - | |
| 16 | Haripur 132kV GS | 2 | - | 3 | 6 | Distance relay for HRP-3 and HRP-6 is defective. |

| Sr. No | Name of Grid Station (GS) | No. of Distance Protection Relays Not Installed/ Defective | No. of Backup O/C-E/F Relays Not Installed/ Defective | No. of Auto-recloser Relay Not Installed/Defective | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------|---------------------------|--|---|--|---|---|
| 17 | Hattar 132kV GS | 2 | - | 2 | 2 | Distance relay for HTR-2 & HTR-3 is defective. |
| 18 | Hattian (AJK) 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 19 | Hayatabad 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 20 | Hussai 132kV GS | - | - | 1 | - | |
| 21 | Jalala 132kV GS | - | 1 | 2 | - | Backup O/C-E/F relay for JLA-4 is not available. |
| 22 | Jamrud 132kV GS | - | - | 1 | 5 | |
| 23 | Jehangira 132kV GS | - | - | - | 3 | |
| 24 | Karak 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 25 | Katlang 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 26 | KDA Kohat 132kV GS | - | - | 4 | - | |
| 27 | Khwazakhela 132kV GS | - | - | 2 | - | |
| 28 | Kohat 132kV GS | 5 | - | 3 | 8 | Five distance relays are defective. |
| 29 | Lachi 132kV GS | 1 | 1 | - | 2 | Distance relay on LCH-I is defective. |
| 30 | Mansehra 132kV GS | - | - | - | 3 | |
| 31 | Mardan II 132kV GS | - | 1 | 3 | - | |
| 32 | Mattani 132kV GS | 1 | - | 1 | - | One distance relay is defective. |
| 33 | Muzaffarabad 132kV GS | - | - | 3 | - | |
| 34 | Nathia Gali 132kV GS | - | - | - | - | |

| Sr. No | Name of Grid Station (GS) | No. of Distance Protection Relays Not Installed/ Defective | No. of Backup O/C-E/F Relays Not Installed/ Defective | No. of Auto-recloser Relay Not Installed/Defective | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------|------------------------------|--|---|--|---|---|
| 35 | Nishat Tarbela 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 36 | Nizampur 132kV GS | - | - | 1 | 1 | |
| 37 | Noseri (AJK) 132kV GS | - | - | - | - | There is no line circuit breaker hence no protection. |
| 38 | Nowshera City 132kV GS | - | - | - | 2 | |
| 39 | Nowshera Industrial 132kV GS | - | - | 1 | - | |
| 40 | Oghi 132kV GS | - | - | 1 | - | |
| 41 | Pabbi 132kV GS | 2 | - | - | - | Two distance relays on PBI-1 and PBI-2 are defective. |
| 42 | Peshawar Cantt 132kV GS | - | - | - | - | All main protections are working properly. |
| 43 | Peshawar City 132kV GS | - | - | - | 2 | |
| 44 | Peshawar Fort 132KV GS | 1 | - | 2 | - | Distance relay installed on Peshawar Fort-Shahibagh Ccct-2 line is defective. |
| 45 | Peshawar Industrial 132kV GS | - | - | - | 2 | |
| 46 | Peshawar University 132kV GS | - | - | - | - | All main protections are working properly. |
| 47 | Pezu 132kV GS | - | - | 2 | - | |
| 48 | Prova 132kV GS | - | - | 2 | - | |
| 49 | Rahman Baba 132kV GS | - | - | - | - | All main protections are working properly. |
| 50 | Rajjar 132kV GS | - | - | 1 | - | |
| 51 | Right Bank 132kV GS | - | - | 1 | - | |
| 52 | Sakhi Chashma 132KV GS | - | - | 2 | 2 | |

| Sr. No | Name of Grid Station (GS) | No. of Distance Protection Relays Not Installed/ Defective | No. of Backup O/C-E/F Relays Not Installed/ Defective | No. of Auto-recloser Relay Not Installed/Defective | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------------|---------------------------|--|---|--|---|--|
| 53 | Sarai Naurang 132kV GS | - | - | 1 | - | |
| 54 | Shabqadar 132kV GS | 2 | - | 5 | - | |
| 55 | Shahibagh 132kV GS | - | - | 8 | 14 | This is a very old GS having old protection schemes; needs up gradation. |
| 56 | Shangla Par 132kV GS | - | - | - | - | There is no line circuit breaker, hence no protections. |
| 57 | Swabi 132kV GS | - | - | - | - | There is no line circuit breaker hence no protections. |
| 58 | Swat 132kV GS | 1 | - | 1 | - | 132kV Swat-Madyan circuit is used as 11kV outgoing feeder as Madyan GS is washed out in flood. |
| 59 | Tajazai 132kV GS | - | - | 3 | - | |
| 60 | Tall 132kV GS | 1 | 1 | 3 | 3 | |
| 61 | Tangi 132kV GS | 1 | - | - | - | Distance relay installed on 132kV Shabqadar-Tangi line is defective. |
| 62 | Tank 132kV GS | - | - | 1 | - | Protections are working properly. |
| 63 | Timergara 132kV GS | - | - | 1 | - | Protections are working properly. |
| 64 | Warsak 132kV GS | 2 | - | 2 | 4 | Distance relays on both incoming 132kV lines are defective. |
| Total | | 29 | 4 | 85 | 73 | |

Table II: Essential Protection Relays for 66kV Transmission Lines

| Sr. No | Name of Grid Station (GS) | No. of Distance Protection Relays Not Installed/ Defective | No. of Backup O/C-E/F Relays Not Installed/ Defective | No. of Auto-Recloser Relay Not Installed/Defective | No. of Trip Circuit Supervision Relays Not Installed/ Defective | Remarks |
|--------------|---------------------------|--|---|--|---|---|
| 1 | Badaber 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 2 | Band Kurai 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 3 | Daggar 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 4 | Daraban 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 5 | Dir 66kV GS | - | - | - | 1 | |
| 6 | Haripur 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 7 | Havalian 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 8 | Kheshki 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 9 | Kohat 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 10 | Kulachi 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 11 | Tajazai 66kV GS | 1 | - | - | 4 | Distance relay for TJZ-3 is not installed. |
| 12 | Timergara 66kV GS | 1 | - | - | 1 | Distance relay for TMG-4 is not installed. |
| 13 | Wari 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| 14 | Warsak 66kV GS | - | - | - | - | There is no line breaker, hence no protections. |
| Total | | 2 | 0 | 0 | 6 | |

www.ep-ep.com.pk
info@ep-ep.com.pk