National Electric Power Regulatory Authority
Islamic Republic of Pakistan

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No. NEPRA/Director.(Tech.)/LAT-01/15077 September 26, 2024

Managing Director
National Transmission & Despatch Company Limited (NTDCL),
414-WAPDA House, Shahrah-e-Quaid-e-Azam,
Lahore

Subject: **Decision of the Authority in the matter of Revised Transmission Investment Plan and losses assessment of National Transmission and Despatch Company Limited (NTDC) for Tariff Control Period from FY 2022-23 TO FY 2024-25**

The Authority as per provisions of Section 32 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (NEPRA Act) and NEPRA's Guidelines for Determination of Revenue requirement and Use of System Charges for Transmission Licensees, 2017 (2017 Guidelines) approves the investment plan and losses assessment of NTDC for tariff control period from **FY 2022-23 to FY 2024-25**.

2. The subject Decision along with **Annex-A,B,C,D,E,F,G,H,J,K,L & M** (total 175 pages) is enclosed herewith for information and further necessary action please.

Enclosure: **As above**

Wasim Anwar

(Wasim Anwar Bhinder)

DECISION OF THE AUTHORITY IN THE MATTER OF REVISED TRANSMISSION INVESTMENT PLAN AND LOSSES ASSESSMENT OF NATIONAL TRANSMISSION AND DESPATCH COMPANY LIMITED (NTDC) FOR TARIFF CONTROL PERIOD FROM FY 2022-23 TO FY 2024-25

1. The Authority, through this decision, is deciding the petition filed by National Transmission & Dispatch Company Limited ("NTDC or the Petitioner) for approval of the Transmission Investment Plan ("TIP") and losses assessment for the tariff control period from FY 2022-23 to FY 2024-25.

2. In compliance with the provisions of Section 32 of the Regulation of Generation Transmission and Distribution of Electric Power Act, 1997 ("NEPRA Act") and NEPRA's Guidelines for determination of Revenue Requirement & Use of System Charges for Transmission Licensees, 2017 ("2017 Guidelines"), NTDC vide its petition dated 12-7-2023 (received on 26-7-2023) submitted its TIP and losses assessment for the MYT control period of three years spanning from FY 2022-23 to FY 2024-25.

3. It is pertinent to note that NTDC initially submitted its investment plan and losses assessment for FY 2022-23 to FY 2024-25 on 23-09-2022, in compliance with section 32 of the NEPRA Act. As per the regulatory requirements a public hearing involving NTDC, Provincial Energy Department, DISCOs and general public was conducted on 02-01-2023. Following the public hearing and the completion of the regulatory process by the Authority, NTDC submitted its revised investment plan on 12-7-2023, which featured significant changes to the capital expenditure requirements for existing projects, as well as the inclusion of new projects. The revised investment plan encompassed 18 additional projects and included budgetary adjustments for 33 existing projects. Furthermore, the total investment requirement escalated from Rs. 370 billion to Rs. 510 billion in this updated plan. In response to the substantial modifications in the revised investment plan, the Authority opted to commence new proceedings. This led to a notable delay in the issuance of the Authority's decision. Given that, the revised plan was submitted after half of the control period had elapsed, therefore the Authority was constrained to actualize the investments already incurred by NTDC during the elapsed period.

4. The Petitioner in its submissions before the Authority stated that the revised TIP comprises of constraint removal schemes along with the necessary interventions to ensure system security and reliability. The summary of the projects under various heads of revised TIP is given below:

Sr	Head	Number of Projects	CAPEX Million Rs.	%
1	Constraints Removal Projects (CRPs) / System Expansion Projects	51	172,681	34
2	Power Evacuation Projects (PEPs)	30	277,434	54
3	Projects for Special Economic Zones (SEZs)	5	30,369	6
4	Other Development Projects (Other)	13	29,621	6
	Grand Total	99	510,105	100

5. The revised TIP reflected the following objectives:

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i. Strengthening and expansion of the transmission system at extra-high voltages (765 kV, 500 kV, 220 kV) to cater for future load requirements.

ii. Removal of system constraints and congestion to ensure stability and reliability of transmission network.

iii. Power evacuation projects for dispersal of electricity generated from power plants.

iv. Conversion of AIS grid stations to GIS grid stations.

v. Improving safety culture.

vi. Technological advancement projects such as SCADA-III project, Battery Energy Storage System (BESS), Static VAR System (SVS) and Static VAR Compensators (SVCs) implementation, etc.

VALIDATION OF NTDC's 3 YEARS REVISED INVESTMENT PLAN:

6. The projects included in the revised TIP underwent a thorough review and approval process by the Central Development Working Party (CDWP) and the Executive Committee of the National Economic Council (ECNEC). Additionally, since the majority of the National Transmission and Dispatch Company's (NTDC) projects are funded by international agencies like JICA, ADB, World Bank, and KfW, these funding institutions also conducted their own third-party validation and evaluation of the proposed projects prior to financing. In light of this, the Authority is convinced that a thorough validation of the NTDC projects incorporated in the revised TIP has been conducted. Furthermore, the Authority has eliminated all such projects for which the PC-I has not received approval from the Planning Commission, ECNEC, or CDWP, or for which funding has not been secured.

PUBLIC HEARING OF NTDC's 3 YEARS REVISED INVESTMENT PLAN

7. To fulfill the requirements stipulated in the 2017 Guidelines, ensure the ends of natural justice, and to arrive at an informed decision, the Authority decided to conduct a public hearing on the revised TIP. An advertisement for public hearing was published in newspapers having national circulation on 24-10-2023 seeking the participation and inviting comments/input of stakeholders on TIP. The TIP and related hearing issues were also uploaded on the NEPRA official website. The notices of hearing were issued to stake holders including provincial energy departments on 25-10-2023. Accordingly, the public hearing in the matter was held on November 22 & 23, 2023 which was participated by stakeholder physically as well as through zoom.

ISSUES FRAMED FOR THE PUBLIC HEARING

8. Following is the list of the issues which was approved by the Authority for the public hearing on the subject matter:

i. Whether the proposed investment plan take into account the Demand Forecast of DISCOs? Whether the demand forecast made by DISCOs and NTDC is justified?

ii. Whether the investment plan has the constraints removal schemes to ensure the full off-take from economic power plants in the power system? NTDC to provide firm timelines

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for removal of system constraints along with financial implications in terms of operation of expensive generation due to such constraints.

iii. Whether NTDC has prioritized the critical projects for coming years? If not, NTDC is advised to prioritize the critical projects and their investment requirements keeping in view the prevailing situations of country.

iv. NTDC is required to brief the Authority regarding the projects delayed due to RoW issues along with the financial implications incurred to national exchequer? Moreover, NTDC to submit forward to mitigate the RoW issues?

v. Whether the claimed investment of Rs. 30,269 million for Special Economic Zones (i.e., Dhabeji, Swabi, Haripur, Lahore and Faisalabad) are justified?

vi. Whether the claimed investment of Rs. 6,616 million for land acquisition of solar power plants in Muzaffargarh, Jhang and Layyah are justified?

vii. Whether the claimed investment of Rs. 335,098 million for PSDP funded ongoing works related to power evacuation and load growth projects are justified?

viii. Whether the claimed investment of Rs. 110,232 million for PSDP funded new works related to power evacuation and load growth projects are justified?

ix. Whether the claimed investment of Rs. 15,340 million for Self-Financed ongoing scheme are justified?

x. Whether the claimed investment of Rs. 4,255 million for completed works through PSDP/own resources are justified?

xi. Whether the claimed investment of Rs. 8,195 million for completed works through foreign funding are justified?

xii. Whether the cost overrun of Rs. 180,382 million in 42 projects (List attached) is justified? NTDC to explain the reasons for cost overrun in each project and steps taken to avoid financial loss due to cost overrun to public exchequer. Further, NTDC to justify the delays in executing the Project.

xiii. Whether the third-party study regarding T&T losses has been completed? If Yes NTDC to share the outcome of study otherwise NTDC is required to apprise timelines for completion of such studies by third party consultant.

xiv. Whether 3rd party audit has been conducted by NTDC for evaluating the projects proposed under the revised investment plan.

xv. Whether the objections/concerns raised by the DISCOs, Provinces and other stakeholders are addressed in the revised investment plan of NTDC?

xvi. Whether the investment allowed in previous financial years have been fully utilized?

xvii. Whether NTDC has included investment for technological advancement such as Power Compensation Devices (SVC, TCR, STATCOM etc.), Reactive Power Management Plan, WAMS, PMUs, PDCs, Revamping Telecom Network, Synchronic Relays, Out of Step Device, Reinforcement of Interim Arrangement, Shunt Reactors etc.?

xviii. Petitioner must provide the project wise rationale against requested investment and techno commercial benefits to be achieved through proposed investment in terms of constraints removal, additional energy available for wheeling through MVA additions, reliability & continuity of supply, reduction in transmission losses, etc.

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INTERVENTION REQUESTS AND COMMENTS:

9. In a letter dated 6-11-2023, the Hyderabad Electric Supply Company (HESCO) highlighted the urgency of early completion of the 220 kV Mirpur Khas grid station, provision of a second source at the 220 kV Hala Road grid station, augmentation works at the 220 kV T.M Khan and 220 kV Hala Road grid stations, and extension work at the 500 kV Jamshoro grid station.

10. Additionally, in a letter dated 28-12-2023, Hydrochina Dawood Pvt Ltd submitted post-hearing comments stating that the Gharo wind power plants (Zephyr, HDPPL, and Tenaga), as well as other wind power plants in general, are encountering issues due to inadequate evacuation arrangements by NTDC.

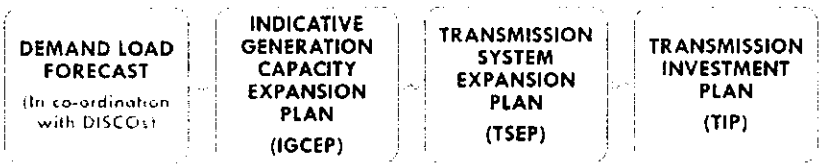
11. During the proceedings, the Authority sought clarification from the Planning Commission regarding cost overruns. In a letter dated 29-12-2023, the Planning Commission informed the Authority that a 15% increase in the original approved project cost (PC-I cost) is permissible as per their guidelines, and no fresh approval is required for ongoing schemes if the cost changes solely due to variations in the exchange rate.

12. The Authority has considered the petition, the material placed on record, and the averments of the Petitioner during the hearing. The issue-wise submissions made by NTDC in the public hearing, as well as the pre- and post-public hearing comments of stakeholders, have been analyzed and are discussed below:

Issue # 01: Does the proposed investment plan take into account the demand forecast of DISCOs? Is the demand forecast made by DISCOs and NTDC justified?

SUBMISSIONS OF PETITIONER:

13. The Petitioner clarified that the TIP is based on the Transmission System Expansion Plan (TSEP) in which all proposed projects are technically justified. Moreover, during preparation of TSEP, demand forecast of each DISCO is considered and all the projects are proposed in coordination with DISCOs. Planning Process as laid down in the Grid Code 2023 is followed.



14. Furthermore, Petitioner briefed the Authority that the demand projections of country i.e. 4.5% (normal scenario) has been considered based on the data of FY 2021 and the same projections are used in IGCEP 2022-31 which has been approved by the Authority. Furthermore, Petitioner clarified that the updated PMS based demand forecast for FY 2022-23 is in process. The Petitioner also clarified that in case the demand projections are increased or decreased from the reference projections of 4.5% then the timelines of some of projects may be changed.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

15. The Authority observes that the investment plan submitted by NTDC for a period of three years FY 2022-23 to FY 2024-25 is based on the parameters i.e., energy and peak demand forecast

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for Medium Term Load Forecasting methodology in consultation with all DISCOs through power market survey (PMS). This energy/demand and consumer base forecasting forms the basis of System Extension & Augmentation Program (SAP) and strategic initiatives (deployment of ABC and AMI smart meters) in DISCOs. Moreover, the input parameters of PMS include but not limited to the following factors.

i. Historic Growth Rates for each category of consumer.
ii. T&D Losses in network.
iii. Load Profiles & Energy Consumption patterns.
iv. Unserved Energy (Load Shedding, Pending Connections).
v. Net Metering Quantum

16. Further, based on these forecasting, the DISCOs/KE prepare their Transmission & Distribution Investment Plans (DIIP). The DISCOs plans serve as one of the inputs for NTDC's transmission investment plan. It is also important to note here that the Authority has already approved the DIIP of ten DISCOs and K-Electric.

17. Additionally, it is important to note that as per the Grid Code 2023, each TNO shall prepare Transmission Investment Plan for a horizon of five years in conformity with centralized TSEP not later than three months from approval of TSEP.

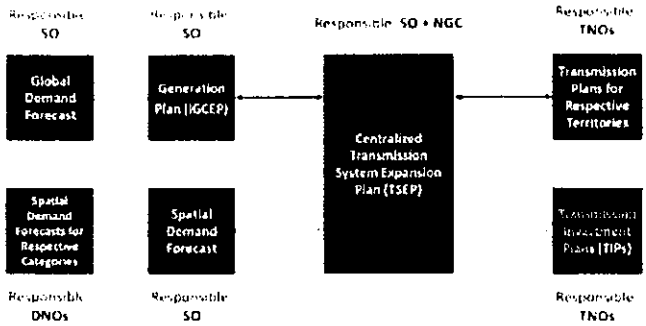

Figure PC 1 Integrated System Planning

18. It is noted that by the Authority that Global Demand Forecast and TSEP are still under preparation. However, the IGCEP and PMS based DISCOs Demand Forecast along with transmission congestions and reliability assessments of the network are available based on which three years investment plan has been prepared by NTDC.

19. Although, the Grid Code 2023 requires 5 years Transmission Investment Plan. However the 5 years DIIP Plan for majority of the DISCOs is approved by Authority from F 2020-21 to FY 2024-25, therefore, the Authority considered to align NTDC plan with most of the DISCOs investment plan to bring synergies in the system planning. Thus, the instant TIP which is for three years control period has been considered by the Authority so that NTDC may proceed to file its tariff petition.

20. It is also observed by the Authority that DISCOs are in compliance with provisions of the Distribution Code as far as methodology of the demand forecast is concerned. The DPC-5 of the Distribution Code stipulates various methodologies of the demand forecasting and

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distribution licensee is obligated to prepare each year medium term load forecast (MTLF) based on any of following methodology adopted:

i. historical population and load growth analysis
ii. land use and zoning methods
iii. end-use energy methods
iv. any other reasonable and justifiable method

21. In view of foregoing, the Authority is of the view that since the PMS based demand forecasting used by DISCOs is in line with provisions of Distribution Code and same projections are also used as input for Distribution Investment Plans (which has already been approved by the Authority) therefore the PMS based demand forecasting used by NTDC in its TIP is adequate.

22. Further, the Authority directs NTDC to ensure that spatial demand forecast used in the TIP and Global Demand Forecast used for IGCEP are aligned to achieve the aim of coordinated system planning and optimal investments in the network.

Issue # 02: Whether the investment plan has the constraints removal schemes to ensure the full off-take from economic power plants in the power system? NTDC to provide firm timelines for removal of system constraints along with financial implications in terms of operation of expensive generation due to such constraints.

SUBMISSIONS OF THE PETITIONER:

23. The Petitioner stated that it has identified 33 constraint removal projects which shall be executed to eliminate the long-standing system constraints and ensure system stability and reliability. The summary of the constraint's removal projects is given below:

Constraint Type	Constraints as reported by NPCC	Count
Transformation Constraints	Overloading Constraints of 500/220 kV Transformer	8
	Overloading Constraints of 220/132 kV Transformer	18
Transmission Line Constraints	Overloading Constraints of 500kV Transmission	6
	Overloading Constraints of 220kV Transmission	1

24. The detailed scope of these constraints' removal schemes and associated relief projects is attached as **Annexure-A**. The brief of all these 33 constraint removal projects as provided by the Petitioner is given below:

Sr	Grid Station/Circuit	Constraint Removal Timeline
	A. Transformation Constraints (Overloaded 500/220 kV Transformers)	
1	500 kV Rawat	December 2026
2	500 kV Gatti	December 2025
3	500 kV Multan	June 2026
4	500 kV Muzaffargarh	June 2026
5	500 kV Yousafwala	June 2026
6	500 kV Jamshoro	June 2024
7	500 kV Shaikh Muhammadi Peshawar	April 2026
8	500kV Lahore Sheikhupura	June 2025
	B. Transformation Constraints (Overloaded 220/132 kV Transformers)	
9	220 kV ISB University	December 2026
10	220 kV Sialkot	June 2026
11	220 kV Sarfaraznagar	Subject to 220 kV Sundar Ind. grid Partially by December 2023

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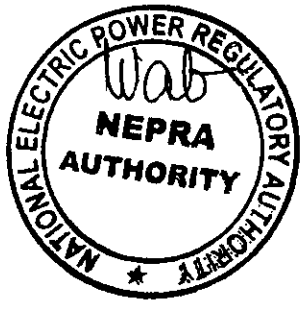
12	220 kV New Kot Lakhpat	June 2026
13	500kV Lahore Sheikhupura	August 2024
14	220 kV Daudkhel	January 2024
15	220 kV Ludewala	April 2024
16	500 kV Yousafwala	June 2026
17	500kV Guddu	June 2025
18	220kV Bahawalpur	January 2024
19	220kV KAPCO P/H	June 2026
20	220 kV Rohri	January 2024
21	220 kV T.M.Khan	August 2025
22	220 kV Khuzdar	June 2024
23	220 kV Quetta Industrial	June 2026
24	220kV Hala Road	August 2025
25	220kV Jamshoro	August 2025
26	220 kV Muzaffargarh New	June 2024
	C. POWER EVACUATION PROBLEMs from South to North (OVERLOADED 500kV T/Lines)	
27	500 kV Jamshoro – China Hub – HUBCO : 500 kV K2/K3 – Jamshoro (Unable to Dispatch Power Plants K2/K3, China HUB, HUBCO on Full Load in this Loop)	June 2024
	500 kV Jamshoro – China Hub and 500 kV HUBCO – K2K3 (Unable to Dispatch Power Plants China HUB & HUBCO) on Full Load during outage of either 500kV China HUB – Jamshoro or 500kV HUBCO – K2K3)	
	500 kV Jamshoro - Matiari circuit 1 & 2; 500 kV Jamshoro – Dadu circuit (Unable to Dispatch existing Power Plants in south on Full Load)	August 2025
28	500 kV Dadu – Shikarpur and 500 kV Moro - Rahim Yar Khan (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)	August 2025
29	500 kV Shikarpur - Guddu 1 & 2 500 kV Moro – Rahim Yar Khan (Unable to Dispatch existing Power Plants in south on Full Load)	August 2025
	D. POWER EVACUATION PROBLEMS IN North and MID Center (OVERLOADED 500kV T/Lines)	
30	500 kV Yousafwala – Sahiwal Coal CFPP(Overloading occurred on dated 18.06.2023, Unable to despatch Sahiwal Coal on Full Load)	June 2026
31	500 kV Nokhar – Karot – Neelum Jhelum interconnection loop (Unable to Dispatch Karot & Neelum Jhelum on Full Load in this Loop during outage of any circuit connected with Nokhar)	December 2025
32	500kV Sheikh Muhammadi – Tarbela Circuit	June 2026
	E. POWER EVACUATION PROBLEM in south (OVERLOADED 220 kV T/Lines)	
33	220 kV Jamshoro – Hala Road circuit # 01 & 02	June 2026

25. The Petitioner apprised the Authority that the Daharki – R.Y.Khan – Bahawalpur - Chistian 220 kV link which is included in the instant investment plan will reinforce the AC network by resulting in parallel 500 kV and 220 kV network from Shikarpur – North. This will improve



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power transfer from south to north. The expected completion of the subject transmission line is May 2027.

26. Moreover, the Petitioner also stated that new 500 kV double circuit T/Line: Matiari – Moro – R.Y. Khan is also proposed by NTDC management to overcome north south power transfer issues. However, the funding or this transmission line is not secured at the moment and not included in instant investment plan. The tentative completion date for this line is at least 4 years. This line will also be helpful in enhancing power transfer capacity from south to north.

27. In addition to above, the Petitioner briefed the Authority that a study project titled as "System Study for Review of Grid System Performance and Proposals for System Stability Improvement" is being conducted by M/s CESI. Furthermore, this study will highlight the measures required to enhance power transfer capacity and address system stability issues from north to south. The scope of the study includes:

    i. Dynamic reactive power compensation devices at appropriate locations in southern and northern network.
    ii. Small signal/low frequency oscillatory stability improvement through Power System Stabilizers (PSS) installed at the existing power plants and with PSSs proposed at other power plants.

28. The Authority was also informed that the North to South power transfer comparison in summer 2023 and summer 2024 has also been carried out. It has been found that after energization of 500 kV KKI and 220 kV Dhabeji grids and associated transmission lines by KE, the surplus power available in south would be provided to KE and thus the issue of surplus power in south would be mitigated to great extent. The comparison as provided by petitioner is given below:

		Summer 2023	Summer 2024
Generation in South	Gross Capacity (MW)	Net Capacity (MW)	Net Capacity (MW)
1. Port Qasim CFPP	1,320	1,250	1,250
2. Engro CFPP	660	608	608
3. China Hub CFPP	1,320	1,250	1,250
4. Lucky CFPP	660	610	610
5. Thar Energy Limited (TEL) CFPP	330	304	304
6. SECL CFPP	1,320	1,240	1,240
7. Thal Nova CFPP	330	304	304
8. Jamshoro CFPP (Unit #1)	-	-	600
9. K-2 NPP	1,145	1,045	1,045
10. K-3 NPP	1,145	1,045	1,045
Wind	1,845	1,753	1,753
Total Generation in South	10,075	9,409	10,009
Power Export to K-Electric		1,100	2,100
HESCO Peak Load Demand		850	900
Total Consumption in South		1,950	3,000
Total AC Line Losses in South		80	80
Total Power in South at Jamshoro/Matiari Interface		7,379	6,929
Total (HVAC+HVDC) Capacity		4,500	5,400
Surplus Power in South		**2,879**	**1,529**

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29. It is also pertinent to mention here that NTDC and CPPA-G gave a detailed presentation before the Authority regarding system constraints and its removal on 20-2-2024 wherein NTDC prioritized the long standing constraints impacting the monthly FCAs, as shown below:

Sr.	Constraint	Commitment of Generation/Curtailment
1	Overloading of Transformers at 500 kV Rawat G/S	Attock Gen
2	Overloading of Transformers at 500 kV Nokhar G/S	HUBCO Narowal & Nandipur
3	Overloading of Transformers at 500 kV Sheikhupura G/S	Saba, Halmore, Sapphire
4	Overloading of Transformers at 500 kV Yousafwala G/S	Saif
5	Overloading of Transformers at 220 kV Sarfraznagar G/S	Nishat Power, Nishat Chunian & KEL
6	Overloading of Transformers at 220 kV Kassowal G/S	FKPCL
7	Transformation congestion at 500 kV Muzaffargarh and New Multan Grids G/S	Lalpir, Pakgen, KAPCO
8	Transformation congestion at 500 kV Gatti G/S	Liberty Tech.
9	South to North Congestion HVDC & HVAC Limitation and Strategic Table for HVDC Operation for Winter/Summer	Curtailment of local Coal/Nuclear/Wind, Operation of RLNG/RFO plants in North
10	Overloading of Gakkhar – Sialkot Circuit	Nandipur & HUBCO Narowal

30. Hydrochina Dawood Pvt Ltd vide its letter dated 28-12-2023 stated that Gharo WPPs (Zephyr, HDPPL & Tenaga) in particular and other WPPs in general are facing following issues due to inadequate evacuation arrangements.

i. Non-provision of N-1 criteria: The Gharo WPPs have been temporarily connected via 220 kV single circuit to Jhampir since more than 2 years without N-1 due to non-availability of 220 kV Gharo G/S.

ii. Continuous curtailments: Gharo WPPs are have faced continuous curtailment since the time they were connected to Jhampir circuit in September 2021. Moreover, after induction of nuclear in south NTDC has been carrying out curtailments from WPPs amounting to 750 MW out of total 1845 MW installed wind power.

iii. Frequent tripping of 132 kV lines: The 132 kV network in the region has a tripping record beyond the agreed technical limits in the EPAs and does not fulfil the NEPRA SAIFI/SAIDI standards even for 132 kV networks.

iv. Maintenance issues of WPPs: WPPs developed faults and the replacement of components could not be made readily available owing to government restrictions on imports. Moreover, due to network issues, O&M cost of WPPs have surged.

31. Furthermore, to the above M/s Hydro China Dawood has requested the early completion of the 220 kV Gharo New G/S Battery Energy Storage pilot project at Jhampir to improve frequency regulations and 132 kV maintenance issues whether to be carried out by NTDC or HESCO also need to be settled.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

32. The Authority has noted that the major bottleneck in provision of affordable and reliable electricity supply is the transmission network of NTDC. Further, the Authority is also aware of the fact the economical, base load and indigenous fuel source generation which include nuclear, thar coal and renewables is concentrated in the south of the country but the transmission and transformation capacity is not adequate to transfer the cheaper generation to the load center.

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Thus, the curtailment of economic power plants is being done by system operator and expensive RFO based power plants are being operated in load centers to ensure system stability and reliability which results in higher generation cost.

33. The Authority also noted that the owners of wind power plants raised serious concerns about the curtailment from wind power projects in the south due to constraints and a fragile/deteriorated transmission network. Though the completion of the 500 kV KKI and 220 kV Dhabeji will reduce the curtailment issues, but in order to ensure maximum power evacuation from WPPs, the 220 kV GIS Gharo is imperative.

34. The Authority is cognizant of the fragile transmission network and system constraints of NTDC and directs NTDC to expedite its efforts in the matter of constraints removal projects and ensure timely completion of all these schemes. Further, Authority feels that there is dire need to address the constraints and system maintenance, design and administrative issues especially in south to avoid curtailments, tower collapses and theft of tower material. Moreover, completion of 220 kV Mirpur khas grid station, provision of ring system in the south of country by providing 2nd source of supply to TM Khan and Hala Road grid station, completion of 220 kV T/line from Dharki to Chistian and review for the tower / insulator designs in south to sustain climate and weather stresses are very critical for stable and reliable grid.

35. Based on the above discussion, observation and analysis, the Authority approves above mentioned 33 constraint removal projects with the directions to ensure completion of the same as per timelines committed by the Petitioner in its TIP.

36. In addition to above, the Authority has noted that NTDC's following grid stations are also overloaded and experiencing constraints. Therefore, NTDC is directed to ensure proper constraints removal schemes for these 8 grid stations as well.
    i. 220kV ISPR Sangjani
    ii. 220kV Gakkhar
    iii. 220kV Sahuwala Sialkot
    iv. 220kV WAPDA Town
    v. 220 kV Ravi
    vi. 220 kV Kassowal
    vii. 220 kV Vehari
    viii. 500kV Nokhar

Issue 3: Whether NTDC has prioritized the critical projects for coming years? If not, NTDC is advised to prioritize the critical projects and their investment requirements keeping in view the prevailing situations of country.

PETITIONER'S SUBMISSIONS

37. The Petitioner during the course of proceedings stressed that all the projects included in the TIP are critical and are required against the years mentioned in the plan. Furthermore, TIP includes transmission projects of critical nature such as power evacuation schemes for upcoming

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generation projects, system reinforcement/expansion for constraints removal & to meet future load demand, system stability improvement and dynamic voltage support, etc.

38. In addition to above the Petitioner mentioned that the TIP is based on the TSEP which is prepared in line with IGCEP, both of which have a specified procedure regarding selection of projects.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

39. It is observed by the Authority that the Petitioner included total 98 projects in its TIP and out of these 98 projects, thirty-eight project (38) have achieved physical completion however some of their payments are still outstanding and these are awaiting financial completion for which the Petitioner must take measures to settle outstanding payments and submit PC-IV to the relevant forum.

40. It is also observed by the Authority that practically this investment plan is comprised of 60 ongoing & planned projects and as per the Petitioner these 60 projects are critical for power evacuation, system expansion to meet future demand and constraint removal projects.

41. Further, the Authority feels that the timely completion of all these 60 projects is of the prime importance in order to avoid the cost over runs in the projects and ensure the power quality and system reliability of national grid. Also, the timely completion of these projects will address the curtailment of economical and indigenous fuel based power plants three resulting in affordable electric power supply to the consumers.

42. The Authority directs the petitioner to expedite the progress of work and ensure early completion of all these 60 projects with especial focus on the following:

i. Power Evacuation of Thar based coal power projects
ii. South – North Power Congestion Projects
iii. System constraints / overloading causing operation of expensive fuel based power plants.

Issue # 4: NTDC is required to brief the Authority regarding the projects delayed due to RoW issues along with the financial implications incurred to national exchequer? Moreover, NTDC to submit way forward to mitigate the RoW issues?

SUBMISSION OF PETITIONER

43. NTDC during the course of hearing stated that it is facing severe right of way issues by the people affected by construction activities and due to the right of way challenges the projects are facing delays. The right of way challenges and their consequential effect as provided by the Petitioner is given below:

Right of Way Challenges

i. Resistance in construction activities by project affected people.

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ii. No compensation policy for land under transmission lines.
iii. Compliance with social safeguards requirements of International Financing Institutions.
iv. Insufficient & impracticable compensations of WAPDA Composite Schedule Rates in past.
v. Inadequate & Outdated Legal Cover for dealing with Land Acquisition & Right of Way.

Consequential effect on NTDC projects

i. Imposition of Penalties / Liquidated Damages
ii. Loan issues with the lenders / IFIs
iii. De-mobilization of contractors & re-bidding
iv. Project cost overrun due to increase in exchange rate, inflation, IDC, change in scope, dispute with contractors & sub-contractors, etc.
v. payment of commitment charges

44. In addition to above the Petitioner submitted that it is making efforts to resolve RoW issues through comprehensive mechanism once and for all. In this regard, a draft bill/law 'TRANSMISSION OF ELECTRICITY (RIGHT OF WAY) BILL' has been prepared by Law Directorate of NTDC by including all the suggestions and covering other issue also such as Railways / National Highways / Motorways crossings etc.

45. The said draft has been sent to the Ministry of Energy to be presented in the legislature to be promulgated as law. Further, the Petitioner is constantly making efforts to get the said draft bill passed.

46. Further to above, the Petitioner intimated that its BoD has approved new compensation policy "NTDC Compensation Policy for RoW & Land Acquisition", the salient features of newly approved policy are given below:

i. Alignment with requirements of IFIs
ii. Resettlement allowances for both grid stations and transmission lines including:
iii. Vulnerability Allowance
iv. Shifting/Transport/Relocation Assistance
v. Business Interruption Allowance
vi. Severe Impact Allowance
vii. Development of new SoPs
viii. One-time additional compensation for transmission lines

47. NTDC further intimated that a number of transmission lines projects are facing delays due to RoW issues. The name of projects facing RoW issues are as follows:

Sr.	NAME OF PROJECT FACING ROW ISSUES AS OF 22-11-2023
1	HVDC Transmission Line from Torkham Border to Nowshera
2	220 kV D/C T/L for in/out of 220 kV Gharo – Jhimpir S/C at 220 kV Dhabeji SEZ G/S
3	500kV D/C T/L For Interconnection of K-2/K-3 Nuclear Plants With 500kV Port Qasim Matiari Transmission Line
4	220kV T/Line from 500kV Nowshehra to Swabi G/S

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5	220kV T/L through in/Out of Mansehra - ISPR at 220kV Haripur G/S
6	500kV T/Line through in/Out of existing Tarbela-Peshawar T/L at 500kV Nowshehra G/S
7	Evacuation of Power from Tarbela 5th Extension
8	500kV T/Line from Suki Kinari HPP to interconnection point of NJTL
9	ADB- 301: 500kV T/Lines Associated with 500kV Lahore North G/S
10	ADB-301B: 220kV T/Lines Associated with 500kV Lahore North G/S
11	TLC-15 : 220kV T/L with IN/OUT of TT Singh-FSD West S/C at Sammundari Road
12	TLC-17 : 220kV D/C T/L from 500kV Faisalabad West G/S to 220kV Lalian G/S
13	220kV G/S Mastung & allied T/Lines
14	Lot-I: In/Out of D/C T/L Hala Road - Jamshoro at Mirpur Khas
15	220kV T/L from Mohmand Dam to Nowhsehra
16	220kV T/L from Mohmand Dam to Jamrud

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

48. The Authority has noted that the Petitioner continues to rely on the Electricity Act 1910 for RoW clearance. This Act has several limitations particularly in securing RoW for transmission towers and transmission lines. NTDC must approach the relevant forum for passing the proposed bill/law 'TRANSMISSION OF ELECTRICITY (RIGHT OF WAY) BILL'.

49. The NTDC management need to enhance its coordination with local government and provincial departments for resolving the RoW issues. In this regard, NTDC is directed to form joint committees comprising of NTDC's concerned field officers, local administration, representative from provincial governments, LEIs representatives to ensure smooth clearance of RoW.

50. In view of the above the Authority directs NTDC to enhance its coordination with relevant forums and departments for early resolution of above mentioned RoW issues and also ensure proper follow-up regarding proposed bill/law 'TRANSMISSION OF ELECTRICITY (RIGHT OF WAY) BILL'.

Issue # 05: Whether the claimed investment of Rs. 6,616 million for land acquisition of solar power plants in Muzafargarh, Jhang and Layyah are justified?

SUBMISSION OF PETITIONER

51. The Petitioner in the proposed TIP has stated that it will acquire a total land of 9,600 acres for proposed solar sites which includes 2,400 acres for Muzafargarh, 2,400 acres for Jhang and 4,800 acres for Layyah. Moreover, the Petitioner has mentioned that the funding for land acquisition has been approved by CDWP on 28-10-2022 as cash deposit loan (CDL), as shown below:

Project	Approval Status	Local	Foreign	Total
Land Acquisition for 600MW Solar Power Plant at Dist: Muzaffargarh	CDWP 28.10.2022	1,400.0	-	1,400.0
Land Acquisition for 600MW Solar Power Plant at Tehsil Athara Hazari Dist: Jhang	CDWP 28.10.2022	2,558.0	-	2,558.0

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Land Acquisition 1200MW Solar Power Plant at Sher Garh Tehsil Chubara Dist: Layyah	CDWP 28.10.2022	2,658.0	-	2,658.0

52. The Petitioner has taken stance that the subject acquisition of land is being done on the direction of Ministry of Energy (Power Division) communicated vide letter dated 21-7-2022.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

53. The Authority noted that NTDC's mandate to procure land for a generation company is not specified neither in NEPRA Act as a function of national grid company nor in granted transmission license of NTDC. Section 18(1) of the NEPRA Act and Article 3 of NTDC's transmission license mandates national grid company to operate and provide safe, reliable transmission and inter-connection services on a nondiscriminatory basis, including to a bulk-power consumer who proposes to become directly connected to its facilities.

54. Further, the issue of land acquisition by NTDC has also been deliberated by the Authority in the decision of the Authority dated 1-2-2023 in the matter of Approval of Request for Proposal (RFP) submitted by Alternative Energy Development Board (AEDB) for Competitive Bidding of 600 MWP Solar PV Projects at Muzaffargarh. The Authority noted following:

i. *The Authority considers that ARE Policy prescribes that the land of the projects shall be made available by the provinces, the provision which is not being exhausted in the subject matter.*

ii. *The Authority hereby decides that yearly lease rentals at the rate of 5% (Rs. 70 million) of the proposed cost of land (Rs. 1,400 million) is allowed to be charged by the successful bidder from the consumers to be transferred to AEDB. This translates into tariff impact of Rs. 0.06/kWh. This impact has not been included in the benchmark tariff and being approved as a separate line item, as requested by AEDB.*

55. Keeping in view the above, the Authority decides to exclude Rs. 6,616 million claimed by NTDC under the head of Land acquisition for solar power project at Muzafargarh, Jhang and Layyah from the TIP. The Authority also decides that such amounts will be considered as a separate line item in the tariff determination of respective solar power plants.

Issue 6: Whether the claimed investment of Rs. 30,269 million for Special Economic Zones (i.e., Dhabeji, Swabi, Haripur, Lahore and Faisalabad) are justified?

SUBMISSIONS OF PETITIONER:

56. The Petitioner during the public hearing stated that above projects are very critical for meeting the future industrial load demand and hence imperative for country's economic well-being. Moreover, GoP has planned these Special Economic Zones to boost industrialization, promote exports, and spur economic growth. Thus, in order to ensure provision of reliable power supply above referred grid stations have been included in the proposed TIP.

57. Moreover, NTDC stated that the Haripur and Swabi grid stations will also relieve the overloading of existing transmission infrastructure in vicinity and provide the voltage stability in KPK, as shown below:

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220 kV Haripur Benefits apart from supply to Hattar special economic zone which falls under CPEC

Sr.	Transmission Line	Line Loading (%)	
		Without 220 kV Haripur	With 220 kV Haripur
1	132 kV Haripur Old – Hattar S/C	144 %	11 %
2	132 kV Burhan-2 – Tarnawan S/C	135 %	58 %
3	132 kV Haripur Old – T Hazara Site S/C	108 %	36 %

220 kV Swabi Benefits apart from supply to SEZ

Name of 132 kV Substation	Voltage (KV)		%age Voltage Improvement
	Without 220 kV Swabi	With 220 kV Swabi	
132 kV Swabi	119.6	132.4	10.70 %
132 kV Dobain	127.4	131.9	3.53 %
132 kV Rustum	121.9	131.8	8.12 %
132 kV G. Amazai	119.2	131.8	10.57 %
132 kV Hussai	123.8	131.3	6.06 %
132 kV Nawan Kely	123.7	132.2	6.87 %

Name of Substation	%age Loading	
	Without 220 kV Swabi	With 220 kV Swabi
220/132 kV transformers at 220 kV Mardan grid station	81 %	52 %
220/132 kV Transformers at 220 kV Burhan grid station	74%-75 %	68 % - 70 %

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

58. The Authority is of the view that the provision of reliable supply to the industrial consumers is very essential and SEZs are very vital for socio economic uplift of the community. Also, development of industries in the area will create gainful employment, additional revenues to government exchequer from the levy of taxes on finished goods, electricity duty due to additional sale of power & GST, etc.

59. Further, SEZs are part of China Pak Economic Corridor. The proposed projects will also improve power supply system & voltage profile around Haripur, Hattar and Wah area, industrial estate Rashakai SEZ and Swabi. The SEZs are government initiative for economic development of the country therefore the Authority fully back the SEZs.

60. It is also noted by the Authority that NTDC claimed the costs exceeding the approved PC-I costs for 220 kV Haripur grid station, 220 kV Quaid-e-Azam Business Park (QABP) grid station and 500 kV Allama Iqbal Industrial City grid stations. For the purpose of fair assessments of the claimed costs for development of SEZs, the Authority feels that since half of the control period has already lapsed therefore investments claimed for above mentioned SEZs have been

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actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025 the incremental costs have been assessed keeping in view the guidelines of planning commission for project cost variations.

61. In view of the above an amount of Rs. 23,950 million is allowed to NTDC against the claimed cost of Rs. 30,269 million under the head of SEZs. The details of allowed investments for development of SEZs is attached at **Annexure-B.** The year wise summary of the allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
Special Economic Zone (SEZs)	2,334	16,563	5,053	23,950

62. Moreover, the allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments.

63. It is also pertinent to mention here that since the actual investment utilized by NTDC for SEZs for half of the control has been actualized which in fact has been utilized less than the requested amount. The additional amount beyond Rs. 23,950 Million for SEZs will be adjusted as per actual spending in the upcoming investment plan keeping in view the approved PC-I cost and the guidelines of planning commission in this regard.

Issue 7: Whether the claimed investment of Rs. 335,098 million for PSDP funded ongoing works related to power evacuation and load growth projects are justified?

SUBMISSION OF PETITIONER:

64. The Petitioner submitted that it has included 17 projects in the head of PSDP funded ongoing projects. These projects include transformation capacity enhancement projects, power evacuation projects, load growth and system reinforcement projects, ERP implementation and technology advancement projects such as Battery Energy Storage ("BESS") and SCADA upgradation projects). The summary of such projects included in PSDP funded ongoing works are given below:

Sr	Name of the Project
	A. Power Evacuation Project
1	Evacuation of power from 2160MW DASU HPP Stage-I
	Evacuation of Power from Suki Kinari, Kohala, Mahal HPPs (Revised Name "Evacuation of Power from Suki Kinari")
3	Evacuation of Power from Tarbela 5th Extension.
4	Evacuation of power from wind power projects at Jhimpir and Gharo Wind Clusters (Revised)
5	Evacuation of Power from 1224MW Wind Power Plants at Jhampir Clusters
6	500kV HVDC Transmission System between Tajikistan and Pakistan for Central Asia-South Asia Transmission Interconnection (CASA-1000)
	B. Load Growth / System Reinforcement Projects
7	500-KV Lahore, North.
8	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations
9	500KV Islamabad West
10	220-KV Dera Ismail Khan - Zhob Transmission Line along with 220-KV Zhob Sub-Station.
11	220-KV Jauharabad G/S along with allied T/Ls.

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12	220kV Mirpur Khas G/S along with allied T/Ls
13	Now 220KV Transmission System Network Reinforcement in Islamabad & Burhan
C.	Technology Projects
14	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station
15	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC
16	Enterprise Resource planning (ERP) (Now Implementation of Integrated Solution to improve Productivity and Control in NTDC by ERP System)
17	Conversion of 220kV Substations at Bund Road, Kala Shah Kaku, Ravi & Nishatabad from AIS to GIS.

65. The Petitioner further stated that the above mentioned power evacuation projects are required to evacuate power from the committed projects as identified in approved IGCEP 2022-31. Moreover, the Petitioner mentioned that CASA 1000 is also cross border interconnection project.

66. The second category of projects in this head is system reinforcement projects to ensure system stability and reliability to meet future load growth of the country. The third category of projects in this head are modernization projects to ensure maximum benefit of the technology in system operations and ensure to achieve the aim of least cost system operation. The benefits of each included project as stated by the Petitioner are given in **Annexure-C.**

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

67. It is observed by the Authority that NTDC being national grid company is mandated for power dispersal of the power plants which are included in the approved IGCEP. Further, as far as system reinforcement projects are concerned these are also essential for system stability and security. Moreover, most of these projects are in Lahore ring and completion of these projects will enable maximum power transfer from south to north. In addition, these projects will be helpful in reducing the system losses and improving power quality.

68. With respect to SCADA upgradation project which is also known as SCADA-III project, Authority is of the opinion that fully functional SCADA at National Power Control Center (NPCC) is the need of the time to monitor and control the power system in real time for smooth, reliable & efficient operation of power system. Moreover, tele-metered data recorded and archived in SCADA System will be useful in post event analysis and system studies. Further, fully functional SCADA system will result in reduction of system operation costs and enhance system stability and reliability.

69. The Authority has noted with serious concerns the delay of SCADA-III project. Furthermore, it is also observed by the Authority that SCADA-II project could not achieve the desired results in terms of real time monitoring of the system. Moreover, the delay of SCADA-III project has serious repercussions in terms of real time monitoring of the system and achieving the aim of least cost system operations. Therefore, NTDC is directed to ensure the timely completion of this important project.

70. Regarding ERP system Authority feels that it will also be beneficial for a centralized database and a unified platform that allows different departments within an NTDC to access and share information in real-time.

71. As for the BESS pilot project at Jhampir, it is noted by the Authority that BESS will play a vital role in modernizing and optimizing electricity grids, increasing renewable energy penetration,

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and enhancing grid resilience and reliability. Further, BESS will be helpful in reducing the impact of curtailments of wind corridor.

72. With regards to conversion of grids from AIS to GIS in Lahore region, the Authority is of the view that conversion from AIS to GIS is essential to enhance the performance, reliability, and efficiency of electrical grid infrastructure while addressing space constraints and environmental considerations. The pollution level in Pakistan especially in winter has increased to dangerous levels and these have impacted the power industry as well. Therefore, to avoid the environmental hazards this conversion is essential.

73. It has also been noted by the Authority that NTDC claimed the costs exceeding the approved PC-I costs for 12 projects which include CASA-1000, 500 kV Lahore North, 500 kV Islamabad West, 220 kV Zhob G/S and associated T/Line, 220 kV Jauhrabad G/S & allied T/Line, 220 kV Mirpurkhas G/S and allied T/Line, ERP, BESS, SCADA-III and power evacuation projects for WPPs at Jhimpir and Gharo.

74. For the purpose of fair assessments of the claimed costs for ongoing PSDP projects, the Authority is of a view that since half of the control period has already lapsed, therefore, investments claimed for above mentioned projects have been actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025 the incremental costs have been assessed keeping in view the guidelines of planning commission for project cost variations.

75. Further, the matter of cost overruns as claimed by NTDC in instant head has been assessed in line with following clarifications provided by the Planning Commission:
    i. 15% increase in the original approved project cost is permissible as per Planning Commission guidelines.
    ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

76. In view of the above, an amount of Rs. 270,167 million is allowed to NTDC against claimed investment of Rs. 335,098 million under the head of PSDP funded ongoing works related to power evacuation and load growth projects without allowing any cost over runs beyond 15% permissible variation unless the same are approved at relevant forum. The details of the allowed investments under the head of PSDP Funded Ongoing Works are given at **Annexure-D.** The year wise summary of allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
PSDP Funded Ongoing Works	101,813	91,388	76,965	270,166

77. Moreover, the allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments.

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Issue 8: Whether the claimed investment of Rs. 110,232 million for PSDP funded new works related to power evacuation and load growth projects are justified?

SUBMISSIONS OF THE PETITIONER:

78. The Petitioner in the proposed TIP has included 35 projects under the head of PSDP funded new works. Out of these projects, only 11 projects have approved PC-I. Another 9 projects PCI is under preparation and 1 project with PC-I submitted to Planning Commission. Whereas remaining 14 projects have neither funding nor PC-I approval at the moment. The list of such projects included in PSDP funded new works are given below:

Sr	Name of the Project	PC-I Status
	A. Power Evacuation Projects	
1	Evacuation of power from 816MW Mohmand Dam	PC-I under preparation
2	Interlinking of 765kV Mansehra with 220kV Mansehra (For Dasu evacuation)	PC-I under preparation (Funding yet to be arranged)
3	600MW Solar Power Plant near Muzaffargarh	Funding yet to be arranged
4	600MW Solar Power Plant near Trimmu Jhang	
5	1200MW Solar Power Plant near Havelli Bahadur Shah	
	B. System Reinforcement / Load Growth	
7	Installation of SVCs at 220kV Quetta Industrial (Revised Name "250 MVAR SVS at 132 kV Quetta Industrial)"	PC-I under preparation (Funding yet to be arranged)
8	220 MVAR SVS AT 132 KV Khuzdar	Funding yet to be arranged
9	Reactive Power Composition 220 &132 KV G/Ss	
10	Mitigation of High Fault level at 132 KV Burhan	
11	500kV Chakwal G/S along with allied T/Ls	CDWP 18.11.2019
12	500/220kV Sialkot Substation	ECNEC 07-10-2022
13	Upgradation of Existing 220kV Vehari Sub-Station to 500 kV Vehari Sub-Station	ECNEC 07-10-2022
14	220kV Dharki - Rahim Yar Khan - Bhawalpur D/C T/L	ECNEC 02.10.2019
15	Re-conducting/Underground cabling of existing 220 kV Bund Road - NKLP D/C T/L (17 km)	ADB funded – retendering to be done
16	220kV Arifwala Substation	CDWP 04.06.2022
17	220KV Head Faqiran G/S along with allied T/Ls.	ECNEC 15.07.2019
18	220-KV Jamrud G/S along with allied T/Ls.	CDWP 19.10.2017
19	220kV Larkana Substation	CDWP 17.10.2019
20	220-KV Mastung G/S along with allied T/Ls.	ECNEC 22.05.2018 (Funding yet to be arranged)
21	220kV Punjab University Grid Station	CDWPs 19-09-2017 (Funding yet to be arranged)
22	Extension and Augmentation of existing 500kV and 220kV Grid Stations (New) Now: Addition & Augmentation of 500kV and 220kV Transformers at the Existing Grid Station for Removal of NTDC System Constraints	ECNEC 07-10-2022
23	220-KV Kamra G/S along with allied T/Ls.	Submitted to PC on 22.11.2019 (Funding yet to be arranged)
24	220kV Gujranwala-II Substation	PC-1 Under preparation (Funding yet to be arranged)
25	220-KV Kohat G/S along with allied T/Ls.	PC-1 Under preparation

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26	220kV Nag Shah Grid Station	PC-I under preparation (Funding yet to be arranged)
27	500kV Ghazi Brotha-Faisalabad West T/L (Revised Name In/Out of Islamabad West to Ghazi Brotha T/L at - Faisalabad West)	PC-I under preparation (Funding yet to be arranged)
28	500kV Ludewala G/S along with 500kV Nowshera-Ludewala-Faisalabad West D/C T/L	PC-I under preparation (Funding yet to be arranged)
29	Re-enforcement of Sahiwal along with 2x500KV Line Bay	Funding yet to be arranged
30	2nd Source of supply to 500 KV Sheikh Muhammadi	
31	220/132KV Zero Point G/S Islamabad and allied T/L	
32	Augmentation of 2x160 MVA Transformers with 2x250 MVA Yousaf Wala	
33	Extension of 3rd Transformer Guddu	
34	Augmentation of remaining 2x160 MVA Transformers with 2x250 MVA Yousaf Wala	
35	Extension of 3rd Transformer Allai Khwar	

79. Moreover, regarding the issue of PC-I approval and securing the funds for newly inducted projects, NTDC stated that it is becoming increasingly difficult to secure financing from International Funding Institutes (IFIs) and local banks due to absence of updated tariff. Furthermore, NTDC stated that in absence of funding source Planning Commission is not entertaining the PC-I. The project wise benefits as provided by Petitioner in its submission are given at **Annexure-E**:

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

80. It is noted by the Authority that NTDC included 35 projects under the head of PSDP funded new projects in its TIP. Further, most of the newly added projects do not have approved PC-I and in many instances the funding arrangement is also not available with NTDC. Out of total 35 projects only 6 projects have approved PC-Is along with funding available. The summary is given below:

Sr.	Name of the Project	PC-I approved	Funding available	PC-I under preparation
	A. Projects with Funding and Approved PC-I			
1	500kV Chakwal G/S along with allied T/Ls	✓	✓	-
2	500/220kV Sialkot Substation	✓	✓	-
3	Upgradation of Existing 220kV Vehari Sub-Station to 500 kV Vehari Sub- Station	✓	✓	-
4	220kV Arifwala Substation	✓	✓	-
5	220KV Head Faqiran G/S along with allied T/Ls.	✓	✓	-
6	220-KV Jamrud G/S along with allied T/Ls.	✓	✓	-
	B. Projects with Approved PC-I but without having any funding			
7	220kV Dharki - Rahim Yar Khan - Bhawalpur D/C T/L	✓	×	-
8	220kV Larkana Substation	✓	×	-
9	220-KV Mastung G/S along with allied T/Ls.	✓	×	-
10	220kV Punjab University Grid Station	✓	×	-
11	Extension and Augmentation of existing 500kV and 220kV Grid Stations (New) Now: Addition & Augmentation of 500kV and 220kV Transformers at the Existing Grid Station for Removal of NTDC System Constraints	✓	×	-
	C. Projects without having any funding and approved PC-I			
12	Re-conducting/Underground cabling of existing 220 kV Bund Road - NKLP D/C T/L (17 km)	×	✓	-

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13	Evacuation of power from 816MW Mohmand Dam	×	×	✓
14	Interlinking of 765kV Mansehra with 220kV Mansehra (For Dasu evacuation)	×	×	✓
15	600MW Solar Power Plant near Muzaffargarh	×	×	×
16	600MW Solar Power Plant near Trimmu Jhang	×	×	×
17	1200MW Solar Power Plant near Havelli Bahadur Shah	×	×	×
18	Installation of SVCs at 220kV Quetta Industrial (Revised Name "250 MVAR SVS at 132 kV Quetta Industrial)"	×	×	✓
19	220 MVAR SVS AT 132 KV Khuzdar	×	×	×
20	Reactive Power Composition 220 &132 KV G/Ss	×	×	×
21	Mitigation of High Fault level at 132 KV Burhan	×	×	×
22	220-KV Kamra G/S along with allied T/Ls.	×	×	✓
23	220kV Gujranwala-II Substation	×	×	✓
24	220-KV Kohat G/S along with allied T/Ls.	×	×	✓
25	220kV Nag Shah Grid Station	×	×	✓
26	500kV Ghazi Brotha-Faisalabad West T/L (Revised Name In/Out of Islamabad West to Ghazi Brotha T/L at - Faisalabad West)	×	×	✓
27	500kV Ludewala G/S along with 500kV Nowshera-Ludewala-Faisalabad West D/C T/L	×	×	✓
28	Re-enforcement of Sahiwal along with 2x500KV Line Bay	×	×	×
29	2nd Source of supply to 500 KV Sheikh Muhammadi	×	×	×
30	220/132KV Zero Point G/S Islamabad and allied T/L	×	×	×
31	Augmentation of 2x160 MVA Transformers with 2x250 MVA Yousaf Wala	×	×	×
32	Extension of 3rd Transformer Guddu	×	×	×
33	Augmentation of remaining 2x160 MVA Transformers with 2x250 MVA Yousaf Wala	×	×	×
34	Extension of 3rd Transformer Allai Khwar	×	×	×

81. The projects with approved PC-I and with a funding source available have been considered by the Authority. Regarding the projects without either PC-I or funding source, the Authority directs NTDC to fulfill these requirements and include such projects in the upcoming investment plan which is due in September 2024.

82. It has also been noted by the Authority that NTDC claimed the costs exceeding the approved PC-I costs for 3 projects which include 220 kV Jamrud, 220 kV Mastung and 220 kV Kamra. For the purpose of fair assessments of the claimed costs for New PSDP projects, the Authority is of a view that since half of the control period has already lapsed, therefore, investments claimed for above mentioned projects have been actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025 the incremental costs have been assessed keeping in view the guidelines of Planning Commission for project cost variations.

83. Further, the matter of cost over runs in NTDC's projects in instant head has been assessed in line with following clarifications provided by Planning Commission:
    i. 15% increase in the original approved project cost is permissible as per planning commission guidelines.
    ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

84. In view of the above, an amount of Rs. 38,825 Million is allowed to NTDC against the claimed investment of Rs. 110,232 Million under the head of PSDP funded new works (having PC-I

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approved) related to power evacuation and load growth projects without allowing any cost over runs beyond 15% permissible variation unless the same are approved by relevant forum. The details of the allowed investments for PSDP Funded new works are given at **Annexure-F**. The year wise summary of allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
PSDP Funded New Works	648	414	37,765	38,827

85. Having said that, the allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments. Further, for PSDP funded new projects for which PC-I and funding is not available, the Authority directed NTDC to get approved PC-I and secure funding against such projects and the same shall be submitted to NEPRA for approval in next investment plan after fulfilling the requirements of the law.

Issue # 9: Whether the claimed investment of Rs. 15,340 Million for Self-Financed ongoing scheme are justified?

SUBMISSIONS OF THE PETITIONER:

86. The Petitioner has included five projects in the head of self-financed ongoing schemes. The list of self-financed schemes are given below:

Sr	Name of Project	PC-I approval Status
	A. Load Growth / System Reinforcement	
1	Feasibility study for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation	CDWP 14.01.2016
2	2nd source of supply to 220kV Jaranwala Road Substation	CDWP 09.06.2020
	B. Power Evacuation Projects	
3	Evacuation of Power from K2/K3 Nuclear Power near Karachi(In/Out of 500-KV Port Qasim to Matiari S/C and 500-KV Hub to Matiari S/C at K2/K3).	ECNEC 12.04.2017
4	Evacuation of Power from 2x660 MW Thar Coal Based SSRL/SECL Power Plant at Thar	ECNEC 12.04.2017
5	Evacuation of Power from 330 MW Siddique sons Ltd.	CDWP 30.01.2020

87. The Petitioner submitted that feasibility study is being carried out for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation. The purpose is to enhance the transmission capacity of NTDC's 500kV transmission system by exploring the impacts of introducing advanced technology such as Flexible AC Transmission System (FACTS) including series/shunt compensation and Power System Stabilizers (PSSs).

88. Moreover, at the moment Jaranwala Road grid station is being fed from 500kV Gatti only. In order to improve system reliability, Jaranwala is proposed to be connected with 220 kV Sammundari Road grid station to complete the 220 kV ring system in FESCO region (between Gatti, Jaranwala and Sammundari). Further, the power evacuation projects from Siddique sons, Thar coal and K2/K3 are also being carried out from own resources to integrate the economical generation of coal and nuclear in the system.

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89. The Authority notes that NTDC has claimed the costs exceeding the approved PC-I costs for 2 projects which include evacuation of power from K2/K3 and feasibility study for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation. For the purpose of fair assessments of the claimed costs, the Authority is of a view that since half of the control period has already lapsed, therefore, investments claimed for above mentioned projects have been actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025 the incremental costs have been assessed keeping in view the guidelines of Planning Commission for project cost variations.

90. Further, the matter of cost over runs in NTDC's projects in instant head has been assessed in line with following clarifications provided by Planning Commission:
    i. 15% increase in the original approved project cost is permissible as per planning commission guidelines.
    ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

91. In view of the above an amount of Rs. 15,198 Million is allowed to NTDC against the claimed investment of Rs. 15,340 Million under the head of self-financed ongoing works related to power evacuation and load growth projects without allowing any cost over runs beyond 15% permissible variation unless the same are approved at relevant forum. The details of the allowed investments for self-financed ongoing works are given at **Annexure-G**. The year wise summary of allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
Self-Financed Ongoing works	10,467	4,031	700	15,198

92. Moreover, the allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments.

Issue # 10: Whether the claimed investment of Rs. 4,255 Million for completed works through PSDP/own resources are justified?

SUBMISSIONS OF THE PETITIONER:

93. The Petitioner has stated that there are total 18 projects which have been physically completed through PSDP/own resources. However their financial completion is awaited due to various reasons. The physical and financial progress and the reasons for not closing the projects as provided by the Petitioner are given below:

Sr	Name of Project	PC-Approval	Physical Progress %	Completion Year	Amount claimed in Investment Plan	Reasons for not closing the project
1	220 KV G/Station at Kassowal with 132 KV Expansion System	ECNEC 25.02.2005	100%	2015	270	Not provided

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	(World Bank Loan No. 7565-Pk. Credit No. 4463-PK & 4464-PK)					
2	220Kv G/S Mansehra Tranche-III	CDWP 07.04.2011	100%	2018	520	Budget provision relates to the payment of ongoing Grid Station Residential Colony works.
3	3rd 500KV Jamshoro-Moro- R.Y Khan Single Circuit T/Line. Tranche-III	ECNEC 28.08.2013	100%	2022	239	Pending liabilities of retention money. EOT cases are in approval process.
4	Inter-Connection- Thar Coal Based . 1200MW (Power Dispersal from 1200MW Thar Coal Power Plant - 500kV Thar - Matiari T/L & Matiari 500kV S/station)	ECNEC 16.08.2012	100%	2018	100	Not provided
5	New 220 KV G/Station at Khuzdar/220 KV Dadu - Khuzdar D/C T/Line JICA Loan No. PK-56	ECNEC 27.07.2004	100%	2014	280	Pending liabilities of retention money. EOT cases are in approval process.
6	Power Transmission Enhancement Project (Tranche-II) (SET)10 Sub projects (I) 9 Sub Projects of 500KV & 220KV S/S& T/Lines ADB Loan No. 2396-PAK	ECNEC 30.06.2012	100%	2014	225	Pending liabilities of retention money. EOT cases are in approval process.
7	Provision of Secured Metering System at Delivery Point. (Local Bank)	ECNEC 04.08.2005	100%	-	145	Project is on-going upon identification of new CDPs.
8	Quaid-e-Azam Solar Park at Lal-Suhanra (Phase-II) Evacuation of 600 MW Solar (Proposed to be carried out by NTDC)	ECNEC 12.02.2014	100%	2018	100	Not provided
9	Transmission Scheme for Dispersal of power from Neelam-Jehlum, Karot and Azad Patan Hydro Power Project	ECNEC 02.03.2015	100%	2022	570	Contract closures and EOT cases of the contractors are under process. Provision of budget is for the payment of retention money and other pending liabilities.
10	Transmission Interconnection for Dispersal of Power From UCH-II Tranche-III	ECNEC 29.07.2011	100%	2018	425	Pending liabilities of retention money. EOT cases are in approval process.
11	Construction of 600 KV HVDC Transmission	CDWP 31.08.2015	95%	-	250	Boundary wall in progress

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	Line From Matiari to Lahore (Land Acquisition for Converter and Grounding Station - Both Ends) (CPEC)					
12	Evacuation of Power from 1200MW RLNG Based Power Projects at Jhang (Haveli Bahadur Shah)	CDWP 28.04.2015	100%	2018	14	Not provided
13	Evacuation of Power from 1320 MW RLNG Power Plant at Trimmu Jhang	ECNEC 17.04.2018	100%	2018	10	Not provided
14	Evacuation of power from 1320MW Power Plant at Bin Qasim	ECNEC 13.05.2015	100%	2020	217	Retention money of Phase-II pending due to non-finalization of EoT case.
15	Evacuation of power from 147MW Patrind HPP	CDWP 27.01.2015	100%	2020	180	EOT/VO case of the contractor have been approved by the BOD (NTDC). Provision of budget is for the payment of pending liabilities of contractor associated with EOT/VO cases.
16	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 KV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290- PAK	ECNEC 27.11.2006	100%	2011	100	Not provided
17	Evacuation of Power from 1320 MW Hub Power Company Ltd.	ECNEC 07.11.2016	100%	2020	500	Final Invoices & Retention Money pending due to non-finalization of EoT cases.
18	Evacuation of Power from 660 MW from Lucky Electric Power Company Ltd.	CDWP 03.03.2020	100%	2021	110	Pending liabilities of retention money. EOT case is in approval process

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94. It is noted by the Authority that the projects completed in 2011 to 2022 have still not been closed by NTDC in the books and rather NTDC is claiming investments for practically completed and energized projects. The reasons for not closing these projects as stated by NTDC are pending colony works and pending liabilities of retention money in majority of cases. Whereas, the retention money is the amount held back to subcontractors from a payment made to them under a construction contract, as a security for their performance.

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95. Further, the Authority observed that NTDC claimed the costs exceeding the approved PC-I costs for 10 projects which include 220 kV Kassowal, 220 kV Mansehra, 220 kV Khuzdar, Power transmission enhancement projects, secured metering system, evacuation of power from Neelum Jhelum-Karot-Azad Pattan, evacuation of power from Uch-II, land acquisition for HVDC grounding stations, Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 KV Sub Stations and T/ Lines), evacuation of power from 1320 MW Hub Power Company Ltd. For the purpose of fair assessments of the claimed costs, the Authority feels that since half of the control period has already lapsed therefore investments claimed for above mentioned projects have been actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025, the incremental costs have been assessed keeping in view the guidelines of the Planning Commission for project cost variations.

96. Further, the matter of cost over runs in NTDC's projects in instant head have been assessed in line with following clarifications provided by the Planning Commission:
    i. 15% increase in the original approved project cost is permissible as per Planning Commission guidelines.
    ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

97. In view of the foregoing, an amount of Rs. 1,626 Million is allowed to NTDC against the claimed investment of Rs. 4,255 Million under the head of PSDP Funded completed works without allowing any cost over runs beyond 15% permissible variation unless the same are approved by the relevant forum. The details of the allowed investments for PSDP Funded Completed Works are given at **Annexure-H.** The year wise summary of allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
PSDP Funded Completed Works	1,594	32	-	1,626

98. The allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments. Further, NTDC is directed to close these completed projects and these projects shall not be included in next investment plan.

Issue # 11: Whether the claimed investment of Rs. 8,195 Million for completed works through foreign funding are justified?

SUBMISSIONS OF THE PETITIONER:

99. The Petitioner has stated that there are total 16 projects which have been physically completed through foreign funding however their financial completion is awaited due to various reasons. The physical and financial progress and the reasons for not closing the projects as provided by petitioner are given below:

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Sr	Name of Project	PC-Approval	Physical Progress %	Completion Year	Amount claimed in investment plan	Reasons for not closing the project
1	220 Kv G/S & Allied T/L D.I Khan	ECNEC 09.12.2010	100%	2019	400.0	Budget provision relates to the payment of ongoing Grid Station Residential Colony works
2	220 KV G/S at Ghazi Road, Lahore with 220 KV D/C T/Line 132 KV Expansion System EDCF Loan No.PAK-2 & KFW	ECNEC 25.02.2005	100%	2019	17.0	Not provided
3	220 Kv Nowshera S/S	ECNEC 06.02.2008	100%	2019	367.0	Budget provision relates to the payment of ongoing Grid Station Residential Colony works
4	220KV Chakdara S/S	ECNEC 02.10.2014	100%	2018	467.0	Budget provision relates to the payment of ongoing Grid Station Residential Colony works
5	220Kv Sub Station Lalian	ECNEC 11.11.2011	100%	2022	430.0	Not provided
6	4 Nos New Projects to be financed by JBIC (I) 500 KV RY Khan G/S & T/L (ii)220 KV Chistian T/L (iii) 220 KV Gujrat G/S & 220 KV T/L (iv) 220 KV Shalimar G/S & 220 KV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	ECNEC 22.10.2007	100%	2010-2018	600.0	Retention money in pending
7	500KV Faisalabad New (2x750) Phase-II (Now 500KV Faisalabad West along with allied T/Ls)	ECNEC 12.01.2015	99%	2022	3050.0	Not provided
8	Addition of 500/220KV Sub Station T/L for Strengthen the existing NTDC system i) 500KV Lahore New ii) 500KV Shikarpur iii) 220KV D.I.Khan (JICA-PK-61)	ECNEC 09.12.2010	100%	2016 & 2019	550.0	Pending liabilities of retention money. EOT cases are in approval process
9	Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line for	ECNEC 24.11.2017	100%	2023	1150.0	Pending liabilities of retention

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	Improvement of Power Supply System in South Areas					money. EOT cases are in approval process
10	Evacuation of power from 1320MW Power Plant at Sahiwal	ECNEC 31.08.2015	100%	2020	540.0	Not provided
11	Extension/Augmentation at 500/220 kV Rewat Substation	CDWP 23.09.2014	100%	2019	10.0	No Budget demanded for 2023-24 as project has been completed. PC-IV is under submission.
12	Improvement & Upgradation of Protection System to Avoid the Frequent Trippings in South Areas	CDWP 08.06.2016	100%	2022	310.0	Not provided
13	Strengthening of TSG Centre for Grid System Operations and Maintenance.	CDWP 21.12.2015	99%	2023	22.0	Not provided
14	500kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	ECNEC 07.11.2016	100%	2020	225.0	Not provided
15	Load Despatch System Upgradation Project (Phase-II)	ECNEC 07-01-2004	85%	TOC 2014	32.0	Very minor amount pending due to provision for payment of dispute settlement invoices of contractor.
16	Evacuation of Power from 747 MW Guddu Power Project		100%	2020	25.0	Not provided

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100. It is noted by the Authority that the foreign funded projects completed in 2010 to 2023 have still not been closed by NTDC in the books and rather NTDC is claiming investments for practically completed and energized projects. The reasons for not closing these projects as stated by NTDC are pending colony works, pending liabilities of retention money and extension of time (EOT) disputes in majority of cases.

101. Further, the Authority observed that NTDC claimed the costs exceeding the approved PC-I costs for 12 projects which include 220 kV Ghazi Road, 220 kV Nowshera, 220 kV Chakdara, 220 kV Lalian, 4 projects financed by JBIC, 500 kV Faisalabad West, Addition of 500/220KV Sub Station T/L for strengthen the existing NTDC system (JICA Load PK-61), Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line, Improvement & Upgradation of protection system to avoid the frequent tripping in South Areas, 500kV HVAC T/Line for inter

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connection of HVDC Converter Station at Lahore with existing HVAC System and Load Despatch System Upgradation Project (SCADA Phase-II). For the purpose of fair assessments of the claimed costs, the Authority is of the view that since half of the control period has already lapsed therefore investments claimed for above mentioned projects have been actualized on the basis of actual expenditure incurred for the period from July 2022 to December 2023 and for the remaining period from January 2024 to June 2025 the incremental costs have been assessed keeping in view the guidelines of the Planning Commission for project cost variations.

102. Further, the matter of cost over runs in NTDC's projects in instant head has been assessed in line with following clarifications provided by the Planning Commission.
    i. 15% increase in the original approved project cost is permissible as per planning commission guidelines.
    ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

103. In view of the above, an amount of Rs. 2,555 Million is allowed to NTDC against claimed investment of Rs. 8,195 Million under the head of Foreign Funded completed works without allowing any cost over runs beyond 15% permissible variation unless the same are approved at relevant forum. The details of the allowed investments for foreign funded completed works are given at **Annexure-J.** The year wise summary of allowed investment is given below:

Million Rs.

Head	FY 2022-23	FY 2023-24	FY 2024-25	Total Allowed
Foreign Funded Completed Works	1,659	696	200	2,555

104. The allowed investment is subject to 3rd party monitoring/audit on quarterly basis and annual CAPEX adjustments. Further, NTDC is directed to close these completed projects and these projects shall not be included in next investment plan submission.

Issue # 12: Whether the cost overrun of Rs. 180,382 Million in 42 projects is justified. NTDC to explain the reasons for cost overrun in each project and steps taken to avoid financial loss due to cost overrun to public exchequer. Further, NTDC to justify the delays in executing the Project.

SUBMISSION OF PETITIONER

105. The Petitioner during the public hearing took the stance that NEPRA has calculated 180 Billion cost overrun in 42 projects by comparing the PC-I costs of these projects with the actual/projected costs incurred/to be incurred by NTDC. However, the fact that these projects are mainly foreign funded and the contracts have been awarded in foreign currency, thus they have indexation of foreign exchange components in the approved PC-I. Further, NTDC mentioned that as per the Planning Commission guidelines 15% cost.

106. The Petitioner mentioned that all these 42 projects which were highlighted by NEPRA have been carefully reviewed and the actual cost-overrun is Rs. 27.6 Billion and not Rs. 180 billion. Furthermore, after careful indexation of Foreign Exchange Component in PC-I cost of NTDC Projects, consideration of revision in PC-I and considering 15% permissible variations, the actual

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cost-overrun is Rs. 18 Billion (which is due to various factors beyond NTDC's control). The summary of cost over run as submitted by the Petitioner is given below:

Description / Category	Count of Projects	NTDC Calculated Cost Over-Run Million PKR	NEPRA Calculated Cost Over-Run Million PKR
Projects with No Cost Overrun of any type	57	-	-
No Cost Overrun after PC-I Revision	7	-	67,583
No Cost Overrun after FEC Indexation	9	-	55,250
Less than 15% Cost Overrun	9	4,789	4,789
Less than 15% Cost Overrun after FEC Indexation	6	3,667	20,351
Less than 15% Cost Overrun after PC-I Revision	3	1,012	8,517
More than 15% Cost Overrun	**8**	**18,139**	**23,778**
Total Cost-Overrun	**42**	**27,606**	**180,268**

107. In addition to above, the Petitioner provided following reasons for cost overrun in NTDC projects:

i. Increase in exchange rates in recent years
ii. Increase in Inflation in recent years (Oil Prices, LME Rates, Land Rates)
iii. Severe Right of Way issues for T/L Projects (Change of Route)
iv. Land Acquisition Issues for G/S Projects (Site Selection issues)
v. Arrangement of Financing for Projects
vi. Security Issues
vii. Litigation Issues
viii. Increase in Scope of Project
ix. Disputes with Contractors and/or Subcontractors
x. Force-Majeure Issues (COVID-19, Floods, Earthquake)
xi. Interest during construction (IDC)

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108. The Authority has assessed matter of cost over runs in NTDC's projects in line with following clarifications provided by the Planning Commission.
   i. 15% increase in the original approved project cost is permissible as per planning commission guidelines.
   ii. No fresh approval is required for ongoing schemes if the cost changes only because of the variation in exchange rate.

109. It is noted by the Authority from above clarifications that 15% variation is permissible in the original PC-I approved cost and also variation in the exchange rate is covered in the PC-I approvals. Thus, all the 42 projects where initially the cost incurred seemed to go beyond the original approved PC-I cost were re-assessed. It is found that only 14 projects have cost over runs beyond 15% permissible limit. Whereas 21 projects have costs within 15% permissible variation limit. Further, the remaining 12 projects cost is within the original approved PC-I cost after actualization of first 18 months investments incurred. It is also observed by the Authority

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that through proper project management the time over run and cost over runs in NTDC projects can be minimized to great extent. The summary of all 42 projects is given below:

	Name of the Project	PC-I Approved Cost			PC-I after Prov. FEC adjustment (if any)	Requested Amount	Amount Allowed by NEPRA after actualization of initial 18 months	Projected cost to be incurred by June 2025 including NEPRA allowed amount	Remarks
		Local	Foreign	Total					
1	220kV Haripur Substation	1,378	2,428	3,806	-	4,801	3,791	3,791	No over run
2	220 kV Quaid-e-Azam Apparel and Business Park (QABP) Grid Station for Provision of Electricity to PIEDMC SEZ	1,216	1,837	3,054	-	3,700	2,668	2,668	
3	500kV Allama Iqbal Industrial City for 600MW Demand of the Special Economic Zone in the PIEDMC area	2,049	3,926	5,976	-	10,350	5,947	5,947	
4	500kV HVDC Transmission System between Tajikistan and Pakistan for Central Asia-South Asia Transmission Interconnection (CASA-1000)	16,053	30,751	46,804	-	54,303	37,449	52,965	Variation within range of 15%
5	500-KV Lahore, North.	9,224	11,508	20,732	31,648	34,790	27,042	28,523	Variation within range of 15% after FEC adjustment
6	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations	4,539	11,987	16,526	22,823	22,059	21,919	25,022	
7	500KV Islamabad West	3,621	4,667	8,288	16,013	42,119	16,288	16,288	
8	220-KV Dera Ismail Khan - Zhob Transmission Line along with 220-KV Zhob Sub-Station.	3,785	3,094	6,879	7,851	2,948	0	12,641	PC-I to be revised
9	220-KV Jauharabad G/S along with allied T/Ls.	1,203	1,758	2,961	-	5,565	3,068	3,203	Variation within range of 15%
10	220kV Mirpur Khas G/S along with allied T/Ls	2,002	1,855	3,857	-	4,735	3,512	3,857	No over run
11	Enterprise Resource planning (ERP) (Now Implementation of Integrated Solution to improve Productivity and	1,192	1,391	2,583	-	3,462	2,302	2,560	No over run

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	Control in NTDC by ERP System)								
12	Evacuation of power from wind power projects at Jhimpir and Gharo Wind Clusters (Revised)	6,543	6,863	13,406	-	1,675	1,451	13,437	Variation within range of 15%
13	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station	113	827	940	-	2,830	941	941	No over run
14	Evacuation of Power from 1224MW Wind Power Plants at Jhampir Clusters	6,047	4,705	10,753	-	8,839	8,027	12,064	Variation within range of 15%
15	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC	3,172	8,466	11,638	14,383	12,250	11,604	13,554	Variation within range of 15% after FEC adjustment
16	220-KV Jamrud G/S along with allied T/Ls.	1,029	1,369	2,398	-	13,225	1,188	1,191	No over run
17	220-KV Mastung G/S along with allied T/Ls.	8,109	6,046	14,155	-	7,590	4,473	4,505	No over run
18	220-KV Kamra G/S along with allied T/Ls.	1,182	2,050	3,232	-	5,005	0	151	No over run
19	Feasibility study for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation	26.35	106.83	133.18	180	125	125	193	Variation within range of 15% after FEC adjustment
20	Evacuation of Power from K2/K3 Nuclear Power near Karachi(In/Out of 500-KV Port Qasim to Matiari S/C and 500-KV Hub to Matiari S/C at K2/K3).	3,719	3,782	7,501	10,413	2,472	1,112	13,167	PC-I t be revised
21	220 KV G/Station at Kassowal with 132 KV Expansion System (World Bank Loan No. 7565-Pk, Credit No. 4463-PK & 4464-PK)	1,206	811	2,017	-	270	0	2,760	PC-I t be revised
22	220Kv G/S Mansehra Tranche-III	359	546	905	-	520	0	1,651	PC-I t be revised
23	New 220 KV G/Station at Khuzdar/220 KV Dadu -	4,380	4,159	8,540	-	280	0	12,177	PC-I t be revised

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	Khuzdar D/C T/Line JICA Loan No. PK-56								
24	Power Transmission Enhancement Project (Tranche-II) (SET)10 Sub projects (I) 9 Sub Projects of 500KV & 220KV S/S& T/Lines ADB Loan No. 2396-PAK	9,275	10,918	20,193	-	225	0	23,496	PC-I t be revised
25	Provision of Secured Metering System at Delivery Point. (Local Bank)	496	513	1,009	-	145	29	1,064	Variation within range of 15%
26	Transmission Scheme for Dispersal of power from Neelam-Jehlum, Karot and Azad Patan Hydro Power Project	10,425	11,272	21,697	-	570	634	21,650	No over run
27	Transmission Interconnection for Dispersal of Power From UCH-II Tranche-III	1,219	1,289	2,508	-	425	0	2,350	No over run
28	Construction of 600 KV HVDC Transmission Line From Matiari to Lahore (Land Acquisition for Converter and Grounding Station - Both Ends) (CPEC)	1,568	-	1,568	-	250	0	4,359	PC-I to be revised
29	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 KV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290- PAK	4,503	8,114	12,617	-	100	0	17,347	PC-I to be revised
30	Evacuation of Power from 1320 MW Hub Power Company Ltd.	8,540	7,875	16,415	18,106	500	0	22,325	PC-I to be revised
31	220 KV G/S at Ghazi Road, Lahore with 220 KV D/C T/Line 132 KV Expansion System EDCF Loan No.PAK-2 & KFW	1,325	1,267	2,592	-	17	0	5,852	PC-I to be revised
32	220 Kv Nowshera S/S	960	916	1,876	-	367	0	2,807	PC-I to be revised
33	220KV Chakdara S/S	2,480	1,917	4,397	-	467	404	4,539	Variation within range of 15%
34	220Kv Sub Station Lalian	646	935	1,581	-	430	0	3,914	PC-I to be revised

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35	4 Nos New Projects to be financed by JBIC (I) 500 KV RY Khan G/S & T/L (ii)220 KV Chistian T/L (iii) 220 KV Gujrat G/S & 220 KV T/L (iv) 220 KV Shalimar G/S & 220 KV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	5,365	7,787	13,152	-	600	506	14,192	Variation within range of 15%
36	500KV Faisalabad New (2x750) Phase-II (Now 500KV Faisalabad West along with allied T/Ls)	3,689	5,691	9,380	-	3,050	0	15,192	Variation within range of 15%
37	Addition of 500/220KV Sub Station T/L for Strengthen the existing NTDC system i) 500KV Lahore New ii) 500KV Shikarpur iii) 220KV D.I.Khan (JICA-PK-61)	11,078	13,450	24,528	-	550	51	24,433	No over run
38	Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line for Improvement of Power Supply System in South Areas	5,456	2,911	8,367	-	1,150	1,147	9,458	Variation within range of 15%
39	Evacuation of power from 1320MW Power Plant at Sahiwal	289	826	1,115	-	540	0	2,301	PC-I to be revised
40	Improvement & Upgradation of Protection System to Avoid the Frequent Tripping in South Areas	232	655	887	1,025	310	80	1,171	Variation within range of 15% after FEC adjustment
41	500kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	2,185	2,621	4,806	6,053	225	209	6,847	Variation within range of 15% after FEC adjustment
42	Load Despatch System Upgradation Project (Phase-II)	1,015	1,880	2,895	-	32	0	4,626	PC-I to be revised

110. Keeping in view the above, the Authority directs NTDC to revise PC-I or submit PC-IV of the projects having cost over runs beyond the 15% permissible limit. Furthermore, NTDC is directed to ensure concrete steps to minimize and eliminate the time over runs and cost over runs in the projects.

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111. **Issue # 13: Whether the third party study regarding T&T losses has been completed? If Yes NTDC to share the outcome of study otherwise NTDC is required to apprise timelines for completion of such studies by third party consultant.**

SUBMISSION OF PETITIONER:

112. The Petitioner submitted before the Authority that T&T losses are purely technical in nature and no manual intervention, administrative loss, or theft/pilferage is involved while calculation of NTDC losses. Moreover, NTDC losses are marginally impacted on technical factors including:
   i. Network equipment characteristics
   ii. Operational scenarios
   iii. I^2R Losses variations due to Underload, Overload
   iv. Contingency operation
   v. Load Centre – Generation Distance / Merit Order Dispatch
   vi. Inadequate Reactive Compensation / Low PF

113. The Petitioner further mentioned that Pakistan is geographically a longitudinal country, the hydel generation is situated in northern part of the country and thermal generation is situated in southern part of the country. While the main load center is situated in the geographical middle of country. Predominantly, the power flows over a longer distance from NTDC connected generation in the Southern & Northern Region to the Central Region load centers, resulting in higher losses.

114. It was further stated that insufficient reactive power compensation at 132 kV & 11 kV networks results in increase of reactive power flow from NTDC system to DISCOs systems, causing not only lower voltage profile but also increase in current flow & T&T losses in the NTDC system. It was prayed that the NTDC should not be penalized for DISCO load induced losses (due to excessive withdrawal of reactive power of DISCOs from NTDC network).

115. Furthermore, NTDC reports its T&T Losses kWh as the arithmetic difference between Energy Exchange recorded at Generation & Distribution CDPs on 500 & 220kV Voltage Level **only**. For % T&T Losses, these kWh losses are divided by **NTDC Import"** recorded at all **CDPs**. NTDC T&T losses % limit is an annual target rather than a monthly. NTDC Bi-directional energy exchange occurs between various power market participants at Metering Common Delivery Points, which are broadly classified into following types for calculation of losses:

NTDC Metering CDPs - Metering Point Type	Count of Metering CDP
NTDC-Generation (500kV & 220kV) Metering CDPs	129
NTDC-DISCOs Metering CDPs	184
NTDC HVDC Metering Points	58
NTDC Grid Auxiliary Metering Points (11kV)	14
Total	385

116. The Petitioner stated that NTDC system has seen vast expansion **dynamics** in the recent years w.r.t. **length of transmission network, quantum of energy served, utilization of technologies (HVDC), overloading and under loading** of regions etc. Any change in NTDC benchmark target needs to be based on **qualitative** and **quantitative** impact of contributing technical factors and on basis of actual study/data. NTDC also stated that in order to arrive at a factual and equitable level of T&T losses benchmark, a consultant is in the process of being hired by NTDC for

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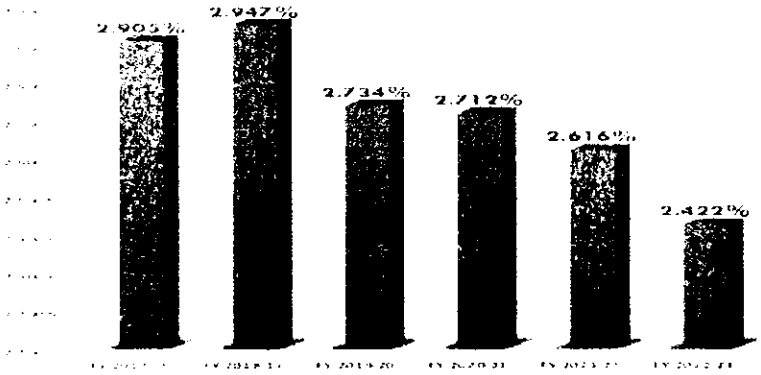
qualitative and quantitative assessment of all factors contributing towards of Primary Transmission System losses of NTDC 500 & 220kV Network.

117. The Petitioner further stated that despite 30% increase in NTDC Network Loading and Inadequate Reactive Power Compensation at DISCOs end, 15% YoY Improvement in NTDC %T&T Losses in last 5 years has been noted. The yearly decreasing trend of NTDC T&T losses is shown below:



118. Petitioner requested to keep the T&T Losses as per actual till conclusion of the Consultant study.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

119. The Authority observed that since the T&T losses of NTDC for 220 kV and above voltage levels are purely technical in nature and no manual intervention, administrative loss, or theft/pilferage is involved while calculation of losses therefore Authority has allowed the actual recorded T&T losses for FY 2022-23. Further, for FY 2023-24 and FY 2024-25 Authority has provisionally allowed 2.50% losses as shown below:

Voltage Level	FY 2022-23	FY 2023-24	FY 2024-25
T&T Loss Target %	2.422	2.50*	2.50*

* Provisionally allowed subject to actual T&T losses ascertained from CDP metering data.

120. The Authority also directed NTDC to carry out third party study of losses and implement the recommendations of consultant to achieve further reduction in T&T losses. The ToRs as approved by the Authority for the Study of T&T Losses to be conducted by third party are attached as enclosed at **Annexure-K.**

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Issue # 14: Whether NTDC has included investment for technological advancement such as Power Compensation Devices (SVC, TCR, and STATCOM etc.), Reactive Power Management Plan, WAMS, PMUs, PDCs, Revamping Telecom Network, Synchronic Relays, Out of Step Device, Reinforcement of Interim Arrangement, Shunt Reactors etc.

SUBMISSIONS OF THE PETITIONER:

121. The Petitioner stated that it has included various projects that incorporates the implementation of best-suited technologies. Examples include:

i. BESS AT 220kV JHAMPIR
ii. SVS AT 220kV QUETTA INDUSTRIAL & KHUZDAR
iii. ENTERPRISE RESOURCE PLANNING (ERP)
iv. SCADA-III
v. HVDC TECHNOLOGY

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

122. The Authority considered the above stated projects and noted that BESS, SVS, STATCOM, Synchronous Condenser are also included in the submitted TSEP 2024-34 which is under review of the Authority at the moment. Thus, these projects are provisionally allowed subject to final approval in the TSEP 2024-34 by the Authority.

Issue # 15: Whether 3rd party audit has been conducted by NTDC for evaluating the projects proposed under the revised investment plan.

SUBMISSION OF THE PETITIONER:

123. The Petitioner stated that as per procedure for all proposed projects, PC-1 is approved from CDWP/ECNEC which can be considered as a 3rd party validation. Moreover, since a majority of the NTDC's projects are funded by donor agencies thus these international funding institutes at the time of financing, also conduct 3rd party validation for evaluation of the proposed projects. Therefore, a rigorous process is followed by CDWP/ECNEC and donor agencies for according approvals to the projects.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY:

124. It is noted by the Authority that all the public sector entities under goes rigorous scrutiny of their projects through ECNEC and CDWP. Further, CDWP and ECNEC approvals are essential for validating the feasibility, importance, and impact of development projects, ensuring efficient use of resources, maintaining transparency, and aligning projects with national development goals.

125. The Authority also noted that Project evaluation by International Financial Institutions (IFIs) like the World Bank, the Asian Development Bank (ADB, etc. is also critical process that helps ensure that projects funded or supported by these institutions are effective, sustainable, and aligned with development goals. It helps manage risks, ensures transparency, and improves the chances of successful project implementation and positive outcomes.

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126. Thus, approval of PC-I by relevant forums as well as project evaluations by donor agencies sufficiently demonstrate the rigorous due diligence in NTDC projects approval. Therefore, the Authority accepts the above submissions in this regard.

Issue # 16: Whether the objections/concerns raised by the DISCOs, Provinces and other stakeholders are addressed in the revised investment plan of NTDC.

SUBMISSION OF THE PETITIONER:

127. The Petitioner submitted that as per the directions of the Authority, a series of consultative sessions were held between NTDC, Provincial Energy Departments, PGCs, and DISCOs under the umbrella of NEPRA team through online meetings, as shown below:

Date & Time	Stakeholders involved
19-12-2022	Energy Department Govt. of Baluchistan, NEPRA, NTDC, QESCO
20-12-2022	Energy Department Govt. of Sindh, NEPRA, NTDC, STDC, HESCO, SEPCO
21-12-2022	Energy Department Govt. of KPK, NEPRA, NTDC, KP Grid Company, PEDO, PESCO, TESCO
22-12-2022	Energy Department Govt. of Punjab, NEPRA, LESCO, FESCO, MEPCO, IESCO, GEPCO
26-12-2022	Energy Department Govt. of GB & AJK, NEPRA, NTDC

128. Moreover, as per NTDC Planning Process, DISCOs were already taken on board from stage of Demand/Load Forecast up to preparation of TSEP. However, 1st time direct interaction has taken place with Provincial Departments in NTDC Planning Process. Moreover, written comments and observations of Provincial Energy Departments & DISCOs were invited and NTDC responses are as under:

i. **AJK (Power Development Organization Muzaffarabad)**

Sr. #	Query/Suggestion	NTDC Response
1	The Hydro Power Projects included in the AJK Public and Private sectors are not included in the NTDC Investment Plan	i. NTDC Investment plan includes those HPPs which are in the approved IGCEP 2022 as per their CODs and for which power evacuation schemes are at 220 kV & above voltage level. ii. There is only one project (48 MW Jagran-II HPP) shared by AJK Power Development Organization which is in the time horizon of NTDC Investment Plan but it is proposed to be connected at 132kV level, therefore, its evacuation scheme is not part of the NTDC investment plan. iii. All the other public sector projects which are in IGCEP 2022 with CoD beyond 2026, will be studied in the next iteration of TSEP. iv. The Private sector projects mentioned in the list provided by AJK PDO were not part of the IGCEP 2022 till June 2031, therefore, they were not considered in TSEP 2022. However, if these projects become part of IGCEP 2024, they would be considered in the next iteration of TSEP.

ii. **Government of KPK Energy & Power Department**

Sr.	Query/Suggestion	NTDC Response
1	While going through NTDC investment plan, I would like to express our deep concern that during the preparation of the investment plan for the FY 2023-25, the NTDC being a National	i. NTDC Investment Plan has been prepared by considering HPPs of PEDO up to 2024-25. Further, those projects which are planned to be connected with 132 kV network of PESCO are not included in the Investment Plan of NTDC.

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	Grid Company (NGC) has neither consulted Energy & Power Department of Khyber Pakhtunkhwa nor Pakhtunkhwa Energy Development Organization.	ii. The PEDO projects beyond 2025-26 would be studied in the next iteration of TSEP. PEDO shall be taken on board in this regard. iii. The complete breakdown of the NTDC Investment Plan is submitted to NEPRA for their approval and the same was shared by NEPRA with all the provincial departments for their comments. iv. NTDC investment plan involves the investment intended for the next 3 years and it includes generation projects from WAPDA and PPIB for power evacuation. These entities were on-board during grid interconnection studies of these projects.
2	The proposed investment plan by NTDC is exclusively targeted to address long standing in-house issues of NTDC network such as to remove system constraints, expand the system capacity and to facilitate power evacuations from power stations. Major chunk of the investment of allocated for power evacuation is not shared with KPK government.	
3	SCADA implementation we hope that NTDC Project of SCADA-III will be equally extended to various PEDO HPPs projects under operations/construction	All the HPPs shall be synchronized with the SCADA-III provided the concerned DISCOs have necessary telecom infrastructure (OPGW and PLC) in this regard and the power plants comply with the essential requirements needed for this provision.
4	We request NEPRA being custodian of the Grid Code 2021 to effectively implement in letter and spirit. The planning code under Grid Code categorically directs the stakeholders to maintain necessary planning coordination between Licensee stakeholders for better planning and coordination with regard to their future network projects.	i. The Grid Code has been revised by addressing comments of all stakeholders including Government of KPK Energy & Power department. ii. TSEP 2022 Phase-1 Report up to year 2025-26 was prepared by NTDC in coordination with the planning teams of DISCOs and in consideration of transmission expansion plans of DISCOs. Moreover, future network model provided by KE was also used in TSEP. iii. For TSEP 2022, all stakeholders were taken on board and objections raised by them were properly addressed by NTDC in different meetings. All stakeholders will be taken on board for next iteration of TSEP as well.
5	It is to our great surprise that NTDC investment plan totally overlooked evacuation plan of PEDO current ongoing HPP projects which are in construction phase and approved in IGCEP. These HPPs projects include Matiltan HPP (84MW), Gabral Kalam HPP (88MW), Kalam Asrit HPP (238MW), Asrit Kedam HPP (229MW) and Madyan HPP (157MW), all duly.	i. NTDC investment plan includes power evacuation of all the generation projects in its network that are envisaged up to 2025-26 and are included in IGCEP 2022. ii. The HPPs like Koto HPP, Lawi HPP and Gorkin Matiltan HPP that are planned to be evacuated at 132 kV level and are in the jurisdiction of PESCO were considered during preparation of TSEP 2022. iii. The power evacuation schemes for other projects i.e. 88 Gabral Kalam, 238 MW Kalam Asrit, 229 MW Asrit Kedam and 157 MW Madyan HPPs which were beyond 2025-26 in IGCEP 2022 would be included in the next iteration of TSEP as their CODs in the IGCEP 2024.
6	The Investment Plan indicated for special economic zones and for 220kV Haripur and 220kV Swabi G/stations falls in the domain of PESCO, an independent entity for load management of 132 kV networks to be fed from mentioned NTDC 220kV G/Stations.	NTDC is responsible for the commissioning of 220 kV G/Stations of Haripur and Swabi, whereas, PESCO is responsible for the allied 132 kV network of these special economic zones. The 220 kV G/stations of Haripur and Swabi are included in the NTDC investment plan.
7	Addendum # 1 500 kV D/C Transmission line from Chitral to Chakdara and Kalam	i. The CODs of the planned HPPs linked with these transmission lines are beyond 2025-26.

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	220 kV D/C Transmission line from Kalam to Chakdara	ii. PEDO has conducted a feasibility study through independent consultant for power evacuation of all the potential HPPs along Swat River valley at 132 kV and 220 voltage levels in consultation of NTDC. The power evacuation schemes of the selected HPPs in IGCEP 2024 would be included in the next iteration of TSEP as well as STP of PESCO. iii. PEDO has hired a consultant to study power evacuation from Chitral valley to the national grid. iv. The requirement of the said 500 & 220 kV transmission lines would be studied in the next iteration of TSEP.

iii. Government of Balochistan Energy & Power Department

Sr #	Query/Suggestion	NTDC Response
1	Construction of 220 kV Transmission Line from Nokundi to Mastung and 220kV grid Station at Nokundi for evacuation of wind energy projects	i. NTDC investment plan includes power evacuation of all the projects in its network that are envisaged for the years up to 2025-26 and are included in IGCEP. ii. There is huge potential of VRE in the Balochistan as identified in "RE Locational Study Report" prepared by World Bank. iii. As per IGCEP 2022, the wind energy projects of total 500 MW have been considered in the study models of TSEP 2022 Phase-1, their interconnections are at 132 kV level as proposed in RE Locational Study. iv. As per IGCEP 2022, there is about 3500 MW wind potential in the years 2027-28 and 2028-29. The evacuation of wind potential in Balochistan and Sindh provinces would be studied in the next iteration of TSEP.
2	Augmentation of 132kV Grid and Transmission network of QESCO for the stable and secure operation of the grid	i. In order to improve the power supply position and to achieve stable/secure operation of the grid in Balochistan, QESCO is responsible for planning, operation & maintenance of 132 kV network and NTDC for 220 kV & higher voltage network. ii. The planning teams of NTDC and QESCO have been working in a coordinated manner in past and present to prepare transmission expansion plans including reactive power compensation within their own jurisdictions. The problem is delay in the implementation of the already proposed projects. Both NTDC and QESCO have also worked together for TSEP 2022 Preparation and would expedite the completion of the planned projects within their jurisdictions.
3	Interconnection of Makran Division	Makran/Gwadar network is presently importing power from Iran through 132 kV lines in the range of 100-150 MW. The plan for additional power supply options for Makran/Gwadar network in short to medium and long term scenarios is given.
4	Conversion of agriculture tube wells on solar system	i. Feasibility study of the said project has already been completed. ii. The PC-1 and execution of this project is the responsibility of Energy department, Government of Balochistan which can provide its latest status. iii. QESCO and AEDB may provide support in this regard. iv. This project is not in the mandate of NTDC.
5	Non electrified villages of province to be converted on off-grid system	NTDC agrees with these suggestions and would extend its technical support to QESCO wherever needed.

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iv. Government of Sindh Energy Department

Sr #	Query/Suggestion	NTDC Response
1	While going through the NTDC investment plan, Energy Department has concern that during the preparation of the investment plan for the FY 2023- 25, NTDC being a National Grid Company (NGC) has not consulted Government of Sindh, rather was shared by NEPRA seeking comments before conducting public hearing.	The subject plan was shared by NEPRA and a zoom meeting has also been scheduled in this regard.
2	The NTDC will stand to qualify its below commitment. i. Improvement in the voltage profile of the network. ii. Reduction in loading of the transmission lines and transformers. iii. Reductions in transmission system losses. iv. 500kV/220kV Ring System Reduction/saving in energy losses per year. v. Increase in capacity marginof transmission lines and transformers and eliminate/decrease forced load shedding. vi. SCADA Implementation. The NTDC Project of SCADA-III Will be equally extended various renewable (solar & wind) and coal energy projects.	NTDC has included system stability projects in its investment plan. Moreover, SCADA-III is also part of this investment plan.
3	Various IPP projects are already in pipeline with Government of Sindh but awaited due to evacuation issues. Since STDC has achieved status of PGC by NEPRA therefore construction of connectivity with Notional Grid or K-Electric should be done by STDC.	The interconnection works between KE and National Grid has already been carried out by KE such as 500 kV KKI grid station and 220 kV Dhabeji grid station.
4	The investment plan indicated for Special Economic Zones where 220/132kV/GIS Substation Dhabeji falls in the domain of Provincial Grid Company (PGC) i.e. Sindh Transmission & Dispatch Company, an independent entity for construction and operations & maintenance. Therefore the project should be handed over to Government of Sindh	NTDC is responsible for the commissioning of 220 kV G/Stations for SEZ in Dhabeji.
5	The HR Improvement Plan submitted by NTDC lacks trainings of personnel from Provincial Grid Company i.e. STDC.	NTDC's services are available for training of PGC personnel.
6	There is dire need of establishment of 500/220 kV ring system in Sindh as shown below.	The provision of 2nd source of supply to 220/132kV Hala Road grid station is a part of PC-1 of 220 kV Mirpur Khas substation and is included in the NTDC Investment Plan. The same was also included in the TSEP 2022.

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v. **Islamabad Electric Supply Company Limited (IESCO)**

Sr #	Query/Suggestion	NTDC Response
1	220/132kV Zero Point Grid Station	220/132 kV Zero Point grid station is included in the NTDC investment plan. The same was also included in the TSEP 2022.
2	Extension at Islamabad University Grid Station	The extension of 3rd 220/132 kV transformer at Islamabad university grid station is included in the NTDC investment plan. The same was also included in the TSEP 2022.
3	Commissioning of 500/132kV Chakwal Grid Station	NTDC team is well aware of the requirement of power supply position and voltage issues in Chakwal region and therefore proposed 500 kV grid station. Chakwal 500/132kV grid station has been delayed due to certain issues, such as, delay in land acquisition, loan agreement and environmental study by the lender, which were beyond the control of NTDC. Now, after resolution of these issues, NTDC shall complete the said project.

vi. **Multan Electric Power Company (MEPCO)**

Sr #	Query/Suggestion	NTDC Response
1	Non-inclusion of 220 kV Layyah grid station in TSEP	i. In the time horizon of NTDC Investment Plan, a 220 kV grid station at Layyah was not required in view of load demand of the region. ii. TSEP 2022 was prepared in coordination with planning team of MEPCO. The 220 kV Layyah grid station was not required by the year 2025-26. iii. The requirement of the said 220 kV grid station shall be studied in the next iteration of TSEP and MEPCO planning team has also be taken on board in this regard. iv. Further, the upgradation of 220 KV Vehari G/S to 500 kV voltage level will resolve the low voltage and system stability issues in the region.

vii. **Hyderabad Electric Supply Company Limited (HESCO)**

Sr #	Query/Suggestion	NTDC Response
1	Proposal for upgradation of upcoming 220 kV Mirpur Khas to 500 kV Level	i. In the time horizon of NTDC Investment Plan, the said upgradation of Mirpur Khas to 500 kV level was not required in view of load demand of the region. ii. TSEP 2022 was prepared in coordination with planning team of HESCO. The upgradation of 220 kV Mirpur Khas to 500

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		kV level was not required by the year 2025-26 in view of the load demand of the region. iii. The requirement of the said upgradation shall be studied in the next iteration of TSEP and HESCO planning team has been taken on board in this regard.
2	Provision of 2nd source to 220/132kV Hala Road grid station	The provision of 2nd source of supply to 220/132kV Hala Road grid station is a part of PC-1 of 220 kV Mirpur Khas substation and is included in the NTDC Investment Plan. The same was also included in the TSEP 2022.

viii. **Sukkur Electric Power Company Limited (SEPCO)**

Sr #	Query/Suggestion	NTDC Response
1	Rehabilitation of 220/132 kV Transformer at TPS Guddu	The spare 160 MVA, 220/132 kV transformer from Multan has already been planned to be installed at TPS Guddu to resolve the issue without minimum additional investment. In future, it is further planned to augment the a2x160 MVA transformers at Guddu with 2x250 MVA transformers along with extension of 3rd 250 MVA transformer at Guddu as per increase in load demand of the region.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY:

129. The Authority has observed that NTDC has responded to the queries/observations of DISCOs and provinces. Regarding, observations of Energy Departments of AJK and KPK NTDC, has stated that it has included all the hydro power projects which are included in IGCEP and to be connected at 220 kV and above voltage level in its investment plan.

130. As far as observation of Energy Department Govt. of Baluchistan are concerned NTDC stated that as per IGCEP 2022, there is about 3500 MW wind potential in the years 2027-28 and 2028-29. The evacuation of wind potential in Balochistan would be studied in the next iteration of TSEP. Moreover, regarding interconnection of Makran region NTDC also shared its proposal which is attached at **Annexure-L**.

131. With regard to observations of Energy Department, Govt. of Sindh NTDC mentioned that the provision of 2nd source of supply to 220/132kV Hala Road grid station is a part of PC-1 of 220 kV Mirpur Khas substation and is included in the NTDC Investment Plan. This will provide 220 kV ring system in Sindh.

132. Further, Authority observed that proposed TIP has included upgradation of 220 kV Vehari G/s to 500 kV voltage level to address the low voltage and system stability issues in MEPCO region.

133. Keeping all above in view, the Authority is satisfied that NTDC has taken on board all stakeholder and included the necessary projects as identified by stakeholder. Therefore, the Authority acknowledges the efforts of NTDC.

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Issue # 17: Whether the investment allowed in previous financial years have been fully utilized.

SUBMISSIONS OF THE PETITIONER:

134. The Petitioner submitted that the investment for FY 2020 and FY 2021 was trued-up by Authority. Moreover, as per "NEPRA Guidelines for determination of Revenue Requirement & UoSC":

> *"Previous investment allowed for FY 2022 is subject to be trued up by the Authority in the subsequent NTDC Tariff Determination for FY 2022-23 to FY 2024-25, which shall be filed upon approval of NTDC's Transmission Investment Plan."*

135. Furthermore, Authority in Section 4.3.5 of the same Review Motion also mentioned the following with regards to Investment in FY 2022:

> *"If NTDC will be able to make investments above the allowed amount and submit the audited accounts in support of making higher investments, the same may be considered for adjustment by the Authority at the time of next determinations for future period as PYA."*

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

136. The Authority noted that as per mechanism given in the previous tariff determinations the investments incurred by NTDC were trued up subject to provision of audited accounts in support of claims. The Authority is of the opinion that above submission of NTDC are satisfactory.

Issue # 18: The petitioner must provide the project-wise rationale for the requested investment and the techno-commercial benefits to be achieved through the proposed investment. This should include constraints removal, additional energy available for wheeling through MVA additions, reliability and continuity of supply, and reduction in transmission losses, among others.

SUBMISSION OF PETITIONER

137. The Petitioner stated that the benefits of NTDC proposed projects i.e. construction of the new substations and transmission lines, augmentation & extension of transformers etc. have been quantified in terms of the following:

i. **Increase in system capacity** for removal of transmission system constraints, for meeting future load demand, and also for power evacuation.
ii. **Reduction in loading** of the transmission lines and transformers at/in the vicinity of the proposed projects.
iii. **Improvement in the voltage profile** of the substations.
iv. **Reductions in transmission system losses.**
v. **Increase in NTDC Revenue.**
vi. Other Benefits include : SCADA Implementation, ERP Modernization, Skill Enhancement

138. Moreover, NTDC stated that the net Project Benefit is calculated on yearly basis.

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Project Cost from Project Benefit.

i. Power Flow per Annum (as per load flow studies) in first year.
ii. Incremental flow in subsequent years up to project life of 40 years as per load growth rate up to max. allowable loading capacity of T/F.
iii. Revenue per annum on the basis of power flow using the latest rate of UoSC determined by NEPRA as Fixed UoSC (@ Rs. 235.30/kW/month) and Variable UoSC @ Rs. 0.22/kWh by using System Load Factor

139. The Petitioner further stated that Internal Financial Rate of Return is calculated using total Benefit for Project life of 40 years using discount rate of 10%. Moreover, the Petitioner stated that IRR depends on investment cost. In case of high power flow with less investment, the rate of return will be high. However, the rate of return will be less when investment cost is high with same power flow.

OBSERVATIONS/ANALYSIS AND DECISION OF THE AUTHORITY

140. The Authority noted that the implementation of proposed investment will result in removal of constraints and enhancement of NTDC's transmission and transformation capacity which will increase NTDC's revenue.

141. Furthermore Authority observed that as per statistics provided by NTDC there will be Rs. 177,884 Million benefit per annum which will be achieved after completion of the proposed projects.

142. Keeping all above in view, the Authority, while relying on the statistics provided by NTDC, considers the submission of NTDC reasonable. Further, the detailed project wise scope and basis for approval/rejection is attached at **Annexure-M.**

ORDER OF THE AUTHORITY

143. The Authority as per provisions of Section 32 of the NEPRA Act, 1997 read with NEPRA's Guidelines for determination of Revenue Requirement & UoSC for Transmission Licensees, 2017 approves the following investment plan and losses assessment of NTDC for three (3) years tariff control period from FY 2022-23 to FY 2024-25.

A. Approved Investment Plan: (Million Rs)

Description / Head	FY 2022-23	FY 2023-24	FY 2024-25	Total
Special Economic Zone (SEZs)	2,334	16,563	5,053	23,950
PSDP Funded Ongoing Works	101,813	91,388	76,965	270,166
PSDP Funded New Works	648	414	37,765	38,827
Self-Financed Ongoing works	10,467	4,031	700	15,198
PSDP Funded Completed Works	1,594	32	0	1,626
Foreign Funded Completed Works	1,659	696	200	2,555
Land Acquisition of Solar Projects	Such costs shall be considered as a separate line item in the tariff determination of respective solar power plants.			
Grand Total Allowed	**118,515**	**113,124**	**120,683**	**352,322**
3rd Party Audit Fee	66.66	66.66	66.66	200

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B. Approved T&T Losses Targets:

Voltage Level	FY 2022-23	FY 2023-24	FY 2024-25
T&T Loss Target %	2.422	2.50*	2.50*

* Provisionally allowed subject to actual T&T losses ascertained from CDP metering data.

C. Other Terms and Conditions:

i. The sole right of interpretation regarding this investment plan decision rests with the Authority. In the event that the Petitioner or any other stakeholder requires clarification on this decision, they may seek clarification directly from the Authority beforehand. Any expenses incurred by the Petitioner without clear provision will be at their own risk and cost.

ii. The Petitioner is directed to make the best efforts to procure materials and services in a manner that ensures the most cost-effective prices for project execution.

iii. The Petitioner shall clearly document both the investment projects and repair and maintenance projects, ensuring there is no duplication between them. The third-party audit/monitoring shall verify this aspect during regular audits.

iv. The approved investment shall be subject to a comprehensive 3rd party independent Monitoring / Audit. The Third party Audit / Monitoring of allowed investments will be carried out on quarterly basis. The ToRs and mechanism of 3rd party Audit/Monitoring will be formulated by the Authority. An indicative cost of Rs.200 Million in the investment plan of NTDC has been allocated for the purpose of 3rd party Audit/Monitoring of Investment Plan. The amount shall be subject to adjustment upward/downwards based on the cost approved by the Authority for the Audit.

v. The Authority has decided to appoint a third-party audit/monitoring firm to perform quarterly audit/monitoring of NTDC's approved investment plan. The firm shall be responsible for examining and verifying the fairness and prudency of CAPEX claims and other CAPEX adjustments of NTDC against various allowed projects to be implemented during the control period as per the approved investment plan of NTDC keeping in view the best utility practices and established principles of the operations.

vi. The Petitioner shall ensure zero fatal accidents goal and shall ensure safe working environment for its employees and general public by utilizing approved investment by the Authority against safety plans.

vii. The Petitioner shall also submit a quarterly progress report showing the utilization of the allowed investment, physical progress, and analysis regarding the benefits accrued against the amount incurred for each project highlighted under different heads for monitoring purposes on a quarterly basis. Moreover, NTDC shall also provide the above progress on online portal specified by NEPRA for monitoring of the approved investment plan.

viii. The Petitioner shall submit a progress report for the performance indicators (T&T losses, SAIFI, SAIDI, Reliability, Continuity & Quality of Power Supply, and other performance standards) achieved as a result of implementing the investment plan approved by the

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Authority. Moreover, NTDC shall also provide the above progress on online portal specified by NEPRA for monitoring of the approved investment plan.

ix. For PSDP funded new projects for which PC-I and/or funding is not available, the Petitioner should get the approved PC-I and secure funding against such projects. The same shall be submitted to NEPRA for approval in the next investment plan after fulfilling the requirements of law.

x. The Petitioner shall strictly follow the timelines approved by the Authority in the instant investment plan.

xi. NTDC shall submit PC-IV of the completed projects that have cost overruns and also revise the PC-I for such projects that have overruns of more than 15% as per the guidelines of the Planning Commission.

xii. NTDC shall timely complete the SCADA – III project on priority and provide a monthly progress report for SCADA-III.

AUTHORITY

Rafique Ahmad Shaikh
Member

Mathar Niaz Rana (nsc)
Member

Engr. Maqsood Anwar Khan
Member

Amina Ahmad
Member

Waseem Mukhtar
Chairman

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Annexure – A

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

SUMMARY OF NTDC NETWORK CONSTRAINTS

Constraint Type	Sr. No.	Constraints as reported by NPCC	Count
Transformation Constraints	1	Overloading Constraints of 500/220 kV Transformer	8
	2	Overloading Constraints of 220/132 kV Transformer	18
Transmission Line Constraints	3	Overloading Constraints of 500kV Transmission	6
	4	Overloading Constraints of 220kV Transmission	1
		Total	**33**

Note: Overloading of Transformer/Transmission Line is considered at 80% of Full Rated Load as per Grid Code.

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

TRANSFORMER CONSTRAINTS:

OVERLOADED 500/220kV TRANSFORMERS

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
1	500kV Rawat	(3x450MVA, 1x750 MVA) Auto T/Fs (T1,T2,T3 &T4) Over Loading	**765/500/220/132kV Islamabad West Substation**	December, 2026
			500/132 kV Chakwal Substation	December, 2026

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
			Completion of pending works at 500kV Faisalabad West i.e. 220kV T/L (02 Nos.) & 132kV T/L (03 Nos.)	220kV FSD West-Lalian T/Line: 28/04/2024.
2	500kV Gatti Grid Station	500/220kV (4x450MVA) Auto T/Fs Overloading	**2nd Source of Supply to Jaranwala Road Faisalabad**	G/S Extension : June, 2025 T/L : December, 2025
			Commissioning of 3rd 750MVA ATB at 500kV Faisalabad West	June, 2025

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
3	500 kV Multan Grid Station	500/220kV (2x450MVA) T/Fs)	**Upgradation of Vehari from 220kV to 500 kV level.**	June, 2026
		(T-1,T-2) Auto T/Fs Overloading	**Replacement of existing 3rd 450 MVA ATB with new one at 500 kV Multan Substation**	June, 2025

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NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
4	500kV Muzaffargarh Grid Station	500/220kV (2x600MVA) Auto T/Fs Overloading	**Upgradation of Vehari from 220kV to 500 kV level.**	June, 2026
5	500kV Yousafwala	500/220kV (3x600MVA) Auto T/Fs T1, T2 & T3 Overloading		

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Other Solution for Muzaffargarh constraints: 3rd 600 MVA, 500/220 kV T/F at Muzaffargarh which shall be examined in TSEP 2024.

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
		500/220kV (3x450MVA) Auto T/Fs Overloading		
6	500 kV Jamshoro Grid Station	A. Power flow from LV to HV due to Hight WIND	**500 kV KKI Substation**	June 2024. Scope of K-Electric
			220 kV Link from Jhimpir-2 to Dhabeji	June 2024. Scope of K-Electric
		B. Power flow from HV to LV due to Low WIND		

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NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
7	500kV Sheikh Mohammadi Peshawar	500/220kV (3x450MVA) T/Fs T/Fs T1, T2 & T3 Auto T/F Overloading	**Addition of 4th 500/220kV 450MVA ATB**	April, 2026
			500/220 kV Nowshera Substation	28/08/2024

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NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 500/220kV Auto Transformer Banks

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
8	500kV Lahore Sheikhupura	500/220kV Auto T/Fs Overloading (4x600MVA) T/Fs) (T1,T2,T3,T4)	• **Early replacement of faulty 450 MVA T-10** • **Replacement of 450 MVA ATB with 600 MVA ATB** **500 kV Lahore North Substation**	• June, 2024 • June, 2025 G/S: 31/08/2024 500kV T/Lines: 03/02/2024 220kV T/Lines: 31/03/2024

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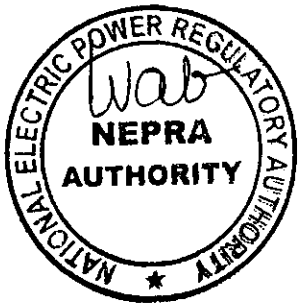
PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

TRANSFORMER CONSTRAINTS:

OVERLOADED 220/132kV TRANSFORMERS

2 BS



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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
1	220kV Islamabad University	220/132kV T/Fs T-1, T-2 (2x250MVA)	**Addition of 3rd 250 MVA Auto T/F**	30/09/2024
			765/500/220/132 kV Islamabad West Substation	December, 2026
2	220kV Sahuwala Sialkot	220/132kV T/Fs T-1,2,3 (3x160MVA)	**500/220/132 kV Sialkot Substation.**	June, 2026
			220/132kV Gujranwala-II	June, 2026

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
3	220 kV Sarfaraz Nagar *	220/132kV T/Fs T-1,2,3,4 (4x160MVA)	**220/132kV Sunder Industrial Substation**	Sundar Ind. was already planned but has been delayed due to land issue with Sundar Ind. estate.
			Addition of 3rd 160 MVA Transformer At 220 kV Okara G/S	10/12/2023
4	220kV New Kot Lakhpat	220/132kV T/Fs T-1,2,3 (3x250MVA)	**Addition of 4th 250 MVA Transformer**	30/04/2024
			220/132kV Punjab University Substation.	June, 2026

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*** Augmentation of 4x160 MVA T/Fs with 4x250 MVA at Sarfraz Nagar is an option but 132 kV network of LESCO has constraints and needs upgradation. An alternate option for Sunder Industrial G/S is new 220 kV G/S at Kasur. Both options shall be studied in TSEP 2024.**

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
5	500kV Lahore Sheikhupura	220/132kV T/Fs T-4,5,6 & 7 (4x160MVA)	**Argumentation of 4x160 MVA to 4x250 MVA** **Lahore North**	30/04/2024 • G/S: 31/08/2024 • 500kV T/Lines: 03/02/2024 • 220kV T/Lines: 31/03/2024
6	220kV Daud Khel	220/132kV T/Fs T-1, T-2 (2x160MVA)	**Addition of 3rd 160 MVA ATR**	31/01/2024

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
7	220kV Ludewala	220/132 kV T/F T-1 (160MVA) + T/Fs T-2, T-3 (2x250MVA)	**Augmentation of 160 MVA to 250 MVA ATR**	30/04/2024
			Completion of scope of 220 kV Lalian Substation	220kV FSD West - Lalian T/Line: 28/04/2024
8	500kV Yousafwala	220/132kV T/Fs T-3,4,5,6 (4x160MVA)	**220 kV Arifwala Substation**	June, 2026

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
9	500kV Guddu	220/132kV T/F T-4 (285MVA) Under fault + T/F T-13 (1x160MVA) Old Age T/F	**Addition of 160 MVA ATR.**	30/04/2024
			Argumentation of 2x160 MVA Transformers to 2x250 MVA ATRs.	June, 2025
10	220kV Bahawalpur	220/132kV T/F T-1 (1x160 MVA)	**Augmentation of existing 160 MVA to 250 MVA ATR.**	30/01/2024

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
11	220kV KAPCO P/H	220/132kV T/F T- 6 (200MVA) + T-1,T-2,T-5 (3x100MVA)	**220kV Nagshah Grid Station**	June, 2026
12	220 kV Rohri	220/132kV T/Fs T-1,T-2 (2x250 MVA)	**Addition of 3rd 220/132 kV 250 MVA ATR**	31/01/2024

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
13	220 kV T.M.Khan	220/132kV T/Fs T-1, T-2 (2x160MVA)	**Augmentation of 2x160 MVA to 2x250 MVA**	13/07/2024
			Commissioning of 220kV Mirpurkhas	31/08/2025
14	220 kV Khuzdar	220/132kV T/Fs T-1,T-2 (2x160MVA)	**Addition of 3rd 160 MVA ATR**	June, 2024 *(subject to land acquisition from Pak Army)*
15	220 kV Quetta Industrial	220/132kV T/F T-2 (1x160MVA)	**Augmentation of 3rd 250 MVA ATR**	18/03/2024
			Commissioning of 220kV Mastung	June, 2026

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
16	220kV Hala Road	220/132kV T/Fs T-1,T-2 (2x160MVA)	**Augmentation of 2x160MVA to 2x250MVA**	13/07/2024
			Commissioning of 220kV Mirpurkhas	31/08/2025
17	220kV Jamshoro	220/132kV T/Fs T-3,T-7 (2x160MVA)	**Addition of 3rd 160 MVA T/F**	13/07/2024
			Commissioning of 220kV Mirpurkhas	31/08/2025

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transformer Constraints : Overloaded 220/132 Auto Transformers

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
			Operational issue	
18	220 kV Muzaffargarh New 220/132kV (3x160MVA) T/F T-1,2,3	220/132kV T/F T-2 (1x160MVA)	T/F operating at reduced load. Issue persisting after T/F testing, dehydration. T/F to be replaced with Spare 160MVA T/F	15/03/2024 *(Will be addressed before Summer 2024)*

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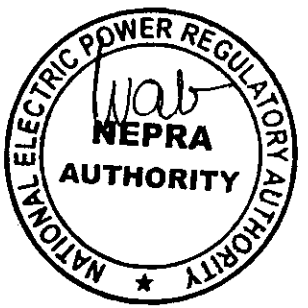
PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

TRANSMISSION CONSTRAINTS:

OVERLOADED 500kV T/L POWER EVACUATION PROBLEM



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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transmission Line Constraints : Overloaded 500kV Transmission Lines

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
1	500 kV Jamshoro	500 kV Jamshoro - Matiari circuit 1 & 2, and 500 kV Jamshoro – Dadu circuit (Unable to Dispatch existing Power Plants in south on Full Load)	• 500 kV Lahore North Substation and its associated T/Lines.	• G/S: 31/08/2024 500kV T/Lines: 03/02/2024 220kV T/Lines: 31/03/2024
			• *500 kV KKI Substation*	• June 2024. Scope of K-Electric
			• 220 kV Dhabeji SEZ Substation	• 21/09/2024
			• 220 kV Mirpur Khas Substation	• 31/08/2025

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transmission Line Constraints : Overloaded 500kV Transmission Lines

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
2	500kV Dadu	500 kV Dadu – Shikarpur and 500 kV Moro - Rahim Yar Khan (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)	• 500 kV Lahore North Substation and its associated T/Lines. • *500 kV KKI Substation*	*As mentioned earlier*
3	500 kV Shikarpur	500 kV Shikarpur - Guddu 1 & 2, 500 kV Moro – Rahim Yar Khan (Unable to Dispatch existing Power Plants in south on Full Load)	• 220 kV Dhabeji SEZ Substation • 220 kV Mirpur Khas Substation	

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NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transmission Line Constraints : Overloaded 500kV Transmission Lines

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
4	500 kV Yousafwala	500 kV Yousafwala – Sahiwal Coal CFPP (Overloading occurred on dated 18.06.2023, Unable to despatch Sahiwal Coal on Full Load)	Additional 500 kV circuit from 500 kV Yousafwala Substation to Sahiwal CFPP has been proposed	June, 2026
5	500 kV Nokhar	500 kV Nokhar – Karot – Neelum Jhelum interconnection loop (Unable to Dispatch Karot & Neelum Jhelum on Full Load in this Loop during outage of any circuit connected with Nokhar)	A 500 kV Double Circuit Line is proposed between Maira to Karot to cater N-1 contingency	Dec, 2025

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NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transmission Line Constraints : Overloaded 500kV Transmission Lines

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
6	500 kV Sheikh Mohammadi Peshawar	500kV Sheikh Muhammadi – Tarbela Circuit	**2nd Source of Supply to 500kV Sheikh Muhammadi**	June, 2026

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

TRANSMISSION CONSTRAINTS:

OVERLOADED 220kV T/L

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PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

Transmission Line Constraints : Overloaded 220kV Transmission Lines

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
1	500 kV Jamshoro	220 kV Jamshoro – Hala Road circuit # 01 & 02	• **Mir Pur Khas 220 kV G/S** • **In-out of Jamshoro - T.M.Khan S/C at Hala Road G/S (2nd source to Hala Road G/S)**	• 31/08/2025 • June 2026

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Annexure B

Approved Investment for Special Economic Zone Projects

Sr.	Name of Project	Approval Status	PC-I Estimates			Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run	Completion Date as per Investment Plan
			Local	Foreign	Total	FY 2022-23 Actual	FY 2023-24	FY 2024-25	Total			
1	220/132 Kv GIS Substation Dhabiji	CDWP 16.12.2020	2,953	3,221	6,174	523	4,500	880	5,902	5,933	NO	G/S: 21-09-2024 T/L: 31-12-2023
2	220kV Haripur Substation	CDWP 30.01.2020	1,378	2,428	3,806	532	3,234	25	3,791	3,791	NO	May 2024
3	220kV Swabi Substation	CDWP 17.10.2019	2,582	3,818	6,400	692	4,450	500	5,642	5,646	NO	July 2024
4	220 kV Quaid-e-Azam Apparel and Business Park (QABP) Grid Station for Provision of Electricity to PIEDMC SEZ	CDWP 19.04.2021	1,216	1,838	3,054	311	2,158	200	2,668	2,668	NO	March 2024
5	500kV Allama Iqbal Industrial City for 600MW Demand of the Special Economic Zone in the FIEDMC area	CDWP 25.05.2021	2,050	3,926	5,976	277	2,221	3,448	5,947	5,947	NO	August 2024
Total SEZs			10,179	15,231	25,410	2,334	16,563	5,053	23,950	23,986	-	

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Approved Scope of Work

Sr.	Name of Project	Scope of Work
1	220/132 Kv GIS Substation Dhabiji	220kV GIS Dhabeji Grid Staion (2x160MVA, 220/132kV Auto Transformer) 220kV Double Circuit Twin Bundled Transmission Line for Looping In/Out of 220kV Gharo –Jhampir S/C at 220kV Dhabeji SEZ Substation (12.4km)
2	220kV Haripur Substation	3 x 250MVA Auto Transformers 220kV Double Circuit Twin Bundle Transmission Line In/out at existing 220kV Mansehra – ISPR Transmission Line (12 km approx.)
3	220kV Swabi Substation	220kV Grid Station with 3 x 250 MVA 220/132kV Auto Transformer. 220kV D/Ct Twin Bundled T/Line from 500kV Nowshehra Grid Station to 220kV Swabi G/Station (55km approx.)
4	220 kV Quaid-e-Azam Apparel and Business Park (QABP) Grid Station for Provision of Electricity to PIEDMC SEZ	220 kV G/Station with 2x250 MVA, 220/132 kV T/Fs 2x220 kV Line Bays for IN/OUT of 220 kV KSK-Bandala Ccts-I & II T/Line. 220 kV D/C T/L (2+2 km) for IN/OUT of existing 220 kV KSK-Bandala Ccts-I & II T/L (completed on 30/11/2020 on cost deposit basis and energized on no-load).
5	500kV Allama Iqbal Industrial City for 600MW Demand of the Special Economic Zone in the FIEDMC area	500kV Grid Station having 3 x 250 = 750 MVA , 500 /220/132 kV Auto transformer. 500 kV D/C T/L on three bundle Greely conductor, from 500 kV AIIC Grid Station for In/Out on the existing Gatti- Ghazi Barotha Circuit-II (Chakwal) 500 kV single circuit T/L

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1. **500 kV Lahore North Substation:** It is required for voltage improvement in Lahore region and also critical for full utilization of HVDC T/line thereby resolving south to north power transfer issues. The tangible benefits of Lahore north are as follows:

Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)	
	Without Lahore North	With Lahore North
Lahore	133.8	137.5
K.S. Kaku	130.8	135.8
Attabad	132.0	136.3
Fatehpuri	130.3	136.3
Ravi-I	128.7	132.5
Ravi-II	129.1	133.3
Sherwala	128.7	133.0
Fort	128.7	132.9
Bhati Gate	128.6	132.8
Badami Bagh	128.9	132.9
Shadaran	129.1	133.5
Rustam	129.4	133.7
ICI Public	133.7	137.2
Green View	129.8	134.1

Reduction in Loading of 220 and 132 kV Transmission lines

Transmission Line	%age Loading	
	Without Lahore North	With Lahore North
Bund Rd 1 - Lahore 220 kV D/C	76%	67%
Lahore – Attabad 132 kV D/C	102%	62%
Attabad – ICI bublic 132 kV S/C	49%	31%

Reduction in Loading of 500/220 and 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading	
		Without Lahore North	With Lahore North
Lahore 500/220/132 kV	4 x 600	120	89
	4 x 250	74	61
Gujranwala 500/220 kV	3 x 600	70	60
	3x250	91	82
Lahore-South 500/220 kV	3 x 750	73	60

d. Reduction in Transmission System Losses = 36.6 MW

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2. Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations

i. (Punjab Province)

Sr. No.	Name of Grid Station	Transformation Capacity	%age Loading without Ext/Augmentation		%age Loading with Ext/Augmentation		Reduction in Losses
			Normal	Contingency	Normal	Contingency	MW / %
1.	220 kV Daud Khel	Extension of 1x160 MVA, 220/132 kV	79%	116%	60%	79%	0.1 MW
2.	220 kV Islamabad University	Extension of 1x250 MVA, 220/132 kV T/F	100%	138%	78%	100%	3.1 MW
3.	500 kV Nokhar (Gujranwala)	Extension of 1x600 MVA,500/220 kV T/F	97%	156%	70%	97%	2.3 MW
		Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA	107%	130%	83%	106%	2.4 MW
4.	220 kV New Kotlakhpat	Extension of 1x250 MVA,220/132 kV T/F.	101%	113%	89%	101%	3.1 MW
5.	220 kV Wapda Town	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA	94%	113%	75%	92%	5 MW
6.	220 kV Ludewala	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA	96%	122%	71%	94%	2.4 MW
7.	220 kV Bahawalpur	Augmentation of 220/132 kV T/Fs from 1x160 MVA to 1x250 MVA	79%	129%	70%	98%	13 MW
8.	220 kV Multan	Augmentation of 220/132 kV T/Fs from 4x63.5 MVA to 2x250 MVA	156%	176%	77%	99%	0.5 MW
9.	500 kV Lahore (Sheikhupura)	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA; Extension of 1x250 MVA,220/132 kV T/F	97%	111%	70%	81%	6.1 MW
10.	500 kV Multan New	Augmentation of 220/132 kV Transformers from 3x160 MVA to 3x250 MVA	90%	102%	75%	90%	0.34 %
11.	220 kV Sangjani	Augmentation of 220/132 kV T/F from 3x160 MVA to 3x250 MVA	-	-	-	-	0.21 %
		Augmentation of 220/132 kV T/F from					

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12.	220 kV Gakhar	2x160 MVA to 2x250 MVA	-	-	-	-	-
13.	220 kV Summandri Road	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA	-	-	-	-	-
14.	220 kV Vehari	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250 MVA	-	-	-	-	-

ii. (KPK Province)

Sr. No.	Name of Grid Station	Transformation Capacity	%age Loading without Ext/Augmentation		%age Loading with Ext/Augmentation		Loss Reduction
			Normal	Contingency	Normal	Contingency	MW
1.	500 kV Sheikh Muhammadi Substation	Extension of 1x450 MVA 500/220 kV T/F	92%	127%	73%	92%	2.1 MW
2.	220kV Bannu Substation	Augmentation of 220/132 kV T/Fs from 3 x160 MVA to 3x250 MVA.	84%	115%	58%	82%	MW

iii. Sindh Province)

Sr. No.	Name of Grid Station	Transformation Capacity	%age Loading without Ext/Augmentation		%age Loading with Ext/Augmentation		Loss Reduction
			Normal	Contingency	Normal	Contingency	MW / %
1.	500 kV Guddu	Augmentation of 220/132 kV T/Fs from 1x160 MVA to 1x250 MVA	112%	-	87%	-	4.9 MW
2.	220 kV Rohri	Extension of 1x250 MVA,220/132 kV T/F	80%	129%	58%	80%	1.4 MW
3.	220 kV Hala Road	Augmentation of 220/132 kV T/F from 3x160 MVA to 3x250 MVA	101%	128%	77%	99%	3.1 MW
4.	220 kV Jamshoro	Extension of 1x160 MVA, 220/132 kV	86%	106%	72%	86%	1.19%
5.	220 kV Daharki	Augmentation of 220/132 kV T/Fs from 1x160 MVA to 1x250 MVA	-	-	-	-	-
6.	220 kV Shikarpur New	Augmentation of 220/132 kV T/Fs from 3x160 MVA to 3x250MVA	79%	104%	57%	77%	0.27 %
7.	220 kV T.M Khan Road	Augmentation of 220/132 kV T/Fs from 2x160 MVA to 2x250MVA	84%	106%	69%	94%	0.14%

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iv. (Balochistan Province)

Sr. No.	Name of Grid Station	Transformation Capacity	%age Loading without Ext/Augmentation		%age Loading with Ext/Augmentation		Loss Reduction
			Normal	Contingency	Normal	Contingency	MW
1.	220 kV Khuzdar	Extension of 1x160 MVA, 220/132 kV T/F	96%	170%	66%	96%	0.3 MW
2.	220 kV Loralai	Extension of 1x250 MVA, 220/132 kV T/F	66%	121%	45%	66%	1.9 MW
3.	220 kV Quetta Industrial	Augmentation of 220/132 kV T/Fs from 1x160 MVA to 1x250 MVA	83%	-	52%	-	0.4 MW
4.	220 kV Sibbi	Extension of 1x160 MVA, 220/132 kV T/Fs	92%	-	66%	-	-

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3. 500 kV Islamabad West Substation

i. Improvement in Voltage Profile

Name of 132kV Substation	Voltage (kV)		% Voltage Improvement
	Without Islamabad West	With Islamabad West	
Taxila	131 kV	136 kV	4%
Fateh Jang	129 kV	135 kV	5%
Pindi Gheb	126 kV	132 kV	5%
Bassal	125 kV	130 kV	4%
Jand	124 kV	128 kV	3%
Lakar Mar	123 kV	127 kV	3%

ii. Reduction in loading of 220 and 132 kV Transmission lines

Transmission Line	%age Loading		%age Loading Relief
	Without Islamabad West	With Islamabad West	
132 kV Wah New – Bahtar More S/C	93%	21%	72%
132 kV Wah New – Taxila S/C	64%	27%	37%
132 kV Burhan – Wah New D/C	58%	44%	14%
132 kV Burhan – Burhan Proposed S/C	75%	57%	18%
132 kV Burhan – AWC S/C	61%	43%	18%

iii. Reduction in Loading of 500/220 kV and 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without Islamabad West	With Islamabad West	
Rewat	2 x 450	67%	50%	17%
500KV	1 x 750	78%	57%	21%
Burhan 220kV	2 x 250 (BB-1)	77%	65%	12%
	2 x 250 (BB-2)	78%	67%	11%
Islamabad University 220/132 kV	3 x 250	70%	56%	14%
ISPR 220/132 kV	3 x 160	78%	67%	11%

iv. Reduction in transmission system losses = 7.9 MW

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4. **220 KV Dera Ismail Khan - Zhob Transmission Line along with 220 KV Zhob Substation**

i. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Improvement
	Without D.I. Khan to Zhob T/L	With D.I. Khan to Zhob T/L	
Zhob	115.7	136.2	15.05 %
G.H. Zai	121.5	136.5	12.35 %
Musafirpur	119	137.7	15.71 %
Sherani	115.1	135.9	18.07 %
Qilla Saifullah	130.3	136.3	04.61 %
Pasinzai	130.2	136	04.46 %
Mus Bagh	130.1	134.1	03.07 %

ii. Reduction in Transmission System Losses = 14.7 MW

5. **220 kV Jauharabad Substation along with allied T/Lines**

i. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Improvement
	Without Jauharabad-N	With Jauharabad-N	
Jauharabad	117.6	133.2	11.7%
Ludewala-N	131.3	133.8	1.8%
Quaidabad	118.2	128.7	8.1%
Wanbuchran	124.5	131.2	5.1%
T-Shahpur	127.2	132.9	3.1%
T-Pioneer	125.1	132.1	5.3%
T-Flying Cement	125.1	132.1	5.3%
Noshera	115.9	126.8	8.6%
Adhikot	115.5	126.5	8.7%

ii. Reduction in Loading of 132 kV Transmission lines

Transmission Line	%age Loading		%age Loading Relief
	Without Jauharabad – N	With Jauharabad - N	
Ludewala N - Jauharabad 132 kV S/C	95%	11%	84%
Wanbuchran – Quaidabad 132 kV S/C	87%	32%	55%
DaudKhelO - Wanbuchran 132 kV S/C	72%	50%	22%
Ludewala-N – T-Shahpur 132 kV S/C	49%	7%	42%

iii. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformer Capacity (MVA)	%age Loading		%age Loading Relief
		Without Jauharabad	With Jauharabad	
Ludewala 220 kV (Without Aug.)	3x 160	93%	59%	34%
Ludewala 220 kV (With Aug.)	3x 250	66%	44%	22%

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iv. Reduction in Transmission Losses = 12.3 MW

6. 220 kV Mirpur Khas Substation along with allied T/Lines

i. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Improvement
	Without Mirpur khas	With Mirpur khas	
M.P Khas	117.7	137.0	16.40 %
Mir Wah Gorchani	117.6	136.8	16.33 %
Sultanabad	118.0	136.8	15.93 %
Kandiari	116.0	135.3	16.64 %
Sanghar	114.9	133.7	16.36 %
Shahpur Chakar	116.3	132.9	14.27 %
M.P.Khas -2	117.3	136.6	16.45 %
Jam Nawaz	116.6	135.1	15.87 %
TandoJam	127.4	135.7	6.51 %
Samaro	118.0	137.0	16.10 %
T.A.Yar	121.1	135.5	11.89

ii. Reduction in Loading of 220/132 kV Transformers

Name of Substation	%age Loading		%age Improvement
	Without Mirpur khas	With Mirpur khas	
T.M Khan Road 220/132 kV	73 % (BB-1)	55 %	24.66 %
	64 % (BB-2)	54 %	15.63 %
Hala Road 220/132 kV	81%	55 %	32.10 %
Jamshoro 220/132 kV	61%	%	13.11 %

iii. Reduction in Loading of 132 kV Transmission Lines

132 kV Transmission Lines	%age Loading		%age Improvement
	Without Mirpur khas	With Mirpur khas	
Tando Jam - T.A.Yar	108 %	35 %	67.59 %
Hala Road – Matiari	92 %	67 %	27.17 %

iv. Reduction in Transmission System Losses = 68.8 MW

7. **220KV Transmission System Network Reinforcement in Islamabad & Burhan:** The stress on the Tarbela-Burhan-ISPR transmission line will reduce which will help create sufficient margin to meet future load growth. It will also help in evacuation of power from Tarbela 4th (1410 MW) and improvement in reliability of NTDC 220 kv network around IESCO. Reduction transmission line losses and will help in voltage Profile improvement of IESCO region

8. **Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station:** The main objectives of project are to Develop a Pilot BESS to improve the frequency regulation capability of NPCC, Voltage support for the southern part of the NTDC grid, especially during contingencies, Capacity building in energy storage systems which will form an

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essential part of future energy systems. Develop a Pilot BESS to improve frequency regulation capability. Voltage support for the southern part of the NTDC grid, etc.

9. **Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC:** This is ADB funded project. The scope of the project includes addition and upgradation of existing SCADA system by installation of hardware and software for data base to perform system operation at National Power Control Center Islamabad & establishing backup control center at Jamshoro Old RCC building. Further, RTU/SAS/DCS Interfacing with Main SCADA System and Backup of NTDC's telecom network will also be performed.

   SCADA System enables SO to monitor and control the system state in real time for Smooth, Reliable & Efficient operation of Power System. It also facilitates the control room engineers with its advisory tools like State Estimator, Reserve Monitoring, Automatic Generation Control, Load Flow Studies etc. Tele-metered Data recorded and archived in SCADA System is used in post event analysis and system studies. The benefits associated with the project include:

Improved efficiency in power supply from NPCC
Improved quality of Supply
Ensuring reliability of supply
Fuel saving through optimized unit commitment
Reduction in Transmission losses through proper VAR scheduling
Reduction in loss of load due to transmission fault / system collapse
Timely and accurate data for most economical despatch of power.
Complete visibility of power network.

10. **Enterprise Resource planning (ERP) (Now Implementation of Integrated Solution to improve Productivity and Control in NTDC by ERP System):** ERP is a business management software system that integrates all facets of an organization into a unified system. It contains modules like Finance, Human Resource, Asset Management, Project Sysytems, Supply Chain & Billing System, Business Inteligence. This is world bank project for ICT Modernization & ERP Program and it will help to enter into a new era of digital transformation while implementing SAP S4/HANA as ERP system. As a result, NTDC enhancing strategic and organizational capabilities by implementing a state-of-the-art suite of software along with ICT enhancement; which ensures transparency, efficiency and effectiveness of day-to-day business operations & activities. The high level overview of ERP system is given below:

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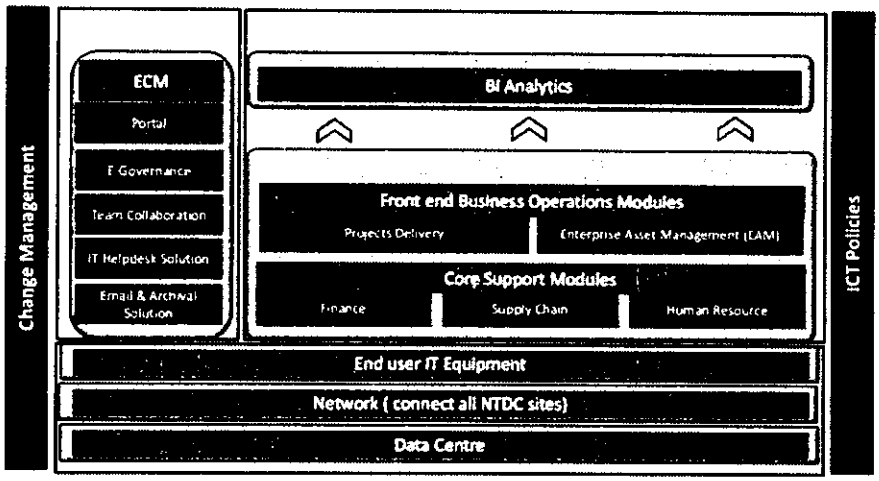
High Level Overview

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED



Benefits of ICT Modernization and ERP Program are as follows:

Overcoming key barriers to NTDC's successful digital transformation
Informed decision making through real time and accurate data
Boosting productivity and improving policy coherence
Improving employees' skills to thrive in the digital age
Standardization based on best international business practices
Being better prepared to archive NTDC's Mission to provide Pakistan with reliable, efficient, and stable transmission network and dispatch services

11. **Conversion from 220kV Substations at Bund Road, Kala Shah Kaku, Ravi and Nishatabad to GIS Technology:** Project scope is the conversion of four 220/132 kV Air Insulated Substations to Gas Insulated Substation (GIS). The objective of the proposed project is conversion of four 220/132 kV Air Insulated Substations to Gas Insulated Substation (GIS) which become deteriorated due to aging factor as well as due to extraordinary pollution from nearby running drain and Chemical Industries causing erosion of all metal parts and differential settlement of the equipment foundations.

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Annexure D

Approved Investment for PSDP Funded Ongoing Projects

Sr.	Name of Project	Approval Status	PC-I Estimates			Escalated PC-I after FEC revision at contract award	Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run	Completion Date as per Investment Plan
			Local	Foreign	Total		FY 2022-23 Actual	FY 2023-24	FY 2024-25	Total			
1	500kV HVDC Transmission System between Tajikistan and Pakistan for Central Asia-South Asia Transmission Interconnection (CASA-1000)	ECNEC 29.08.2019	16,053	30,751	46,804	-	21,455.92	8,992.60	7,000	37,449	52,965	Variation Within 15% limit	HVDC April 2024 HVAC August 2024
2	Evacuation of power from 2160MW DASU HPP Stage-I	ECNEC 01.10.2020	20,021	112,229	132,250	-	26,302.31	17,694.20	52,144	96,141	98,550	NIL	T/L June 2026 G/S August 025
3	500-KV Lahore, North.	ECNEC 24.11.2017	9,224	11,508	20,732	31,648	19,876.80	5,014.90	2,150	27,042	28,523	NIL, after FEC revision	March 2024
4	Evacuation of Power from Suki Kinari, Kohala, Mahal HPPs (Revised Name "Evacuation of Power from Suki Kinari")	ECNEC 14.11.2018	35,815	44,115	79,930	-	11,732.25	26,000.00	441	38,173	42,016	NIL	April 2024
5	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations	ECNEC 12.04.2017	4,539	11,987	16,526	22,823	7,918.76	12,200.00	1,800	21,919	25,022	Variation Within 15% limit, after FEC revision.	Multan & Vehari: 01-01-2023 Shikarpur: 04-02-2023 (completed) Quetta Industrial: 18-03-2024

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													Rohri, Daharki &Bahawalpur: 31-03-2024 Sibbi & Loralai: 29-03-2024 T.M.Khan, Hala Road & Jamshoro: 13-07-2024 Ludewala: 28-02-2024 Isd. University: 09-02-2024 NKLP: 28-02-2024 Sammundri Rd. & Ghakkar: 30-11-2023 WAPDA Town & Sheikhupura: 30-11-2023 Nokhar: 14-11-2024 Sheikh Muhammadi: Yet to be awarded Daud Khel & Bannu: November - 2023
6	500KV Islamabad West	ECNEC 20.07.2016	3,621	4,667	8,288	16,013	0	8,188	8,100	16,288	16,288	Variation Within 15%	June 2026

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												limit, after FEC revision.	
7	220-KV Dera Ismail Khan - Zhob Transmission Line alongwith 220-KV Zhob Sub-Station.	ECNEC 07.11.2016	3,785	3,094	6,879	7,851	0	0	0	0	12,641	Yes, PC-I to be revised	G/S December 2023 T/L April 2023
8	220-KV Jauharabad G/S alongwith allied T/Ls.	CDWP 02.05.2018	1,203	1,758	2,961	-	561.24	6.40	2,500	3,068	3,203	Variation Within 15% limit	March 2024
9	220kV Mirpur Khas G/S alongwith allied T/Ls	ECNEC 07.11.2016	2,002	1,855	3,857	-	259.6	1,952.20	1,300	3,512	3,857	NIL	G/S December 2023 T/Line 24 month from award
10	Now 220KV Transmission System Network Reinforcement in Islamabad & Burhan	ECNEC 09.01.2016	1,817	1,802	3,619	-	37.1	54.80	-	92	650	NIL	June 2025
11	Conversion from 220kV Substations at Bund Road, Kala Shah Kaku, Ravi and Nishatabad to GIS Technology	ECNEC 07.03.2017	2,525	3,159	5,684	-	-	0.00	-	-	70	NIL	January 2024
12	Enterprise Resource planning (ERP)	CDWP 19.03.2018	1,192.50	1,390.60	2,583.10	-	330.23	1,471.90	500	2,302	2,560	NIL	March 2024
13	Evacuation of Power from Tarbela 5th Extension.	ECNEC 24.11.2017	2,049	2,091	4,140	-	656.7	1,103.00	500	2,260	2,306	NIL	November 2024
14	Evacuation of power from wind power projects at Jhimpir and	ECNEC 06.01.2020	6,543	6,863	13,406	-	201.62	1,149.10	100	1,351	13,437	NIL	220 kV Gharo GIS June 2026

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	at Jhimpir and Gharo Wind Clusters (Revised)												
15	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station	CDWP 25.05.2018	113	827	940	-	295.63	365.00	280	941	941	NIL	February 2024
16	Evacuation of Power from 1224MW Wind Power Plants at Jhampir Clusters	ECNEC 24.11.2017	6,047	4,706	10,753	-	7,076.70	950.00	-	8,027	12,064	Variation Within 15% limit	Completed
17	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC	ECNEC 07.03.2018	3,172	8,466	11,638	14,383	5,108.30	6,346.00	150	11,604	13,554	NIL, after FEC revision	June 2024
Total PSDP Ongoing			119,722	251,269	370,990	-	101,813	91,388	76,965	270,167	328,547	-	-

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Approved Scope of Work

Sr.	Name of Project	Approval Status
1	500kV HVDC Transmission System between Tajikistan and Pakistan for Central Asia-South Asia Transmission Interconnection (CASA-1000)	**TW-01:** ±500kV Converter Station at Nowshera Electrode Station at Charsadda **TW-02:** 500kV HVDC Transmission Line from Torkham to Nowshera (113Km) Electrode line from Nowshera to Charsadda (24Km) **HVAC GS:** 500 kV HVAC Grid Station (Azakhel) Nowshera **HVAC TL:** 500 kV HVAC T/L Through In/Out of Tarbela Peshawar at 500kV Nowshera
2	Evacuation of power from 2160MW DASU HPP Stage-I	Evacuation of Power from 2160 MW Dasu HPP (Stage-I) through construction of: i). **LOT-I:** 765KV Double Circuit T/Line from Dasu to 765/220kV Mansehra Grid Station (157 km) ii). **LOT-II:** 765KV Double Circuit T/Line from 765/220KV Mansehra G/S to 765/500/220/132KV Islamabad West G/S (97.6 km) iii). **LOT-III:** 765/220 kV Mansehra Grid Station
3	500-KV Lahore, North.	**Grid Station:** 500/220/132 kV Lahore North G/S with **3X750 MVA**, 500kV and **3X250 MVA**, 220/132 kV T/Fs Extension at 500 kV Lahore Convertor station & 500 kV Nokhar for construction of 02 No. 500 kV Line Bays at each substation **500kV T/L:** T/L from HVDC Converter Station at Balloki to Nokhar via Lahore North (113 km). **220kV T/L** 220 kV D/C T/Line for IN/OUT of KSK-Ghazi Road S/C T/Line (15 km) – (Package-I) 220 kV D/C T/Line for IN/OUT of KSK-Ravi S/C T/Line (15 km) – (Package-II) 220 kV D/C T/Line for IN/OUT of Lahore-Ravi S/C T/Line (9 km) – (Package-III)
4	Evacuation of Power from Suki Kinari, Kohala, Mahal HPPs (Revised Name "Evacuation of Power from Suki Kinari")	500 kV Double-Circuit Quad-Bundle Transmission Line from 870MW Suki Kinari HPP to Neelum Jhelum Interconnection Point using ACSR Bunting Conductor (Approx. 75 km) 500kV Maira Switching Station (8x500 kV Line Bays along with Shunt Reactor Banks) 500kV D/C T/Line from Sangal to Maira Switching Station (Approx. 83 km) 500kV D/C T/Line from Maira Switching Station to Islamabad West (131 km)

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		500kV D/C T/Line from Maira Switching Station to Karot (20 km)
5	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations	Augmentation at 500 kV Multan New G/S (03x160 MVA to 03x250 MVA autotransformers) 220 kV Vehari G/S (02x160 MVA to 02x250 MVA autotransformers) Augmentation at 220 kV Shikarpur G/S (02x160 MVA to 02x250 MVA autotransformers) Augmentation at 220 kV Quetta Industrial G/S (2x160 MVA to 2x250 MVA auto-transformers Extension at 220 kV Rohri G/S (1x250 MVA) Augmentation at 220 kV Daharki G/S (1x160 MVA to 1x250 MVA) Augmentation at 220 kV Bahawalpur G/S (1x160 MVA to 1x250 MVA) Extension works at 220 kV Sibbi G/S (1x160 MVA) Extension works at 220 kV Loralai G/S (1x250 MVA) Augmentation works at 220 kV T.M Khan Road G/S (2x160 MVA to 2x250 MVA) Augmentation works at 220 kV Hala Road G/S (2x160 MVA to 2x250 MVA) Extension works at 500 kV Jamshoro G/S (1x160 MVA) Augmentation of 1x160 MVA with 1x250 MVA T/F at 220 kV Ludewala G/S Extension of 1x250 MVA T/F at 220 kV Bara Kahu / University G/S Extension of 1x250 MVA T/F at 220 kV New Kot Lakhpat G/S Augmentation of 2x160 MVA with 2x250 MVA T/Fs At 220 kV Summandri Road G/S Augmentation of 2x160 MVA with 2x250 MVA T/Fs At 220 kV Ghakkar G/S Augmentation of 4x160 MVA with 4x250 MVA T/Fs at 500 kV Sheikhupura G/S Augmentation of 3x160 MVA with 2x250 MVA T/Fs at 220 kV WAPDA Town G/S Augmentation works at 500 kV Nokhar G/S (220/132 kV, 3x160 MVA to 3x250 MVA) Extension works at 500 kV Nokhar G/S (500/220 kV, 1x600 MVA) Extension works at 500 kV Sheikh Muhammadi G/S (500/220 kV, 1x450 MVA) Addition of 1 x 160 MVA transformer at 220 kV Daudkhel G/S Augmentation of 2 x 160 MVA with 2x250 MVA T/Fs at 220 kV Bannu G/S
6	500KV Islamabad West	Construction of 765/500/220/132KV Grid Station Islamabad West
7	220-KV Dera Ismail Khan - Zhob Transmission Line alongwith 220-KV Zhob Sub-Station.	220kV substation at Zhob consisting of two 220 kV transformer bays for 220/132kV, 2x160 MVA transformers, two 220 kV line bays and six 132 kV line bays along with allied equipment and accessories.

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		220 kV single conductor double circuit transmission on Rail conductor from Dera Ismail Khan to Zhob (220 km) Extension at 220 kV D.I Khan Grid Station (Two Line Bays)
8	**220-KV Jauharabad G/S alongwith allied T/Ls.**	3x160 MVA autotransformers along with allied equipment and accessories.
9	**220kV Mirpur Khas G/S alongwith allied T/Ls**	220kV substation at Mirpurkhas with two 220/132kV, 250MVA transformers. 220kV D/C transmission line for looping In/Out of proposed Hala Road - Jamshoro 220kV S/C transmission line as Mirpurkhas (Lot-I: 70km) 220kV D/C transmission line for looping In/Out of one circuit of the existing Jamshoro – T.M.Khan Road 220kV D/C T/L at Hala Road (Lot-II: 10 km) Extension at 220kV Hala Road Grid Station (Two Line Bays)
10	**Now 220KV Transmission System Network Reinforcement in Islamabad & Burhan**	Re-conductoring work for Tarbela - Burhan Circuit-I&II (Phase-I). Replacement of existing 220 kV Tarbela - burhan D/C Transmission line Circuit III & IV on LL-ACSR conductor (35 km) (Phase-II)
11	**Conversion from 220kV Substations at Bund Road, Kala Shah Kaku, Ravi and Nishatabad to GIS Technology**	**Conversion from AIS to GIS**
12	**Enterprise Resource planning (ERP)**	Owner Agent-Project Management & Quality Assurance (PMQA) to provide facilitation to NTDC in all aspects of procurement, project management, quality assurance of outputs, record keeping, issue management and risk management Tier-3 Data Center involving Primary & Secondary Data centers, Structured Cabling Outlets and Conditioned Power Supply Outlets Networking of all +130 sites ICT-Office automation (OA) End User Equipment Laptops Desktops Printers / Scanners etc. ICT-ENTERPRISE RESOURCE PLANNING (ERP) Implementation

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		Human Resource and Administration Financial Management Procurement/Inventory Management/Warehouse Management Enterprise Asset Management Extension of existing help desk services Sales & Services Supply Chain Projects Management Business Intelligence
13	Evacuation of Power from Tarbela 5th Extension.	500kV D/C Transmission Line for Evacuation of Power from Tarbela 5th Extension Switchyard to Islamabad West Substation (50km Approx.). 500kV S/C Interconnector from Tarbela-T5 Switchyard to Tarbela 1-4 Switchyards(Approx. 2km)
14	Evacuation of power from wind power projects at Jhimpir and Gharo Wind Clusters (Revised)	**220kV Jhimpir Substation:** Four 220/132 kV, 250MVA transformers with transformer bays at both ends. Four 220 kV line bays for 220 kV D/C T/L toward 220 kV Gharo and T.M.Khan Road substations. Fourteen 132 kV line bays for interconnection of WPPs. **220kV GIS Gharo Substation:** Two 220/132 kV, 250MVA transformers with transformer bays at both ends. Two 220 kV line bays for double circuit T/L towards 220 kV Jhimpir. Four 132 kV line bays for interconnection of WPPs at Gharo cluster.
15	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station	Installation of Battery Energy Storage System at Jhampir-I Capacity Buildings in various stakeholders
16	Evacuation of Power from 1224MW Wind Power Plants at Jhampir Clusters	Grid Station 220/132kV Jhimpir-II Substation with 4x250MVA 220/132kV transformers alongwith associated equipment including 6x220kV Line Bays and 4x132kV Line Bays. 132kV Transmission Lines Lot-I: 132 kV D/C T/L for connection of five (05) Wind Power Plants with 220 kV Jhimpir-II Grid Station (34 km)

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		Lot-II: 132 kV D/C T/L for connection of the Six (06) Wind Power Plants with 220 kV Jhimpir-II Grid Station (47 km) 220kV Transmission Lines **Line-I:** 220 kV D/C T/B T/Line for looping In/Out both Circuits of existing 220 kV Jamshoro-KDA 33 D/C T/Line at 220 kV Jhampir-II Grid Station (220kV Jamshoro-Jhampir-II T/L - 19km) **Line-II:** 220 kV D/C T/B T/Line for looping In/Out both Circuits of existing 220 kV Jamshoro-KDA 33 D/C T/Line at 220 kV Jhampir-II Grid Station (220 kV KDA 33-Jhampir-II T/L - 20km) **Line-III:** 220kV D/C T/B T/Line for looping In/Out of 220kV Gharo-Jhampir-I T/Line at 220kV Jhampir-II G/Station (2.2km)
17	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC	• Upgradation of existing SCADA System at NPCC. • Integration of 116 RTUs with new SCADA System at NPCC. • Field wiring works of existing 49 RTUs from LDS-II. • Microwave System (64 sites) as a backup. • OPGW Live Line Installation of 4085 kms. • SMS Meters (246 sites) data transportation over NTDC Telecom network. • Telecom network revamping.

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i. 220 kV Jamrud Substation along with allied T/Lines:

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement
	Without Up-gradation of Jamrud	With Up-gradation of Jamrud	
Jamrud	127.4	134.6	5.7%
Hayatabad	127.9	134.3	5.0%
Peshawar University	127.4	133.7	4.9%
Warsak Power	129.4	134.4	3.9%
Peshawar Cantt	127.8s	132.7	3.8%
Warsak	128.9	133.7	3.7%
Peshawar Ind.	128.7	133.3	3.6%
SakhiChashma	128.6	132.9	3.3%
Sheikh Muhammadi-1	130.8	134.8	3.1%
Sheikh Muhammadi-2	130.1	134.2	3.2%
Shahi Bagh	129.2	133.1	3.0%
Shahi Bagh New	129.8	133.5	2.9%

b. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without Up-gradation of Jamrud	With Up-gradation of Jamrud	
Peshawar	(2x250) BB-1	87%	65%	22%
	(2x250) BB-2	92%	69%	23%
Shahi Bagh	4x160	78%	64%	14%

c. Reduction in Loading of 132 kV Transmission lines

132 kV Transmission Line	%age Loading		%age Loading Relief
	Without Up-gradation of Jamrud	With Up-gradation of Jamrud	
Sh. Muhammadi-1 – Hayatabad	72%	27%	45%
Sh. Muhammadi-2 – Hayatabad	52%	12%	40%
Sh. Muhammadi-2 – Bara	90%	55%	35%
Hayatabad – Jamrud D/C	35%	10%	25%
Pabbi – TaruJaba S/C	105%	81%	24%
Pibbi – Nowshera New	87%	72%	15%

d. Reduction in Transmission System Losses = 14.8 MW

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ii. 500 kV Chakwal Substation along with allied T/Lines

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement with Chakwal New
	Without Chakwal New	With Chakwal New	
Chakwal	124.0	137.0	10.5%
C.S.Shah	121.7	137.4	12.9%
Dandot	121.3	137.6	13.4%
Pinanwal	117.8	134.8	14.4%
Gharibwal Cement Factory	116	133.3	14.9%
D.G.Khan Cement Factory	123.4	137	11.0%
Pakistan Cement Factory	122.9	136.6	11.1%
Talagang	123.8	131.7	6.4%
Tam-man	124.6	130.1	4.4%
Padshahan	126.2	135.5	7.4%
Chakri	126.1	134.1	6.3%

b. Reduction in Loading of 500/220 kV and 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief With Chakwal New
		Without Chakwal New	With Chakwal New	
Rewat 500/220 kV	2 x 450 (BB-1)	96%	86%	10%
	1 x 750 (BB-2)	99%	91%	8%
Rewat 220/132 kV	2 x 250 (BB-1)	100%	80%	20%
	2 x 250 (BB-2)	84%	76%	8%
Mangla 220/132 kV	3 x 138	90%	77%	13%

c. Reduction in Transmission System Losses = 23 MW

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iii. Extension and Augmentation of existing 500 kV and 220 kV Grid Stations (New) (Punjab)

a. Net increase in Capacity (MVA) / Power Flow (MW)

Sr. No.	Name of Grid Station	MVA Capacity			Power Flow (MW)			Loss Reduction (MW)
		Existing Capacity	Enhanced Capacity	Net Increase	Without Ext/Aug	With Ext/Aug	Net Increase	
1	500 kV Faisalabad West	2x750	3x750	750	1068	1235.1	167.1	4.9
2	500 kV Lahore (Sheikhupura)	4x600	5x600	600	2096	2288	192	2.7
3	500 kV Multan	2x450	3x450	450	863.8	1053	189.2	11.4
4	500 kV Rahim Yar Khan	2x250	3x250	250	389.6	427.8	38.2	2

b. Loading Positions of Transformers during Normal and Contingency Conditions

Sr. No.	Name of Grid Station	%age Loading of Transformers without Addition/Augmentation		%age Loading of Transformers with Addition/Augmentation	
		Normal	Contingency	Normal	Contingency
1	500 kV Faisalabad West Substation	83%	121%	63%	83%
2	500 kV Lahore (Sheikhupura)	99%	116%	86%	99%
3	500 kV Multan Substation	109%	-	88%	109%
4	500 kV Rahim Yar Khan Substation	87%	146%	63%	87%

iii. Extension and Augmentation of existing 500 kV and 220 kV Grid Stations (New) (Sindh)

a. Net increase in Capacity (MVA) / Power Flow (MW)

Sr. No.	Name of Grid Station	MVA Capacity			Power Flow (MW)			Loss Reduction (MW)
		Existing Capacity	Enhanced Capacity	Net Increase	Without Ext/Aug	With Ext/Aug	Net Increase	
1	500 kV Guddu	2x160	2x250	180	271.4	337	65.6	-
2	500 kV Dadu	2x450	3x450	450	573.6	608.4	34.8	1.2

b. Loading Positions of Transformers during Normal and Contingency Conditions

Sr. No.	Name of Grid Station	%age Loading of Transformers without Addition/Augmentation		%age Loading of Transformers with Addition/Augmentation	
		Normal	Contingency	Normal	Contingency
1	500 kV Guddu	85%	114%	67%	97%
2	500 kV Dadu	64%	112%	45%	64%

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iv. 220 kV Arifwala Substation

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (KV)		%Age Voltage Improvement
	Without 220/132 kV Arifwala New	With 220/132 kV Arifwala New	
Arifwala	126.1	133.5	5.90%
Arifwala-2	126.1	133.5	5.90%
Kamirwala	128.3	134	4.40%
Hota	125.8	132.8	5.60%
Qabula	125.1	131.9	5.40%
Gagoo	125.7	131.6	4.70%
Pak Pattan	126.8	132.1	4.20%

b. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%Age Loading		%Age Loading Relief
		Without 220/132 kV Arifwala New	With 220/132 kV Arifwala New	
Yousafwala 220/132 kV	4x160	101%	86%	15%
Vehari 220/132 kV	3x160	92%	81%	11%
Kassowal 220/132 kV	2x160	71%	58%	13%

c. Reduction in Loading of 132 kV Transmission lines

132 kV Transmission Line	%Age Loading		%Age Loading Relief
	Without 220/132 kV Arifwala New	With 220/132 kV Arifwala New	
Arifwala – Yousafwala	82%	24%	58%
Kamirwala – Yousafwala	72%	23%	49%
Arifwala – Kamirwala	62%	13%	49%

d. Reduction in Transmission System Losses = 18 MW

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v. 500 kV Sialkot Substation

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement
	Without Sialkot New	With Sialkot New	
Sialkot City	116.8	132.3	13.3%
Sialkot New	117.1	132.4	13.1%
Sialkot Cantt	117.8	133.4	13.2%
S.P. Road	117.9	134.0	13.6%
Pasrur	119.9	133.9	11.7%
Sahuwala	121.9	134.6	10.4%
Daska Industrial	121.3	132.2	9.0%
Daska New	122.1	134.1	9.8%
Nandipur	123.6	134.8	9.1%
G.P.Road	125.0	135.0	8.0%
Aroop	125.0	135.0	8.0%
Garden Town	125.4	135.1	7.7%
Dewan Road	126.4	134.7	6.6%
Gujranwala-2	127.4	135.4	6.3%
Gakkhar	127.6	135.9	6.5%
Khiali	127.5	134.9	5.8%
Q.D.Singh	127.7	135.2	5.9%
Wazirabad	127.1	135.1	6.3%
Gujrat New	130.4	135.8	4.1%
Nokhar	132.9	138.2	4.0%

b. Reduction in Loading of 500/220 kV and 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	% age Loading		%age Loading Relief
		Without Sialkot New	With Sialkot New	
Nokhar 500/220 kV	4x600	85%	66%	19%
Lahore North 500/220 kV	4x750	76%	66%	10%
Gujranwala-2 220/132 kV	2x250	102%	77%	25%
Nokhar 220/132 kV	4x250	94%	77%	17%
Ghakkar 220/132 kV	4x160	96%	79%	17%
Gujrat 220/132 kV	3x160	69%	59%	10%

c. Reduction in loading of 220 kV and 132 kV Transmission lines

Transmission Lines	%age Loading		%age Loading Relief
	Without Sialkot New	With Sialkot New	
Ghakkar – Nokhar 220 kV S/C	78%	52%	26%
Gakkhar – Sialkot 220 kV S/C	61%	16%	45%
Nokhar – Q.D.Singh 132 kV S/C	93%	63%	30%
Nokhar – Khiali 132 kV S/C	65%	49%	16%
New Gujrat – Wazirabad 132 kV S/C	96%	60%	36%
Kotli Loharan – Sialkot Cantt D/C	59%	9%	50%
Sahuwala – Sialkot New	88%	50%	38%
Gakkhar – Daska Industrial	88%	55%	33%

d. Reduction in Transmission System Losses = 54 MW

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vi. **500 kV Vehari Sub Station**

a. Improvement in Voltage Profile

Name of Substation	Voltage Profile (KV)		%age Voltage Improvement
	Without Proposed Upgradation of Vehari	With Proposed Upgradation of Vehari	
220 kV Vehari	210.7	222.9	5.8
220 kV Chishtian	204.9	215.9	5.4
220 kV Lal Suhanra	209.9	218.5	4.1
220 kV Kassowal	212.5	220.9	3.9
220 kV Bahawalpur	212.4	219.1	3.1
132 kV Fort Abbas	120.9	129.8	7.4
132 kV Ludden	125.6	134.7	7.2
132 kV Faqir wali	121.8	130.5	7.1
132 kV Hasil pur	123.5	131.5	6.5
132 kV Chishtian	126.3	134.2	6.2
132 kV Karorpacca	122.5	129.9	6.0
132 kV Vehari Old	128.8	136.5	6.0
132 kV Vehari New	129.4	137.0	5.9
132 kV Garhmore	126.6	133.3	5.3
132 kV Burewala	126.9	132.5	4.4
132 kV Jehanian	126.8	132.4	4.4
132 kV Mukhdoom Rashid	129.6	133.6	3.1

b. Reduction in Loading of Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without Proposed Upgradation of Vehari	With Proposed Upgradation of Vehari	
500 kV Multan	3x450	96%	72%	24%
500 kV Yousafwala	3x600	83%	72%	11%
220 kV Yousafwala	4x160	78%	68%	10%

c. Reduction in Transmission System Losses in NTDC = 14.7 MW and Reduction in Transmission System Losses in DISCOs = 30.6 MW

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vii. 220 kV Larkana Substation

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement
	Without 220 kV Larkana and Moro	With 220 kV Larkana and Moro	
Mehar	120.3	133.2	10.7%
Larkana-3	119.7	132.5	10.7%
Larkana-1	121.2	132.7	9.5%
Larkana-2	122.1	133.1	9.0%
Rato Dero	125.7	133.1	5.9%

b. Reduction in Loading of 132 kV Transmission lines

Transmission Line	%age Loading		%age Loading Relief
	Without 220 kV New Larkana	With 220 kV New Larkana	
Dadu-N – Mehar 132 kV S/C	90%	55%	35%
Naseerabad – Mehar 132 kV S/C	56%	36%	20%
Shikarpur N – Rato Dero 132 kV S/C	68%	27%	41%
Shikarpur N – Larkana-2 132 kV S/C	71%	20%	51%

c. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without 220 kV New Larkana	With 220 kV New Larkana	
Shikarpur 500/220 kV	2x600	59%	61%	2%
Shikarpur 220/132 kV	3x250	78%	60%	18%
Dadu 500/220 kV	2x450	86%	81%	5%
Dadu 220/132 kV	4x160	107%	95%	12%
Rohri 220/132 kV	3x250	79%	68%	11%

d. Reduction in Transmission System Losses = 16.2 MW

viii. 220 kV Mastung Substation along with allied T/Lines

a) Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (KV)		%age Voltage Improvement
	Without addition of Mastung	With addition of Mastung	
Kirdgheb	117.5	134.5	14.5%
Panjpai	118.2	134.4	13.7%
Noshki	117.7	133.7	13.6%
Dlbindin	119.6	135.0	12.9%
Chagai	119.7	135.2	12.9%
Mastung	120.3	135.4	12.6%
Mall	119.3	134.0	12.3%
Khad Kocha	120.2	134.0	11.5%
Kanak	120.4	134.1	11.4%
Mangochar	120.9	134.2	11.0%
Kalat	122.6	134.5	9.70%

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b) Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading Without Up-gradation	%age Loading With Up-gradation	%age Loading
Quetta Industrial 220/132 kV	3x250	62%	41%	21%
Sibbi 220/132 kV	3x160	44%	32%	12%
220 kV Khuzdar	3x160	51%	39%	12%

c) Reduction in Loading of 220 &132 kV Transmission lines

Transmission Line	%age Loading Without addition of Mastung	%age Loading With addition of Mastung	%age Loading Relief
Quetta – Sibbi 220 kV D/C	78%	52%	26%
Panjpai – Kirdgheb 132 kV S/C	32%	9%	23%
Mastung – Panjpai 132 kV S/C	39%	18%	21%

d) Reduction in Transmission System Losses = 35 MW

ix. 220 kV Gujranwala-II Substation

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (KV) Without 220/132 kV Gujranwala	With 220/132 kV Gujranwala	%age Voltage Improvement
Shera Wala Bagh	127.6	131.9	3.4%
Thari Sansi	128.2	131.9	2.9%
Gujranwala Pasrur Road	127.2	131.0	3.0%
City Housing Society	128.7	131.9	2.5%
Khiali	129.2	132.6	2.6%
Gujranwala Lahore Road	127.9	131.9	3.1%

b. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	% age Loading Without 220/132 kV Gujranwala	% age Loading With 220/132 kV Gujranwala	%age Loading Relief
Nokhar 220/132 kV	4x250	92%	82%	10%
Gakkhar 220/132 kV	4x160	81%	70%	11%
Gujrat 220/132 kV	3x250	64%	59%	5%

c. Reduction in Loading of 132 kV Transmission lines

132 kV Transmission Line	%age Loading Without 220/132 kV Gujranwala	%age Loading With 220/132 kV Gujranwala	%age Loading Relief
Gakkhar – Q.D.Singh	90%	82%	8%
Gakkhar – Khiali	72%	53%	19%
Gakkhar – Gujranwala College Road	63%	53%	10%
Thari Sansi – Gujranwala Lahore Road	78%	27%	51%
Thari Sansi – Gujranwala College Road	53%	13%	40%
Khiali – Thari Sansi	59%	38%	21%
Thari Sansi – Shera Wala Bagh	41%	2%	39%

d. Reduction in Transmission System Losses = 14 MW

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x. **220 kV Kohat Substation along with allied T/Lines**

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (KV)		%age Voltage Improvement
	Without Kohat New	With Kohat New	
Hangu	123.8	131.5	6.2%
Kohat Town Ship	125.0	132.8	6.2%
Kohat - SP	125.1	132.6	5.9%
Doaba	124.8	131.9	5.6%
Tall	126.7	133.0	4.9%
Matani	127.7	133.4	4.4%
Gurguri	129.3	134.3	3.8%
Sheikh Muhammadi- II	131.7	136	3.3%
Sheikh Muhammadi- I	131.4	133.9	1.9%
Kohat	131.7	134.2	1.9%
Lachi	130.7	132.4	1.3%

b. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without Kohat New	With Kohat New	
Peshawar 220/132 kV	(2x250) BB-2	75%	58%	18%
	(2x250) BB-1	63%	60%	3%

c. Reduction in Loading of 132 kV Transmission lines

132 kV Transmission Line	%age Loading		%age Loading Relief
	Without Kohat New	With Kohat New	
Sh. Muhammadi-II – K.T.Ship	70%	33%	37%
Sh. Muhammadi-II – Matani	98%	62%	36%
Sh. Muhammadi-II – Kohat	56%	23%	33%
Sh. Muhammadi-II – Kohat-SP	62%	32%	30%
Daudkhel – Kohat D/C	42%	16%	26%

d. Reduction in Transmission System Losses = 21 MW

xi. **220/132 kV Nagshah Grid Station**

a. Reduction in Loading of Transformers

Name of Grid Station	Transformer Capacity (MVA)	Transformer Loading		%age Loading Relief
		Without 220 kV Nagshah Grid Station	With 220 kV Nagshah Grid Station	
220 kV Muzaffargarh New	3x160	82%	59%	23
220 kV Multan	3x250	84%	70%	14
220 kV NGPS	3x160	76%	65%	11

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b. Reduction in Loading of 132 kV Transmission Lines

132 kV Transmission Line	Transmission Line Loading		%age Loading Relief
	Without 220 kV Nagshah Grid Station	With 220 kV Nagshah Grid Station	
Punjab Housing – Multan Bosan Road S/C	81%	45%	36
Punjab Housing – Wapda Town S/C	67%	47%	20

c. Reduction in Transmission System Losses = 7.8 MW

xii. 220 kV Punjab University Grid Station

a. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without P.U Grid	With P.U Grid	
New Kot Lakhpat 220/132 kV	2 x 250 (BB-1)	99%	73%	26%
	2 x 250 (BB-2)	95%	80%	15%
Bund Road 220/132 kV	2 x 250 (BB-1)	87%	74%	13%
	2 x 250 (BB-2)	88%	73%	15%

b. Reduction in Loading of 132 kV Transmission lines

Transmission Line	%age Loading		%age Loading Relief
	Without P. U Grid	With P. U Grid	
New Kot Lakhpat – Old Kot Lakhpat 132kV S/C	63%	32%	31.0%
Bund Rd – Saidpur 132 kV D/C	84%	60%	24.0%
New Kot Lakhpat – Township 132kV S/C	43%	26%	17.0%
Saidpur – A.I.Town 132 kV S/C	79%	69%	10.0%

c. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement
	Without P. U Grid	With P. U Grid	
Punjab University	130.9	133.3	1.8%
Model Town	131.2	133.3	1.6%
Rehman Park	131.1	133.0	1.4%
Johar Town	131.1	132.7	1.2%
Old Kot Lakhpat	131.5	132.9	1.1%
Shadman	131.0	132.3	1.0%

xiii. 220 KV Head Faqirian Substation along with allied T/Lines

a. Improvement in Voltage Profile

Name of 132 kV Substation	Voltage (kV)		%age Voltage Improvement
	Without 220 kV Head Faqirian	With 220 kV Head Faqirian	
Head Faqirian	129.7	132.4	2.1%
Bhera Industrial	130	132.6	2.0%
Phalia	127.7	130.6	2.3%
M.B.Din	127.7	130.7	2.3%
Helan	126.9	130.0	2.4%
Dinga	128	130.8	2.2%
K.Sheikhan	127.3	131.8	3.5%
Bhalwal	127.6	132.3	3.7%
Bhabra	126.6	131.5	3.9%
S.P.Non	129.6	133.1	2.7%

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b. Reduction in Loading of 132 kV Transmission lines

Transmission Line	%age Loading		%age Loading Relief
	Without 220 kV Head Faqirian	With 220 kV Head Faqirian	
M B Din – Helan 132 kV S/C	43%	24%	19%
Helan – Dinga 132 kV S/C	65%	46%	19%
Dinga – Mangla 132 kV S/C	80%	60%	20%
Mangla – K Sheikhan 132 kV S/C	59%	51%	8%
Bhera – Ludewala 132 S/C	51%	17%	34%
Ludewala – S. P Noon S/C	61%	33%	28%
S P Noon – Bhalwal S/C	51%	23%	28%

c. Reduction in Loading of 220/132 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without Head Faqirian	With Head Faqirian	
Ludewala 220kV	3 x 250	57%	45%	12%

d. Reduction in Transmission System Losses = 10 MW

xiv. **220 kV Kamra Grid Station**

a. Reduction in Loading of 132 kV Transmission lines

132 kV Transmission Line	%age Loading		%age Loading Relief
	Without 220/132 kV Kamra	With 220/132 kV Kamra	
Faqirabad – Gondal 132 kV S/C	58	05	53
Burhan – Faqirabad 132 kV S/C	86	11	75
Faqirabad – Old Kamra 132 kV S/C	69	12	57
Burhan – Kamra JF-17 132 kV S/C	74	66	08
Kamra JF-17 – AWT 132 kV S/C	60	53	07
AWT – Nizampur 132 kV S/C	45	14	31
Jehangira – Nizampur 132 kV S/C	36	19	17

b. Reduction in Loading of 220/1320 kV Transformers

Name of Substation	Transformation Capacity (MVA)	%age Loading		%age Loading Relief
		Without 220/132 kV Kamra	With 220/132 kV Kamra	
Burhan 220/132 kV	2 x 250 (BB-1)	67	65	02
	2 x 250 (BB-2)	76	61	15
Islamabad West 220/132 kV	3 x 250	75	71	04

c. Reduction in Transmission System Losses = 6.3 MW

xv. **220/132 kV Zero Point Grid Station**

a. Reduction in Loading of Transformers

Name of Grid Station	Transformer Capacity (MVA)	Transformer Loading %		%age Loading Relief
		Without 220 kV Zero Point Grid Station	With 220 kV Zero Point Grid Station	
220 kV Islamabad University	3x250	90%	71%	19
220 kV ISPR	5x160	66%	54%	12
220 kV Rewat	4x250	104%	95%	9

b. Reduction in Loading of 132 kV Transmission Lines

132 kV Transmission Line	Transmission Line Loading		%age Loading Relief
	Without 220 kV Zero Point Grid Station	With 220 kV Zero Point Grid Station	
IBD I-10 – Zero Point	46%	9%	37
ISPR – Pirwadhai S/C	67%	42%	25
ISPR – RWP KTM S/C	75%	54%	21

c. Reduction in Transmission System Losses = 17.9 MW

xvi. Augmentation of 4x160 MVA, 220/132 kV Transformers with 4x250 MVA at Yousafwala

a. Reduction in Loading of Transformers

Name of Grid Station	Transformer Loading Without Augmentation		Transformer Loading With Augmentation	
	Normal	Contingency	Normal	Contingency
220 kV Yousafwala	95%	109%	74%	88%

b. Reduction in Transmission System Losses = 1.6 MW

viii. Extension of 3rd 250 MVA, 220/132 kV Transformer at Guddu

a. Reduction in Loading of Transformers

Name of Grid Station	Transformer Loading Without Extension	Transformer Loading With Extension
220 kV Guddu	91%	57%

ix. Extension of 3rd 160 MVA, 220/132 kV Transformer at Allai Khwar

a. Reduction in Loading of Transformers

Name of Grid Station	Transformer Loading Without Extension		Transformer Loading With Extension	
	Normal	Contingency	Normal	Contingency
220 kV Allai Khwar	63%	125%	42%	63%

b. The said extension is required for reliable dispersal of power from hydel generation connected with 132 kV Allai Khwar grid station.

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Annexure F

Approved Investment for PSDP Funded New Works

Sr.	Name of Project	Approval Status	PC-I Estimates			Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run	Completion Date as per Investment Plan
			Local	Foreign	Total	FY 2022-23 Actual	FY 2023-24	FY 2024-25	Total			
1	220kV Arifwala Substation	CDWP 04.06.2022	4,209.00	4,534.00	8,743.00	-	173	8,000	8,173	8,173	NIL	2026
2	220kV Dharki - Rahim Yar Khan - Bhawalpur D/C T/L	ECNEC 02.10.2019	5,995.00	9,800.00	15,795.00	55	-	415	470	470	NIL	June 2025
3	220KV Head Faqiran G/S alongwith allied T/Ls.	ECNEC 15.07.2019	2,821.00	2,991.00	5,812.00	11	2	4,900	4,913	5,187	NIL	June 2025
4	220-KV Jamrud G/S alongwith allied T/Ls.	CDWP 19.10.2017	1,029.00	1,369.00	2,398.00	30	8	1,150	1,188	1,191	NIL	June 2025
5	220kV Larkana Substation	CDWP 17.10.2019	2,443.00	4,006.00	6,449.00	11	-	1,200	1,211	1,211	NIL	June 2025
6	220-KV Mastung G/S slongwtih allied T/Ls.	ECNEC 22.05.2018	1,997.00	2,903.00	4,900.00	73	-	4,400	4,473	4,505	NIL	June 2025
7	500/220kV Sialkot Substation	ECNEC 07-10-2022	14,618.40	17,202.00	31,820.40	-	-	8,500	8,500	8,500	NIL	2026
8	500kV Chakwal G/S alongwith allied T/Ls	CDWP 18.11.2019	3,323.90	5,602.50	8,926.40	416	221	2,400	3,038	3,383	NIL	June 2025
9	Upgradation of Existing 220kV Vehari Sub-	ECNEC 07-10-2022	7,590.90	9,515.60	17,106.50	-	8	2,400	2,408	2,408	NIL	2026

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	Station to 500 kV Vehari Sub- Station											
10	220kV Punjab University Grid Station	CDWP 19-09-2017	1,555.20	1,392.90	2,948.10	-	-	400	400	400	NIL	Non-availability of Land
11	Exentension and Augmentation of existing 500kV and 220kV Grid Stations (New) Now: Additon & Augmentation of 500kV and 220kV Transformers at the Existing Grid Station for Removal of NTDC System Constraints	ECNEC 07-10-2022	6,185.80	8,926.30	15,112.10	51	-	4,000	4,051	4,051	NIL	2025
Sub Total Projects with approved PC-I			**51,768**	**68,242**	**120,011**	**648**	**413**	**37,765**	**38,825**	**39,479**	**-**	**-**
12	220kV Gujranwala-II Substation	PC-I Under preparation	2,838.90	6,624.10	9,463.00	-	-	-	-	117	NIL	June 2025
13	220-KV Kamra G/S alongwith allied T/Ls.	Submitted to PC on 22.11.2019	1,182.00	2,050.00	3,232.00	-	-	-	-	151	NIL	June 2027
14	220-KV Kohat G/S alongwith allied T/Ls.	PC-I Under preparation	5,280.00	7,920.00	13,200.00	-	-	-	-	-	NIL	June 2025
15	220kV Nag Shah Grid Station	PC-I under preparation	4,120.60	5,955.40	10,076.00	-	-	-	-	-	NIL	June 2026
16	500kV Ghazi Brotha-Faisalabad West T/L (Revised Nmae In/Out of Islamabad West to Ghazi	PC-I under preparation	33,660.00	32,340.00	66,000.00	-	-	-	-	-	NIL	Not provided

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	Brotha T/L at - Faisalabad West)											
17	500kV Ludewala G/S along with 500kV Nowshera-Ludewala-Faisalabad West D/C T/L	PC-I under preparation	20,192.90	47,116.70	67,309.60	-	-	-	-	-	NIL	Not provided
18	Evacuation of power from 816MW Mohmand Dam	PC-I under preparation	6,807.00	4,539.00	11,346.00	-	-	-	-	-	NIL	June 2026
19	Installation of SVCs at 220kV Quetta Industrial (Revised Name "250 MVAR SVS at 132 kV Quetta Industrial)"	PC-I under preparation	1,485.00	3,465.00	4,950.00	-	-	-	-	-	NIL	Not provided
20	Interlinking of 765kV Mansehra with 220kV Mansehra	PC-I under preparation	2,308.50	5,386.50	7,695.00	-	-	-	-	-	NIL	Not provided
21	Re-conducting/Underground cabling of existing 220 kV Bund Road - NKLP D/C T/L (17 km)	Studies under process	1,426.00	2,139.00	3,565.00	-	-	-	-	158	NIL	Not provided
22	Re-enforcement of Sahiwal along with 2x500KV Line Bay	-	1,643.40	2,250.60	3,894.00	-	-	-	-	-	NIL	Not provided
23	2nd Source of supply to 500 KV Sheikh Muhammadi	-	9,075.00	9,130.00	18,205.00	-	-	-	-	-	NIL	Not provided
24	600MW Solar Power Plant near Muzaffargarh	-	1,540.00	1,738.00	3,278.00	-	-	-	-	-	NIL	Not provided

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25	600MW Solar Power Plant near Trimmu Jhang	-	1,405.80	1,586.20	2,992.00	-	-	-	-	-	NIL	Not provided
26	1200MW Solar Power Plant near Havelli Bahadur Shah	-	475.2	536.8	1,012.00	-	-	-	-	-	NIL	Not provided
27	220/132KV Zero Point G/S Islamabad and allied T/L	-	4,611.20	5,544.00	10,155.20	-	-	-	-	-	NIL	June 2025
28	220 MVAR SVS AT 132 KV Khuzdar	-	1,045.00	2,541.00	3,586.00	-	-	-	-	-	NIL	Not provided
29	Reactive Power Composition 220 &132 KV G/Ss	-	3,141.60	7,330.40	10,472.00	-	-	-	-	-	NIL	Not provided
30	Mitigation of High Fault level at 132 KV Burhan	-	44	176	220	-	-	-	-	-	NIL	Not provided
31	Augmentation of 2x160 MVA Transf. with 2x250MVA Yousaf Wala	-	541.2	1,262.80	1,804.00	-	-	-	-	-	NIL	Not provided
32	Extension of 3rd Transformer Guddu	-	624.8	1,159.40	1,784.20	-	-	-	-	-	NIL	Not provided
33	Augmentation of remaining 2x160 MVA T/F with 2x250MVA Yousaf Wala	-	631.4	1,172.60	1,804.00	-	-	-	-	-	NIL	Not provided
34	Extension of 3rd Transformer Allai Khwar	-	563.2	1,045.00	1,608.20	-	-	-	-	-	NIL	Not provided

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Approved Self Financed Ongoing Works

Sr.	Name of Project	Approval Status	PC-I Estimates			Escalated PC-I after FEC revision at contract award	Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run	Completion Date as per Investment Plan
			Local	Foreign	Total		FY 2022-23 Actual	FY 2023-24	FY 2024-25	Total			
1	Feasibility study for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation	CDWP 14.01.2016	26.4	106.8	133.2	180	-	125	-	125	193	Within 15% limit after FEC revision	Not provided
2	2nd source of supply to 220kV Jaranwala Road Substation	CDWP 09.06.2020	1,551	2,267.00	3,818	-	217	86	200	503	503	NIL	Not Provided
3	Evacuation of Power from K2/K3 Nuclear Power near Karachi(In/Out of 500-KV Port Qasid to Matiari S/C and 500-KV Hub to Mastiari S/C at K2/K3).	ECNEC 12.04.2017	3,719	3,782.00	7,501	10,413	1,092	20	-	1,112	13,167	YES, PC-1 to be revised if project is completed then PC-IV to be submitted	April 2023
4	Evacuation of Power from 2x660 MW Thar Coal Based SSRL/SECL Power Plant at Thar	ECNEC 12.04.2017	10,303	11,480.00	21,783	-	9,158	3800	500	13,458	18,275	NIL	April 2023

5	Evacuation of Power from 330 MW Siddiquesons Ltd.	CDWP 30.01.2020	817	1,537.00	2,354	-	-	0	0	-	36	NIL	April 2023
Total Self-Financed Ongoing			16,416	19,173	35,589	-	10,467	4,031	700	15,198	32,174	-	-

Approved Scope of Work for Self-Financed Ongoing Works

Sr.	Name of Project	Scope of Work
1	Feasibility study for enhancing the transmission capacity of NTDCs 500- KV Transmission System by applying series compensation	Consultancy services for carrying out Feasibility study for enhancing transmission capacity of NTDC's 500 kV transmission system by applying series compensation
2	2nd source of supply to 220kV Jaranwala Road Substation	220 kV Jaranwala-Sammundari Road T/L (Including U/G Cable Portion) – approx. 40 km
3	Evacuation of Power from K2/K3 Nuclear Power near Karachi(In/Out of 500-KV Port Qasid to Matiari S/C and 500-KV Hub to Matiari S/C at K2/K3).	500kV D/C Quad Bundle Transmission Line for Interconnection of K2/K3 Power Plant with 500kV Port Qasim – Matiari Circuit (102 km)
4	Evacuation of Power from 2x660 MW Thar Coal Based SSRL/SECL Power Plant at Thar	**Lot-I:** 500 kV D/C T/L from SECL plant up to 86th km **(86 km)** **Lot-II:** 500 kV D/C T/L from 86th km up to 157th km **(71 km)** **Lot-III:** 500 kV D/C T/L from 157th km up to Matiari Converter Station **(64 km)**
5	Evacuation of Power from 330 MW Siddiquesons Ltd.	

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Annexure H

Approved Investments for PSDP Funded Completed Works

Million Rs.

Sr.	Name of Project	Approval Status	PC-I Estimates			Escalated PC-I after FEC revision at contract award	Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run
			Local	Foreign	Total		FY 2022-23 Actual	FY 2023-24	FY 2024-25	Total		
1	220 KV G/Station at Kassowal with 132 KV Expension System (World Bank Loan No. 7565-Pk, Credit No. 4463-PK & 4464-PK)	ECNEC 25.02.2005	1,206	811	2,017	-	0	0	0	0	2,760	Yes, PC-I to be revised / PC-IV to be submitted
2	220Kv G/S Mansehra Tranch-III	CDWP 07.04.2011	359	546	905	-	0	0	0	0	1,651	Yes, PC-I to be revised / PC-IV to be submitted
3	3rd 500KV Jamshoro-Moro- R.Y Khan Single Circuit T/Line.Tranch-III	ECNEC 28.08.2013	10,612	26,245	36,857	-	60	22	0	82	22,371	NIL
4	Iter-Connection- Ther Coal Based , 1200MW (Power Dispersal from 1200MW Thar Coal Power Plant - 500kV Thar - Matiari T/L & Matiari 500kV S/station)	ECNEC 16.08.2012	7,250	15,056	22,306	-	237	0	0	237	17,131	NIL
5	New 220 KV G/Station at Khuzdar/220 KVDadu - Khuzdar D/C T/Line JICA Loan No. PK-56	ECNEC 27.07.2004	1,648	1,253	2,901	-	0	0	0	0	12,177	Yes, PC-I to be revised / PC-IV to be submitted

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6	Power Transmission Enhancement Project (Tranch-II) (SET)10 Sub projects (I) 9 Sub Projects of 500KV & 220KV S/S& T/Lines ADB Loan No. 2396-PAK	ECNEC 30.06.2012	9,275	10,918	20,193	-	0	0	0	0	23,496	Yes, PC-I to be revised / PC-IV to be submitted
7	Provision of Secured Metering System at Delivery Point. (Local Bank)	ECNEC 04.08.2005	496	513	1,009	-	29	0	0	29	1,064	Variation Within 15% limit
8	Quaid-e-Azam Solar Park at Lal-Suhanra (Phase-II) Evacuation of 600 MW Solar (Proposed to be carried out by NTDC)	ECNEC 12.02.2014	2,161.8	1,905.2	4,067	-	76	0	0	76	2,499	NIL
9	Traansmission Scheme for Dispersal of power from Neelam-Jehlum, Karot and Azad Patan Hydro Power Project	ECNEC 02.03.2015	10,425	11,272	21,697	-	634	0	0	634	21,650	NIL
10	Transmission Interconnection for Dispersal of Power From UCH-II Tranch-III	ECNEC 29.07.2011	1,219	1,289	2,508	-	0	0	0	0	2,350	NIL
11	Construction of 600 KV HVDC Transmission Line From Matiari to Lahore (Land Acquisition for Converter and Grounding Station - Both Ends) (CPEC)	CDWP 31.08.2015	1,568	-	1,568	-	0	0	0	0	4,359	Yes, PC-I to be revised / PC-IV to be submitted
12	Evacuation of Power from 1200MW RLNG Based Power Projects at	CDWP 28.04.2015	828	788	1,616	-	13	0	0	13	13	NIL

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13	Evacuation of Power from 1320 MW RLNG Power Plant at Trimmu Jhang	ECNEC 17.04.2018	2,184.80	2,047	4,231.80	-	0	0	0	0	2,267	NIL
14	Evacuation of power from 1320MW Power Plant at Bin Qasim	ECNEC 13.05.2015	5,957	7,022	12,979	-	112	0	0	112	9,981	NIL
15	Evacuation of power from 147MW Patrind HPP	CDWP 27.01.2015	616	350	966	-	11	0	0	11	671	NIL
16	Power Transmission Enhancement Project Tranch-I (19 Sub Projects of 500/220 KV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290- PAK	ECNEC 27.11.2006	4,503	8,114	12,617		0	0	0	0	17,347	YES, PC-I to be revised / PC-IV to be submitted
17	Evacuation of Power from 1320 MW Hub Power Company Ltd.	ECNEC 07.11.2016	8,540	7,875	16,415	18,106	0	0	0	0	22,325	YES, PC-I to be revised / PC-IV to be submitted
18	Evacuation of Power from 660 MW from Lucky Electric Power Company Ltd.	CDWP 03.03.2020	564	751	1,315.00		90	10	-	100	1,122	NIL
Total PSDP Funded Completed Works			**69,413**	**96,755**	**166,168**	-	**1,594**	**32**	**0**	**1,626**	**165,234**	-

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Scope of Work for PSDP Funded Completed Works

Sr.	Name of Project	Approval Status
1	220 KV G/Station at Kassowal with 132 KV Expension System (World Bank Loan No. 7565-Pk, Credit No. 4463-PK & 4464-PK)	Grid Station 3x200MVA, 500/220kV Auto Transformer Transmission Line 02 x 220k Double Circuit T/Lines for in & out of existing 220kV Vehari- Yousafwala D/C T/line. (approx. 70 km)
2	220Kv G/S Mansehra Tranch-III	3 x 250 MVA 220/132kV Auto Transformer, 220kV Line Bays 02 Nos.
3	3rd 500KV Jamshoro-Moro- R.Y Khan Single Circuit T/Line.Tranch-III	Package-I: Transmission Line (600km) Package-II: 500kV Moro Switching Station & Extension works at 500kV Jamshoro, 500kV Dadu and 500kV R.Y.Khan Grid Stations
4	Iter-Connection- Ther Coal Based , 1200MW (Power Dispersal from 1200MW Thar Coal Power Plant - 500kV Thar - Matiari T/L & Matiari 500kV S/station)	500kV D/C T/Line Thar – Matiari (250 km)
5	New 220 KV G/Station at Khuzdar/220 KVDadu - Khuzdar D/C T/Line JICA Loan No. PK-56	2x220/132kV, 160 MVA Auto-Transformer 2x18 MVAR Shunt Reactor 220kV Transmission Line Dadu-Khuzdar (274km)
6	Power Transmission Enhancement Project (Tranch-II) (SET)10 Sub projects (I) 9 Sub Projects of 500KV & 220KV S/S& T/Lines ADB Loan No. 2396-PAK	220kV Loralai G/S & T/Lines 220/132kV, 2x250MVA Auto-transformer 220 kV D/C Twin Bundle D.G Khan - Loralai Transmission Line (227km) 500kV D.G.khan G/Station & T/Lines 500/220 kV, 2x600MVA ATB

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		220/132 kV, 2x250MVA ATF In & Out arrangement of 500kV Guddu-Multan 1st Circuit at 500kV D.G Khan Substation (26km) **220 kV Okara Grid Station** 220/132kV, 3x250MV ATFs In and out of existing Yousafwala Sarfraz Nagar 220 kV D/C T/L (10.8 KM). **220 kV Toba Tek Singh Grid Station** 220/132kV, 3x250MV ATFs In and out of existing Nishatabad Multan 220 kV D/C T/L at T.T. Singh (1.2 km).
7	Provision of Secured Metering System at Delivery Point. (Local Bank)	The main objective of the project is to install accurate and secured metering system with dedicated CTs/PTs of 0.2 accuracy class at all. Metering Delivery Point located at various grid stations and power stations in separate air conditioned rooms, with provision for remote meter reading / data collection through the Public Switched Telephone Network (PSTN) and/or SCADA.
8	Quaid-e-Azam Solar Park at Lal-Suhanra (Phase-II) Evacuation of 600 MW Solar (Proposed to be carried out by NTDC)	220 kV AIS Grid Station at Lal Suhnara, Bahawalpur (1x250 MVA) 220 kV T/Line from Quaid-e-Azam Solar Park to Bahawalpur G/S (38 km)
9	Transmission Scheme for Dispersal of power from Neelam-Jehlum, Karot and Azad Patan Hydro Power Project	500 kV D/C transmission line on Quad Bundled from Neelum Jhelum HP to Gujranwala. Two 500 kV Line bays along with 3 x 37 MVA shunt reactors at 500 kV grid station Gujranwala. In/out of one circuit o Neelum Jhelum to Gujranwala T/L at karot. In/out of One circuit of Neelum – Jehlum Gujranwala T/L at Azad Pattan.
10	Transmission Interconnection for Dispersal of Power From UCH-II Tranch-III	220kV D/C T/Line Uch-II to Sibbi (113.4km)
11	Construction of 600 KV HVDC Transmission Line From Matiari to Lahore (Land Acquisition	Land acquisition for HVDC Converter Stations, Lahore & Matiari; Grounding Electrode Station at Syedwala, Punjab and Khipro, Sindh; 03 No Repeater Stations and Central Warehouse Feroza along with boundary walls at all stations.

	for Converter and Grounding Station - Both Ends) (CPEC)	
12	Evacuation of Power from 1200MW RLNG Based Power Projects at Jhang (Haveli Bahadur Shah)	500 kV D/C T/Line on for in/out of Existing Multan – Gatti 500 kV S/C T/Line at Haveli Bahadar Shah Power Plant (53 Km) 500 kV D/C T/Line for In & out of Existing Muzaffargarh-Gatti 500 kV S/C T/Line at Haveli Bahadar Shah Power Plant (1.77 Km)
13	Evacuation of Power from 1320 MW RLNG Power Plant at Trimmu Jhang	Lot-I Construction of 220 kV D/C T/L (Circuit-I&II) from RLNG Power Plant Near Trimmu Head Work To Mid Point Location (Approx: 25 Km). Lot-II Construction of 220 kV D/C T/L (Circuit I &II) from Mid Point Location To 220kV G/S Toba Tek Singh (Approx: 25 Km)
14	Evacuation of power from 1320MW Power Plant at Bin Qasim	Phase-I: 500kV T/L Port Qasim-Hub Jamshoro T/L CCT-I (54.5km) Phase-II: 500kV Hub Jamshoro T/L CCT-I – 500kV Matiari (118 km)
15	Evacuation of power from 147MW Patrind HPP	Phase-I: 132kV T/Line for Evacuation of Power from Patrind HPP to Mansehra New Grid Station (40km approx) Phase-II: Construction of 132kV T/Line for Evacuation of Power from Patrind HPP to Muzaffarabad-II Rampura G/S (6km approx)
16	Power Transmission Enhancement Project Tranch-I (19 Sub Projects of 500/220 KV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290- PAK	Kotlakhpat: Augmentation of 3x160 MVA with 3x250 MVA 'ATF' Bahawalpur: Addition of 1x160 MVA 'ATF' Yousufwala: Addition of 1x160 MVA 'ATF' Hala Road: Addition of 1x160 MVA 'ATF' Multan: Addition of 3x160 MVA 'ATF'
17	Evacuation of Power from 1320 MW Hub Power Company Ltd.	500 kV double circuit quad bundle transmission line on Greeley conductor from Hub Power Plant to 500 kV Matiari switching station (220 km). Extension at 500 kV Matiari switching station (Two Line Bays with Shunt Reactors)

18	Evacuation of Power from 660 MW from Lucky Electric Power Company Ltd.	Tower Locations: 39 No. Length of T/Line: 12.36 km

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Approved Investments for Foreign Funded Completed Works

Million Rs.

Sr.	Name of Project	Approval Status	PC-I Estimates			Escalated PC-I after FEC revision at contract award	Approved Investment by Authority				Projected Expenditure incurred/to be incurred up to June 2025	Cost Over Run
			Local	Foreign	Total		FY 2022-23 (Actual)	FY 2023-24	FY 2024-25	Total		
1	220 Kv G/S & Allied T/L D.I Khan	ECNEC 09.12.2010	2,350.00	1,429.00	3,779	-	366.5	0	0	366.5	3,461	NIL
2	220 KV G/S at Ghazi Road, Lahore with 220 KV D/C T/Line 132 KV Expansion System EDCF Loan No.PAK-2 & KFW	ECNEC 25.02.2005	1,325.00	1,267.00	2,592	-	0	0	0	0	5,852	Yes, PC-I to be revised / PC-IV to be submitted
3	220 Kv Nowshera S/S	ECNEC 06.02.2008	960	916	1,876	-	0	0	0	0	2,807	Yes, PC-I to be revised / PC-IV to be submitted
4	220KV Chakdara S/S	ECNEC 02.10.2014	2,480.00	1,917.00	4,397	-	237.1	167	0	404	4,539	Variation Within 15% limit
5	220Kv Sub Station Lalian	ECNEC 11.11.2011	646	935	1,581	-	0	0	0	0	3,914	Yes, PC-I to be revised / PC-IV to be submitted
6	4 Nos New Projects to be financed by JBIC (I) 500 KV RY Khan G/S & T/L (ii)220 KV Chishtian T/L (iii) 220 KV Gujrat G/S & 220 KV T/L iv) 220 KV Shalimar G/S & 220 KV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	ECNEC 22.10.2007	5,365.00	7,787.00	13,152		305.7	0	200	506	14,192	Variation Within 15% limit
7	500KV Faisalabad New (2x750) Phase-II (Now 500KV Faisalabad West alongwith allied T/Ls)	ECNEC 12.01.2015	3,688.70	5,690.80	9,379.50	-	0	0	0	0	15,192	Yes, PC-I to be revised / PC-IV to be submitted

8	Addition of 500/220KV Sub Station T/L for Strengthing the existing NTDC system : i) 500KV Lahore New, ii) 500KV Shikarpur,iii) 220KV D.I.Khan (JICA-PK-61)	ECNEC 09.12.2010	11,078.00	13,450.00	24,528	-	51.3	0	0	51	24,433	NIL
9	Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line for Improvement of Power Supply System in South Areas	ECNEC 24.11.2017	5,455.60	2,911.10	8,366.6	-	483.9	663	0	1147	9,458	Variation Within 15% limit
10	Evacuation of power from 1320MW Power Plant at Sahiwal	ECNEC 31.08.2015	289.4	826	1,115.40	-	0	0	0	0	2,031	Yes, PC-I to be revised / PC-IV to be submitted
11	Extension/Augmentation at 500/220 kV Rewat Substation	CDWP 23.09.2014	243.3	600.3	843.5	-	3.1	0	0	3	798	NIL
12	Improvement & Upgradation of Protection System to Avoid the Frequent Trippings in South Areas	CDWP 08.06.2016	232	655	887	1,025	0	80	0	80	1,171	Variation Within 15% limit after FEC revision
13	Strengthening of TSG Centre for Grid System Operations and Maintenance.	CDWP 21.12.2015	290	651	941	-	18.2	0	0	18	926	NIL
14	500kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	ECNEC 07.11.2016	2,185.00	2,621.00	4,806	6,053	193.4	15.8	0	209	6,847	Variation Within 15% limit after FEC revision
15	Load Despatch System Upgradation Project (Phase-II)	ECNEC 07-01-2004	1,015.00	1,880.00	2,895	-	0	0	0	0	4,626	Yes, PC-I to be revised / PC-IV to be submitted
16	Evacuation of Power from 747 MW Guddu Power Project	-	-	-	-	-	0	0	0	0	39	PC-I to be prepared
Total Foreign Funded Completed Works			**37,603**	**43,536.20**	**81,139**	**-**	**1,659**	**696**	**200**	**2,555**	**100,056**	**-**

Scope of Work for Foreign Funded Completed Works

Sr.	Name of Project	Approval Status
1	220 Kv G/S & Allied T/L D.I Khan	2 x 250 MVA 220/132kV Auto Transformer, 220kV Line Bays 02 Nos 132kV Line Bays 06 Nos.
2	220 KV G/S at Ghazi Road, Lahore with 220 KV D/C T/Line 132 KV Expansion System EDCF Loan No.PAK-2 & KFW	2 X 250 MVA, 220/132KV AUTO TRANSFORMERS - 4 x 220KV LINE BAYS - 3 x 220KV TRANSFORMER BAYS - 4 x 132KV TRANSFORMER BAYS - 8 x 132KV LINE BAYS
3	220 Kv Nowshera S/S	3 x 250 MVA 220/132kV Auto Transformer, 220kV Line Bays 02 Nos. 132kV Line Bays 06 Nos.
4	220KV Chakdara S/S	2 x 250 MVA 220/132kV Auto Transformer, 220kV Line Bays 02 Nos. 132kV Line Bays 06 Nos.
5	220Kv Sub Station Lalian	2x250 MVA, 220/132 kV T/Fs 220 kV Gatti-Ludewala D/C T/L (4+4km) feed from Lalian
6	4 Nos New Projects to be financed by JBIC (I) 500 KV RY Khan G/S & T/L (ii)220 KV Chishtian T/L (iii) 220 KV Gujrat G/S & 220 KV T/L iv) 220 KV Shalimar G/S & 220 KV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	500 KV Sub-station R.Y Khan. 2x600 MVA, 500/220 KV T/F with controlling switch gear on both side. 500KV S/C T/L with line controlling equipment for In/Out of 500KV Guddu to Multan 3rd Circuit at R.Y Khan (30+30km). 2X250 MVA 220/132KV T/Fs with controlling switch gear on both sides. 6.3 MVA 132/11 KV T/Fs with controlling switch gear for auxiliary services. Six 132KV line bays for interconnection of 132KV T/Ls.

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		<u>220KV Substation Gujrat.</u> 3x250MVA, 220/132KV T/Fs with controlling switch gear on both sides. 220KV D/C T/L with line controlling equipment for In/Out of existing 220 KV Mangla-Ghakkar D/C at Gujrat New (2+2km). 6.3 MVA 132/11 KV T/Fs with controlling switch gear for auxiliary services. Eight 132KV line bays for interconnection of 132KV T/Ls. <u>220KV GIS Substation Shalamar Lahore.</u> 3x160MVA, 220/132KV T/Fs with controlling switch gear on both sides. 220KV D/C T/L with line controlling equipment for In/Out of one circuit of Ravi K.S.K T/L at Shalamr (9km long overhear T/L and 3+3km underground cable. 6.3 MVA 132/11 KV T/Fs with controlling switch gear for auxiliary services. Six 132KV line bays for interconnection of 132KV T/Ls. <u>220KV Substation Chistian.</u> 3x250MVA, 220/132KV T/Fs with controlling switch gear on both sides. 220KV Chistian-Vehari D/C T/L with line controlling equipment (65km) on both sides. 6.3 MVA 132/11 KV T/Fs with controlling switch gear for auxiliary services. Eight 132KV line bays for interconnection of 132KV T/Ls.
7	500KV Faisalabad New (2x750) Phase-II (Now 500KV Faisalabad West alongwith allied T/Ls)	2x500/220 kV, 750 MVA T/Fs 3x220/132 kV, 250 MVA T/Fs
8	Addition of 500/220KV Sub Station T/L for Strengthing the existing NTDC system ; i) 500KV Lahore New, ii) 500KV Shikarpur,iii) 220KV D.I.Khan (JICA-PK-61)	<u>500kV Shikarpur Grid Station</u> 3x200MVA, 500/220kV Auto Transformer <u>Transmission Line</u> 500kV D/C T/Lines for In & Out of 500kV Dadu-Guddu T/Line Circuits I & II (32.3km) and 220kV D/C T/Line for In & Out of 220kV Guddu-Sibbi T/Line at 500kV Shikarpur G/Station (52.8km)

		The project aims at enhancing the capacity if the transmission system by upgradation of existing 220kV Shikarpur substation to 500kV new Substation alongwith associated T/Line to meet the growing power requirement of Shikarpur District and adjoining areas for industrial, agricultural and economic development, and to improve the overall efficiency of the power distribution network of SEPCO. Also it will increase its capacity to meet the economic growth target and to evacuate power from new IPPs including Uch-II, Engro and Fauji Fertilizer Power Plants. Implementation of the project will also help to meet power demand of the SEPCO area. **500kV Shikarpur Grid Station** 3x200MVA, 500/220kV Auto Transformer **Transmission Line** 500kV D/C T/Lines for In & Out of 500kV Dadu-Guddu T/Line Circuits I & II (32.3km) and 220kV D/C T/Line for In & Out of 220kV Guddu-Sibbi T/Line at 500kV Shikarpur G/Station (52.8km) **Lahore South G/S :** 2X750MVA, 500/220 kV Auto Transformers. 500 kV Line bays: 04 Nos. 220 kV Line bays: 04 Nos. One 750 MVA 500/220 Auto Transformer Bank 1+2/3rd 500 kV bays 2/3rd 220 kV bays **Lahore South associated T/L:** Lot- IA In & Out arrangement of 500 kV Sahiwal - Lahore T/Line at New Lahore 500 kV Substation (15 KM) Lot- IB In & Out arrangement of 500 kV Ghakhar - Lahore T/Line at New Lahore 500 kV Substation (50 KM) Lot- IIA

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		In & Out arrangement of 220 kV New Kot Lakhpat -Ghazi Road T/Line at New Lahore 500 kV Substation (50 KM) **Lot-IIB** In & Out arrangement of 220 kV Wapda Town – New Kot Lakhpat T/Line at New Lahore 500 kV Substation (36 KM) **Lot-IIC** In & Out arrangement of 220 kV Mangla – Ghakhar T/Line at Gujrat 220 kV Substation (2 KM)
9	Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line for Improvement of Power Supply System in South Areas	220kV Guddu to Interconnection point of 220kV Shikapur (108.4 km) 220kV Shikarpur Interconnection point to Uch Power House (92.6km) Uch Power House to 220kV Sibbi Substation (115 km)
10	Evacuation of power from 1320MW Power Plant at Sahiwal	0.5 km , 500 kV T/Line from Yousafwala to Lahore in/ out at sahiwal power plant. Addition of 600 MVA, 500/ 20 kV T/F at 500 kV yousafwala G/S. Replacement of 3 220 kV CB at 500 kV Yousafwala G/S.
11	Extension/Augmentation at 500/220 kV Rewat Substation	1 x 750 MVA T/F at Rawat 500/220 kV substation
12	Improvement & Upgradation of Protection System to Avoid the Frequent Trippings in South Areas	Main objective of the proposed project is improvement in reliability of Protection System in Southern areas of NTDC network by installation of Shunt Reactors, Protection Relays, Event Recorder, Fault Locator & Fault Recorder etc. at various 500kV & 220kV Grid stations
13	Strengthening of TSG Centre for Grid System Operations and Maintenance.	Up gradation of GSO operation Training Simulator to include 765kV, 500kV, ±660kV HVDC, Solar Power System and wind Power System Preparation of Scenarios for Simulator Trainings Additional Scope of the Project: Study, Investigate and Recommend Countermeasure to prevent Blackout on Guddu Power Station incident on 09.01.2021 Training of Trainers at Japan of 10 Nos. TSG/GSO Training Instructors/ Experts Provision of 32 Nos. PC Type GSO Simulators Provided at different Grid Stations of NTDC Pakistan

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14	500kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	500kV Double Circuit Quad Bundled Transmission Line SKP-Lahore (South) CCT-II In & OUT at HVDC Converter Station. NO. of Towers = 11 Nos. Length of T/Line= 2.587 KM Phase II 500kV Double Circuit Quad Bundled Transmission Line SKP-Lahore (South) CCT-I In & OUT at HVDC Converter Station. Length of T/Line: 10 KM
15	Load Despatch System Upgradation Project (Phase-II)	Up-gradation/extension of old Telecom System with new state of the art system including laying of Optical Ground Wire (OPGW) on existing transmission lines and integrated Telephone System. • Installation & Commissioning of new Remote Terminal Units (RTUs) at NTDC/WAPDA GENCO stations. • Interfacing of existing RTUs at IPPs through Protocol Converters (Software) • Replacement of old Supervisory Control and Data Acquisition (SCADA) System at NPCC, Islamabad. • Construction of residential accommodation for NPCC staff
16	Evacuation of Power from 747 MW Guddu Power Project	500 kV Guddu New-Muzaffargarh T/Line on 04 Bundle Drake Conductor (256 Km). 500 kV T/Lines on 04 Bundle Drake Conductor for looping In/Out of D.G Khan-Multan 500 kV T/Line at 500 kV Muzaffargarh Substation (10+10 Km). Three 500 kV Line Bays at Muzaffargarh Substation.

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Term of Reference (ToR)

for Estimation of NTDC T&T Losses by an Independent Consultant

NTDC shall conduct the Competitive Bidding process for the award of the contract to conduct the T&T losses study by 3rd party. The Terms of Reference for study of assessment of NTDC Transmission & Transformation (T&T) losses by an independent consultant/3rd party are as under:

1. Review and validation of all the input data provided by NTDC with regard to technical parameters of transmission network component and metering.

2. Modeling and simulation of twenty four (24) matched power flow cases of peak and off-peak scenario for each FY 2021-22, 2022-23, 2023-24 and 2024-25 by using PSS/E (preferably version 33 or advanced).

3. Evaluation of corona, dielectric and any other losses associated with the network would also be evaluated and included in the total T&T losses of each scenario.

4. Matched cases would include modeling of ±660 kV HVDC transmission line with converter stations, and 500 kV & 220 kV transmission lines and grid stations equipment, i.e., transformers, switch shunts, fixed shunts, static var compensator, shunt reactors etc.

5. All the data of power system components like generators, transmission lines, transformers, switch shunts, fixed shunts, static var compensator, shunt reactors etc. would be modeled properly in the matched cases. No load and Full load losses of transformer would be entered correctly. Appropriate techniques would be adopted for taking into account the transmission line losses due to ageing.

6. Evaluate the impact of aging of transmission assets i.e. power/auto transformers, transmission line conductors switch gear equipment, etc. and weather conditions such as pollution, humidity, etc on T&T losses of NTDC and propose remedial measures/recommendations in this regard.

7. Evaluate the impact of insufficient reactive power compensation in the DISCO networks on the reactive power flow from the NTDC system, leading to higher losses. Analyse the historical data and trend of losses on the Tie Lines between NTDC & other Licensees impacting T&T losses.

8. Lumped load modeling at 132 kV bus bar would be performed.

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9. Modeling of split or coupled bus bars would be performed as per operating scenarios (information to be provided by Asset Management and System Operator).

10. Modeling of generation dispatch would be performed with respect to split generation at different interconnection voltage levels, where applicable.

11. For each matched case, recorded system parameters such as power flows on transmission lines and transformers, voltage profile at substation buses, generation dispatch etc. would be matched exactly in power flow study cases simulated through PSS/E for the existing scenarios.

12. Above factors/details shall be kept in view for development of future scenario simulations.

13. T&T Losses (MW) in the network would be evaluated from the two simulated/matched cases for each particular month (peak and off-peak operating scenarios). The assessed T&T losses would be computed for the peak and off-peak condition of each month of each FY 2021-22, 2022-23, 2023-24 and 2024-25.

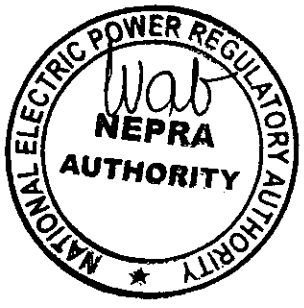
14. The % age losses of NTDC network for each FY 2021-22, 2022-23, 2023-24 and 2024-25 would be evaluated by either developing loss curve through curve fitting technique and estimation of energy loss using area under the curve method or by any other appropriate technique.

15. Both fixed and variable T&T losses of NTDC network would also be calculated and presented.

16. The assessment of %age T&T losses of NTDC network for each network zone separately for all voltage levels operated and maintained by NTDC including but not limited to 500 kV, 220 kV and other lower voltage on account of power evacuation facilities which is under purview of the NTDC network.

17. Separate assessment / segregation of overall T&T Losses of 500 kV network and 220 kV network of NTDC and her lower voltage on account of power evacuation facilities which is under purview of the NTDC network.

18. Identify and provide the details of transmission line sections and power transformers with abnormal or higher losses on account of their non-optimal utilization. Consultant shall also evaluate, calculate and present the consolidated losses of the auxiliary system of the NTDC network, separately.



19. Comparison of losses evaluated from the simulated cases with losses physically measured by NTDC for the same period.

20. Comparison of NTDC's assessed losses with transmission licensees operating in different regions of the world.

21. Review the present energy metering system of NTDC, accuracy class of meters, CTs and PTs etc. in accordance with provision of the Grid Code 2023, used for this purpose and recommend measures for improvement if so required, to correctly measure and record the transmission system losses of NTDC.

22. Evaluate and quantify the impact of delay in augmentation/rehabilitation projects on T&T losses of NTDC.

23. Remedial measures would be recommended to reduce overall T&T losses in NTDC's network as well as specific measures to be implemented in each zone of NTDC's network for reduction of T&T losses.

24. A cost-benefit analysis may also be carried out by consultant to evaluate the economic impact of suggested remedial measures to help the Authority in informed decision making regarding implementation of such measures.
25. Presentation of work done to NTDC and NEPRA.

26. The consultant shall ensure confidentiality to safeguard any sensitive information and data provided by NTDC.

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Annexure – L

Power Supply Options for Makran/Gwadar
Short to Medium Scenarios

1. 70-90 MW import from Iran on the existing 132 kV T/Line from Jackigoor (Iran) to Mand (Gwadar)
   - Operational since 2003

2. 100 MW Additional Import from Iran
   - 51 km of T/Line from Polan (Iran) to Pak-Iran border - completed
   - Interim 132 kV supply link has been completed in Feb. 2023 – 30.3 km, 132 kV T/Line from Pak-Iran border (Gabd) to Gwadar-Jiwani T/Line
   - Permanent 220 kV supply link shall be completed after funding arrangement from EDBI of Iran and completion of Gwadar 220kV G/Station and remaining 45 km T/Line (18 months construction time).

3. 70-80 MW by linking 132 kV network of Makran/Gwadar with national grid
   - 132 kV transmission lines (Basima - Nal - Nag - Panjgoor) completed by QESCO
   - 160 MVA, 220/132 kV T/F at Khuzdar shall be installed by NTDC

Total Supply for Makran/Gwadar = 250 – 260 MW

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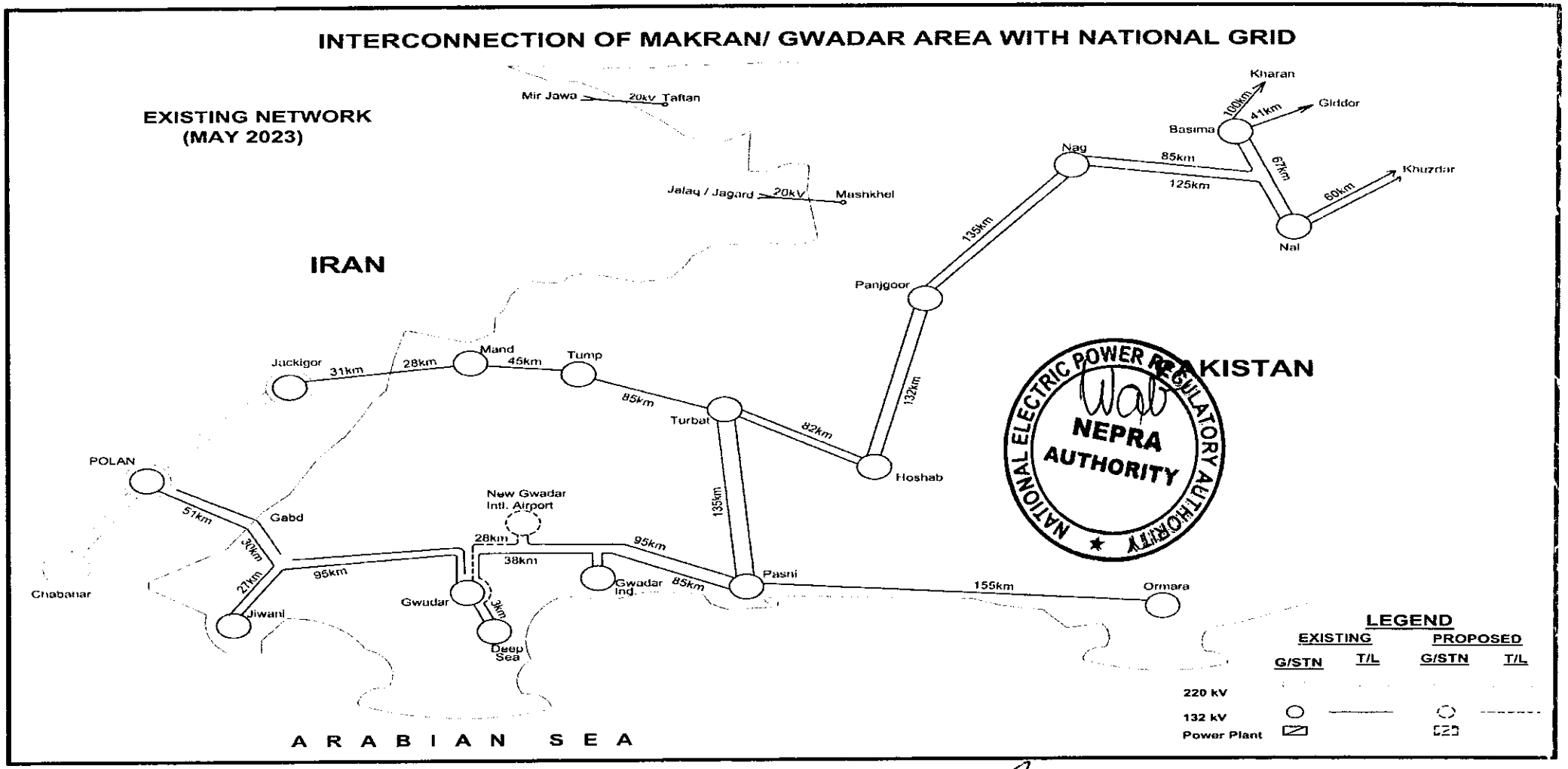
Existing Makran/Gwadar Network
With Additional Power Import from 132 kV Supply Arrangement with Iran



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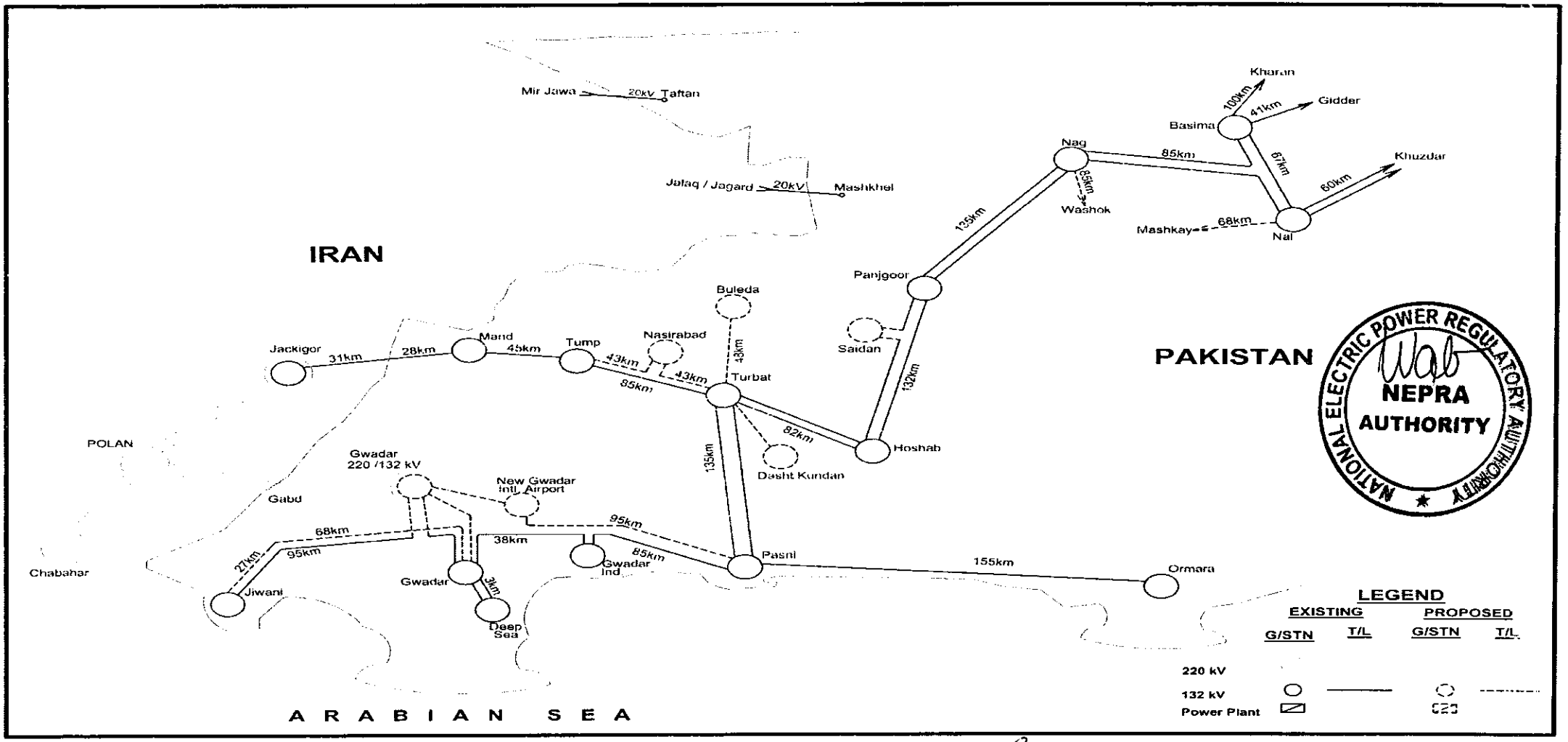
Existing/Planned Network of Makran/Gwadar - 132 kV Connection with National Grid and Additional Power Import from 220kV Permanent Supply Arrangement with Iran



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Power Supply Options for Makran/Gwadar
Medim Term Scenario

300 MW Coal Fired Power Project (CFPP) at Gwadar under CPEC Framework

- Imported coal option
- GoP Target CoD: Dec. 2025
- Latest CoD to be intimated by PPIB
- Power Evacuation shall be through 132 kV T/Lines to be built by QESCO

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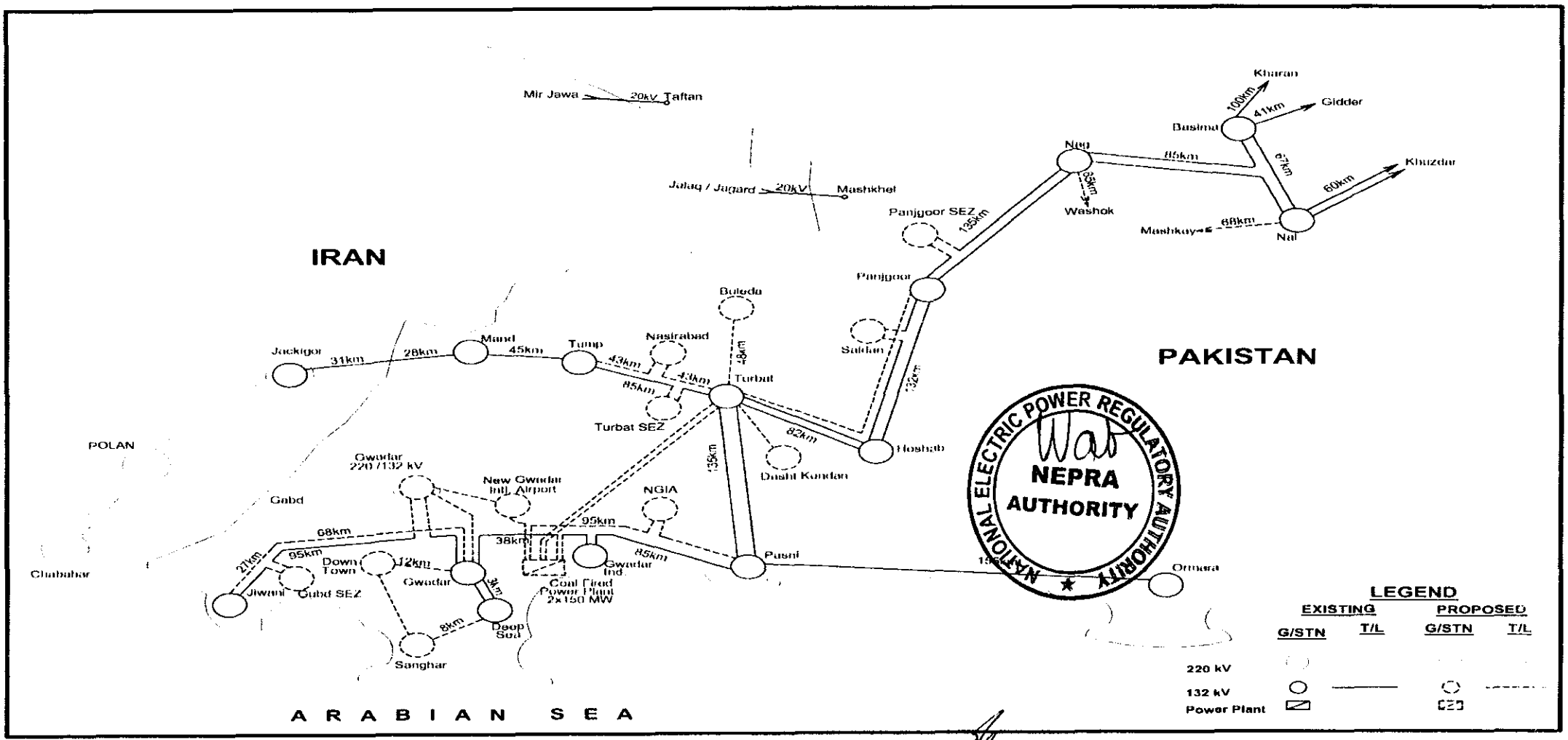
Addition of 300 MW Coal Plant at Gwadar



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Power Supply Options for Makran/Gwadar Long Term Scenario

Bulk Supply from National Grid to Makran/Gwadar Network

- 500 kV T/Line from Southern NTDC network along coastal highway via Ormara to Gwadar along with 132 kV network expansion in Makan/Gwadar network.
- Two-phase development may be adopted in consideration of the load growth in Makran-Gwadar network:

  Phase-1: China-Hub CFPP – Ormara 500 kV T/Line (approx. 335 km)

  Phase-2: Ormara – Gwadar 500 kV T/Line (approx. 260 km)

- Reactive power compensation for voltage support at Ormara and Gwadar
- Total power Supply Capacity = 900 – 1000 MW

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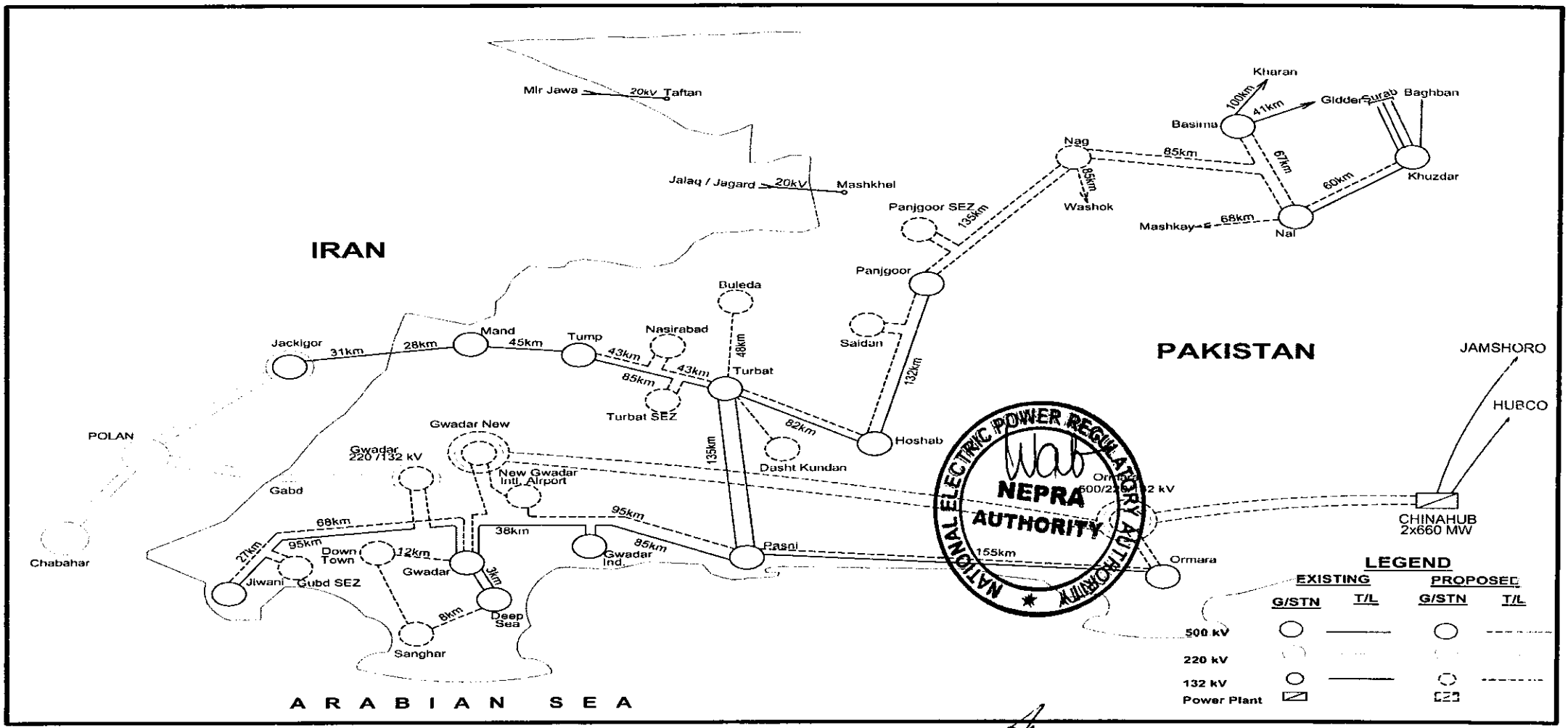
Bulk Supply Option from National Grid
Hub – Ormara – Gwadar 500 kV Link



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RE Addition in the Gwadar/Makran Network

Following options are also important and need further evaluation in order to tap the potential of VRE in the Makran/Gwadar network:

a) Hybrid RE Generation

Wind-Solar hybrid project (200 MW Wind/100 MW Solar) at Panjgoor in Makran as proposed in the VRE locational study report carried out by World Bank.

b) Distributed Solar Generation at Consumer end

The distributed solar options would provide electricity during day time. They can be installed along 11 kV feeders and/or Roof tops.

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Annexure-M

Sr	Name of the Project	Major Scope of Project		Need Assessment Submitted by Petitioner	Project Cost as requested by Petitioner	Project Completion Details as submitted by Petitioer		Cost Over Run beyond 15%	Progres as of December 2023		NEPRA's Approval	
						Commencement Date	Completion Date		Physical	Financial w.r.t to original PC-I Cost	Basis	Cost
A	**SPECIAL ECONOMIC ZONES (SEZs)**	**Grid Station**	**Transmission Line**									
1	Construction of 220/132 Kv GIS Substation Dhabiji and allied transmission line	2x160MVA, 220/132kV Auto Transformer	220kV Double Circuit Twin Bundled Transmission Line for Looping In/Out of 220kV Gharo – Jhampir S/C at 220kV Dhabeji SEZ Substation (12.4km)	Provision of electricity for Special Economic Zone (DSEZ) as per decision of the Federal Government.	5,980	**G/S:** 31-03-2023 **T/L:** 12-05-2022	**G/S:** 21-09-2024 **T/L:** 31.12.2023	NIL	35	9	Provision of Electricity to SEZs as per decision of federal governmen t	5,902
2	Construction of 220kV Haripur Substation and allied transmission line	3 x 250MVA Auto Transformers	220kV Double Circuit Twin Bundle Transmission Line In/out at existing 220kV Mansehra – ISPR Transmission Line (12 km approx.)	Provision of electricity for Special Economic Zone (DSEZ) as per decision of the Federal Government.	4,801	**G/S:** 30/08/2022 **T/L:** 09/07/2023	May-24	NIL	61	20	Provision of Electricity to SEZs as per decision of federal governmen t	3,791
3	Construction of 220kV Swabi Substation and allied transmission line	220kV Grid Station with 3 x 250 MVA 220/132kV Auto Transformer	220kV D/Ct Twin Bundled T/Line from 500kV Nowshehra Grid Station to 220kV Swabi G/Station (55km approx.	Provision of electricity for Special Economic Zone (DSEZ) as per decision of the Federal Government.	5,538	7/26/2022	Jul-24	NIL	46	16	Provision of Electricity to SEZs as per decision of federal governmen t	5,642

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4	Construction of 220 kV Quaid-e-Azam Apparel and Business Park (QABP) Grid Station for Provision of Electricity to PIEDMC SEZ and allied transmission line	220 kV G/Station with 2x250 MVA, 220/132 kV T/Fs2x220 kV Line Bays for IN/OUT of 220 kV KSK-Bandala Ccts-I & II T/Line.	220 kV D/C T/L (2+2 km) for IN/OUT of existing 220 kV KSK-Bandala Ccts-I & II T/L (completed on 30/11/2020 on cost deposit basis and energized on no-load).	Provision of electricity for Special Economic Zone (DSEZ) as per decision of the Federal Government.	3,700	01.11.2022	Primary Work: 31-01-2024 Secondary Work : 30.03.2024	NIL	55	15	Provision of Electricity to SEZs as per decision of federal governmen t	2,668
5	Construction of 500kV Allama Iqbal Industrial City for 600MW Demand of the Special Economic Zone in the FIEDMC area and allied transmission line	500kV Grid Station having 3 x 250 = 750 MVA , 500 /220/132 kV Auto transformer	500 kV D/C T/L on three bundle Greely conductor, from 500 kV AIIC Grid Station for In/Out on the existing Gatti-Ghazi Barotha Circuit-II (Chakwal) 500 kV single circuit T/L	Provision of electricity for Special Economic Zone (DSEZ) as per decision of the Federal Government.	10,350	N/A	8/16/2024	NIL	12	5	Provision of Electricity to SEZs as per decision of federal governmen t	5,947

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Sr	Name of the Project	Major Scope of Project		Need Assessment Submitted by Petitioner	Project Cost as requested by Petitioner	Project Completion Details as submitted by Petitioer		Cost Over Run beyond 15% and FEC revision	Progres as of December 2023		NEPRA's Approval	
						Commencement Date	Completion Date		Physical	Financial w.r.t to original PC-I Cost	Basis	Cost
B	**Power Evacuation Projects**											
6	Land Acquisition for installation of 600 MW Solar Power Plant at Distt. Muzaffargarh	Land acquisition of 2400 Acres (Actual as per Section-IV: 2627 Acres).	-	Fuel substitute for expensive power generation during day time	1,400	Jan-23	N/A	NIL	70	72	The issue will be treated as separate line item in tariff of solar power plants in line with decision of 600 MW Solar at Muzafargarh	0
7	Land Acquisition for installation of 600 MW Solar Power Plant at Tehsil Athara Hazari Distt. Jhang	Land acquisition of 2400 Acres (Actual as per Section-IV: 2500 Acres).	-	Fuel substitute for expensive power generation during day time	2,558	Jan-23	N/A	NIL	14	-		0
8	Land Acquisition for Installation of 1200MW Solar Power Plant at Sher Garh Tehsil Chubara Disstt: Layyah	Land acquisition of 4800 Acres.	-	Fuel substitute for expensive power generation during day time	2,658	Jan-23	N/A	NIL	16	-		0

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9	500kV HVDC Transmission System between Tajikistan and Pakistan for Central Asia - South Asia Transmission Interconnection (CASA-1000) (NTDC)	±500kV Converter Station at Nowshera Electrode Station at Charsadda 500 kV HVAC Grid Station (Azakhel) Nowshera	500kV HVDC Transmission Line from Torkham to Nowshera (113Km) Electrode line from Nowshera to Charsadda (24Km) 500 kV HVAC T/L Through In/Out of Tarbela Peshawar at 500kV Nowshera	G-G Project (Approval from Ministry of Energy Power Div.) Reduce the supply/demand gap by import of power from Tajikistan Improvement in Voltage Profile = 2 to 4% Reduction in Transmission Losses = 16 MW	54,303	TW01-Converter Station: 28.08.2018 TW02-Transmission Line: 06.11.2020 HVAC Grid Station: 28.02.2022 HVAC T/Line: 30.05.2022	TW01-Converter Station: 04.04.2024 TW02-Transmission Line: 04.04.2024 HVAC Grid Station: 28.08.2024 HVAC T/Line: 17.05.2024	NIL	65	89	Power evacuation from CASA 1000 project as per G-G commitments	37,449
10	Evacuation of Power from 2160MW Dasu HPP (Stage-I)	**LOT-III:** 765/220 kV Mansehra Grid Station	LOT-1: 765KV Double Circuit T/Line from Dasu to 765/220kV Mansehra Grid Station (157 km) LOT-II: 765KV Double Circuit T/Line from 765/220KV Mansehra G/S to 765/500/220/132KV Islamabad West G/S (97.6 km)	PC-I approved from ECNEC. Dispersal of 2160 MW clean environment friendly energy from Dasu HPP WAPDA (Stage-I) in a reliable way. Additions of power in National Grid which will help eliminate load shedding. Improvement in voltage profile, stability & reliability of NTDC Grid System. Enhancement in transmission capacity and improvement in power supply	96,232	T/L **(LOT-I & LOT-II)**: 10.02.2023 G/S (LOT-III): 20.02.2023	T/L (LOT-I & LOT-II): 09.06.2026 G/S (LOT-III): 19.08.2025	NIL	5	23	Power Evacuation t	96,141

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				system in North Region								
11	500kV Islamabad West Grid Station	Construction of 765/500/220 /132KV Grid Station Islamabad West		PC-I approved from ECNEC. Dispersal of 2160 MW clean environment friendly energy from Dasu HPP WAPDA (Stage-I) in a reliable way. Additions of power in National Grid which will help eliminate load shedding. Improvement in voltage profile, stability & reliability of NTDC Grid System. Enhancement in transmission capacity and improvement in power supply system in North Region. •Power evacuation from hydel power projects from North •Reduction in loading of 500/220 kV transformers of Rewat and 220/132 kV transformer loading at Burhan, Isb-	42,120	Dec-23	Jun-26	NIL	0	0	Power Evacuation	16,288

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				University and ISPR (Sangjani) •Improvement in Voltage Profile = 3% to 5% •Reduction in Transmission Losses = 7.9 MW •IFRR = 22.16 % •Annual benefits per annum = 4210.43 MRs.							
12	Interlinking of 765kV Mansehra with 220kV Mansehra	2*1200 MVA, 765/220kV Transformers	220kV double circuit line from 765kV Mansehra to 220kV Mansehra. (10km)	This project will help to evacuate power from Dasu and other plants in this vicinity.	1,415	-	-	NIL	0	0	PC-I not approved	-
13	**Evacuation of Power from Suki Kinari, Kohala, Mahal HPPs (Revised Name "Evacuation of Power from Suki Kinari")**	500kV Maira Switching Station (8x500 kV Line Bays along with Shunt Reactor Banks)	500 kV Double-Circuit Quad-Bundle Transmission Line from 870MW Suki Kinari HPP to Neelum Jhelum Interconnection Point using ACSR Bunting Conductor (Approx. 75 km) 500kV D/C T/Line from Maira Switching Station to Islamabad West (131 km) 500kV D/C T/Line from	PC-I approved from ECNEC. The main objective of the project is to provide interconnection facility for evacuation of bulk amount of power from the upcoming power plant, which are falling in the KPK/AJK region under China Pakistan Economic Corridor projects. Improvement in	40,703	02-06-2022 (ADB-401A), 19-11-2021 (ADB-300B)	04-04-2024 (ADB-401A), April-2024 (ADB-300B)	NIL	70	27	Power Evacuation	38,173

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			Sangal to Maira Switching Station (Approx. 83 km) 500kV D/C T/Line from Maira Switching Station to Karot (20 km)	the reliability of NTDC network Improvement in voltage profile of existing system								
14	500 kV Tarbela-Islamabad West Transmission Line for Evacuation of Power from Tarbela 5th Extension HPP (1410 MW)	-	500kV D/C Transmission Line for Evacuation of Power from Tarbela 5th Extension Switchyard to Islamabad West Substation (50km Approx.). 500kV S/C Interconnector from Tarbela-T5 Switchyard to Tarbela 1-4 Switchyards(Approx. 2km)	This project will helps evacuation of 1410 Mw power from Tarbela 5th extension which will help in improvement of overall power supply position in the country.	2,347	11/4/2022	11/3/2024	NIL	34	17	Power evacuation from IGCEP approved project	2,260
15	Evacuation of Power from Wind Power Projects Jhimpir and Gharo Wind Cluster	220kV GIS Gharo Substation: Two 220/132 kV, 250MVA transformers with transformer bays at both ends. Two 220 kV line bays for	-	Dispersal of power from WPPs reliably. Improvement in voltage profile of HESCO & NTDCL Grid System. Reduction in T/Line Losses of HESCO & NTDCL Grid	1,675	12.01.2022 (Consultancy)	46 Months 10 months (procurement phase) 24 months (construction phase) 12 months (DLP)	NIL	Jhimpir 100, Gharo	91	Power Evacuation	1,451

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		double circuit T/L towards 220 kV Jhimpir. Four 132 kV line bays for interconnecti on of WPPs at Gharo cluster.		System. Improvement in reliability of NTDCL & HESCO networks at/around Jhampir & Gharo. Reduction in the loading of 220/132 kV transformers at T.M Khan Road 220 kV Substation. Provision of more reliable supply of electricity to the consumers. Creation of small business services. Creation of new job opportunities for local communities.								

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16	Evacuation of Power from 1224MW Wind Power Plants at Jhimpir Clusters	220/132kV Jhimpir-II Substation with 4x250MVA 220/132kV transformers alongwith associated equipment including 6x220kV Line Bays and 4x132kV Line Bays.	132kV Transmission Lines Lot-I: 132 kV D/C T/L for connection of five (05) Wind Power Plants with 220 kV Jhimpir-II Grid Station (34 km) Lot-II: 132 kV D/C T/L for connection of the Six (06) Wind Power Plants with 220 kV Jhimpir-II Grid Station (47 km) 220kV Transmission Lines Line-I: 220 kV D/C T/B T/Line for looping In/Out both Circuits of existing 220 kV Jamshoro-KDA 33 D/C T/Line at 220 kV Jhampir-II Grid Station (220kV Jamshoro-Jhampir-II T/L - 19km) Line-II: 220 kV D/C T/B T/Line for looping In/Out both Circuits of existing 220 kV Jamshoro-KDA 33 D/C T/Line	Environment friendly power will be available for the country. Dispersal of power from upcoming WPPs reliably. Improvement in voltage profile of HESCO and NTDC Grid System. Improvement in reliability of NTDC & HESCO networks at/around Jhimpir-I and Gharo New.	8,839	Grid Station: 11.03.2020 220KV T/L: 08-02-2021 132KV T/L: 28-08-2020	Grid Station: 20-02-2022 220KV T/L: 31-03-2022 132KV T/L: 28-12-2021	NiL	100	109	Power Evacuation	8,027

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			at 220 kV Jhampir-II Grid Station (220 kV KDA 33-Jhampir-II T/L - 20km) Line-III: 220kV D/C T/B T/Line for looping In/Out of 220kV Gharo-Jhampir-I T/Line at 220kV Jhampir-II G/Station (2.2km)									
18	Evacuation of Power from Mohmand Hydro Power Plant	-	·220 kV T/Line from 884 MW Mohmmand HPP to 220/132 kV Jamrud Grid Station (Approx. 52 km). 20kV T/Line from 884 MW Mohmmand HPP to 220/132 kV Nowshera Grid Station (Approx. 60km)	Evacuation of Power from 816MW Mohmand Hydro Power Plant. Smooth supply of power to the national grid to eliminate severe load shedding condition in the country. Improvement & enhancement in overall power system efficiency and reliability.	2,803	-	2025-26	NIL	2	0	PC-I not approved	0

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20	Import for 100 MW Power from Iran (220 KV Grid Station Gwadar & Allied T/L from Iran to Gawadar	2x160 MVA, 220/132 kV Auto-Transformers	220 KV double circuit Twin Bundle Transmission Line from Iran Border to Gwadar GIS (75 km).	The main objective of the project is supply of Power to Gwadar from Iran to meet the growing power demand of Gwadar and other areas in Makran Division of Balochistan by Construction of 220 KV double circuit transmission line from Pak – Iran border to Gwadar and 220 GIS substation at Gwadar.	0	13-07-2022	Priority Phase: 08-02-2023 (30km of T/Line Completed) 220KV GS and Balance Transmission Line held up due to restrictions on transections with Iranian Companies.	-	Phase I 100%		not requested by petitioner	0
21	600MW Solar Power Plant near Muzaffargarh		In-out of 220kV KAPCO - Multan S/C at 600MW Muzzaffargarh solar PV project. (4km)	This project is required for evacuation of power from 600MW Muzaffargarh solar PV project.	504	-	-	Nil	0	0	PC-I not approved	0
22	600MW Solar Power Plant near Trimmu Jhang		In-out of 220kV TT Singh – Trimmu RLNG PP S/C at Trimmu Jhang solar PV project. (23km)	This project is required for evacuation of power from 600MW Trimmu Jhang solar PV project	1,663	-	-	NIL	0	0	PC-I not approved	0
23	1200MW Solar Power Plant near Havelli Bahadur Shah		In-out of 500Kv Haveli Bhadur Shah – Muzaffargarh S/C at Havelli Bahadur Shah solar PV project. (4.5km)	This project is required for evacuation of power from 1200MW Havelli Bahadur Shah solar PV project	562	-	-	NIL	0	0	PC-I not approved	0

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	Extension of 3rd Transformer Allai Khwar	Extension of 3rd Transformer Allai Khwar		For Evacuation of power from power houses in vicinity	792	-	-	NIL	0	0	PC-I not approved	0
	Evacuation of Power from K2/K3 Nuclear Power near Karachi		500kV D/C Quad Bundle Transmission Line for Interconnection of K2/K3 Power Plant with 500kV Port Qasim – Matiari Circuit (102 km)	The main objective is evacuation of power from 2x1100MW K2/K3 Nuclear Power Plants.	2,472	10/28/2020	30.04.2023	YES, PC-I to be revised / PC-IV to be submitted	60	175	Power Evacuation	1,112
	Evacuation of Power from 2x660 MW Thar Coal Based SSRL/SECL Power Plant at Thar		Lot-I: 500 kV D/C T/L from SECL plant up to 86th km (86 km) Lot-II: 500 kV D/C T/L from 86th km up to 157th km (71 km) Lot-III: 500 kV D/C T/L from 157th km up to Matiari Converter Station (64 km)	The main objective of the project is evacuation of 2x660 MW power from Shanghai Electric Power Plant (SSRL/SECL) to be installed in Thar area of Sindh Province to National Grid for transfer of power to upcountry load centers.	12,143	7/5/2021	Lot-I: 05-05-2023, Lot-II: 08-05-2023, Lot-III: 30-04-2023 (Revised Completion by BoD-NTDC as 30-04-2023)	NIL	100	78	Power Evacuation	13,458
	Evacuation of Power from 330 MW Siddiquesons Ltd.				10			NIL	100	-	Completed project and no expenditure incurred during firrst 18 months of control period	0

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	Iter-Connection-Ther Coal Based , 1200MW (Power Dispersal from 1200MW Thar Coal Power Plant - 500kV Thar - Matiari T/L & Matiari 500kV S/station)		500kV D/C T/Line Thar – Matiari (250 km)	The primary objective of making effective use of the ample coal reserves in the Thar Desert to meet Pakistan's power generation needs, spur economic development, and bring energy security to the country, the benefits of the project is to enhance the capacity of transmission line, and to provide the transmission link between various Sub-Station in order to facilitate transfer bid block of power to either side under different generation scenarios, which contributes to increase the electrification, to fulfill energy demands, development of industries, reduce load shedding and to alleviate poverty of the	100	Lot-I: 25.01.2016 Lot-II: 03.06.2016	31.07.2018	NIL	100	77	Power Evacuation	237

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				area.								
	Quaid-e-Azam Solar Park at Lal-Suhanra (Phase-II) Evacuation of 600 MW Solar	220 kV AIS Grid Station at Lal Suhnara, Bahawalpur (1x250 MVA)	220 kV T/Line from Quaid-e-Azam Solar Park to Bahawalpur G/S (38 km)	Evacuation of power from Quied-A-Azam solar park.	100	G/S: 30.11.2015 T/L: 31.02.2015	G/S: 15/02/2018 T/L: 20/10/2017	NIL	100	61	Power Evacuation	76
	Transmission Scheme for dispersal of Power from Neelam – Jehlum, Karot and Azad Patan Hydro Power Project	Two 500 kV Line bays along with 3 x 37 MVA shunt reactors at 500 kV grid station Gujranwala.	500 kV D/C transmission line on Quad Bundled from Neelum Jhelum HP to Gujranwala. In/out of one circuit o Neelum Jhelum to Gujranwala T/L at karot. In/out of One circuit of Neelum – Jehlum Gujranwala T/L at Azad Pattan.	Evacuation of Power from Neelum Jhelum, Karot and Azad Pattan HPP. Smooth supply of power to the national grid to eliminate severe load shedding condition in the country. Improvement & enhancement in overall power system efficiency and reliability.	570	Ph-I: 02.04.2018 Ph-II: 13.01.2022 Karot:13.01.2022	Phase-I Completed Phase-II Completed Karot TL: completed	NIL	100	100	Power Evacuation	634
	Transmission Interconnection for Dispersal of Power from UCH-II Trench-III		220kV D/C T/Line Uch-II to Sibbi (113.4km)	The main objective of 220kV Transmission Line is to transmit power generating from Uch-II Power Plant to Sibbi G/station	425	01.01.2015	05.05.2018	NIL	100	98	Completed project and no expenditure incurred during firrst 18 months of control period	0

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				and thereby strengthening the existing NTDC integrated system.								
	Evacuation of Power from 1200MW RLNG Based Power Projects at Jhang (Haveli Bahadur Shah)		500 kV D/C T/Line on for in/out of Existing Multan – Gatti 500 kV S/C T/Line at Haveli Bahadar Shah Power Plant (53 Km) 500 kV D/C T/Line for In & out of Existing Muzaffargarh-Gatti 500 kV S/C T/Line at Haveli Bahadar Shah Power Plant (1.77 Km)	Evacuation of power from RLNG power plant.	14	17.07.2016	08.03.2018	NIL	100	-	power evacuation	13
	Evacuation of Power from 1320 MW RLNG Power Plant at Trimmu Jhang		Lot-I Construction of 220 kV D/C T/L (Circuit-I&II) from RLNG Power Plant Near Trimmu Head Work To Mid Point Location (Approx: 25 Km). Lot-II Construction of 220 kV D/C T/L (Circuit I &II)	Evacuation of power from RLNG Trimmu.	10	15.02.2018	13.08.2018	NIL	100	54	power evacuation	2

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			from Mid Point Location To 220kV G/S Toba Tek Singh (Approx: 25 Km)									
	Evacuation of power from 1320MW Power Plant at Bin Qasim		Phase-I: 500kV T/L Port Qasim-Hub Jamshoro T/L CCT-I (54.5km) Phase-II: 500kV Hub Jamshoro T/L CCT-I – 500kV Matiari (118 km)	For dispersal of Power from Port Qasim Power Plant.	217	Phase-I: 28.07.2016 Phase-II: Lot-I: 19.09.2017, Lot-II: 03.04.2017, Lot-III: 06.04.2017	Phase-I: 31.10.2017 Phase-II: Lot-I: 20.04.2019 Lot-II: 24.06.2019 Lot-III: 02-11-2020	NIL	100	77	power evacuation	112
	Evacuation of power from 147MW Patrind HPP		Phase-I: 132kV T/Line for Evacuation of Power from Patrind HPP to Mansehra New Grid Station (40km approx) Phase-II: Construction of 132kV T/Line for Evacuation of Power from Patrind HPP to Muzaffarabad-II Rampura G/S (6km approx)		180	Phase-I: 07/06/2016 Phase-II: 23/04/2016	Phase-I: 25/09/2020 Phase-II: 28/04/2017	NIL	100	69	power evacuation	11

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	Evacuation of Power from 1320 MW Hub Power Company Ltd.	Extension at 500 kV Matiari switching station (Two Line Bays with Shunt Reactors)	500 kV double circuit quad bundle transmission line on Greeley conductor from Hub Power Plant to 500 kV Matiari switching station (220 km).	The main objective of the project is evacuation of 1320 MW power from the proposed Hub Power Plant envisaged to be installed near existing 1292 MW Thermal Power Station at Hub.	500	20.08.2018	Lot-I: 17-09-2020 Lot-II: 29-03-2020 Lot-III: 19-03-2020 Lot-IV: 28-06-2020	YES, PC-I to be revised / PC-IV to be submitted	100	136	cost over run	0
	Evacuation of Power from 660MW Lucky Electric Coal Power Plant (12.36km)		Tower Locations: 39 No. Length of T/Line: 12.36 km	The main objective of the project is the evacuation of power from 660MW Lucky Electric Coal Power Plant.	110	18.11.2020	05-11-2021 (T/Line commissioned/ energized on 09-11-2021)	NIL	100	99	power evacuation	100
	Evacuation of power from 1320MW Power Plant at Sahiwal	Addition of 600 MVA, 500/ 20 kV T/F at 500 kV yousafwala G/S. Replacement of 3 220 kV CB at 500 kV Yousafwala G/S.	0.5 km , 500 kV T/Line from Yousafwala to Lahore in/ out at sahiwal power plant.	Power Evacuation	540	21.02.2019	22.07.2020.	YES, PC-I to be revised / PC-IV to be submitted	100	182	cost over run	0

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	Evacuation of Power from 747 MW Guddu Power Project		·500 kV Guddu New-Muzaffargarh T/Line on 04 Bundle Drake Conductor (256 Km). ·500 kV T/Lines on 04 Bundle Drake Conductor for looping In/Out of D.G Khan-Multan 500 kV T/Line at 500 kV Muzaffargarh Substation (10+10 Km). ·Three 500 kV Line Bays at Muzaffargarh Substation.	The main objective of the project is power dispersal arrangements from 747 MW additional Combined Cycle Power Plant at Guddu by construction of 500kV Transmission Lines from Guddu to Muzzafargarh along with extension at 500 kV Muzaffargarh Substation.	25	Lot-I: 22-12-2017 Lot-II: 15-10-2018 Lot-III: 12-10-2018 Lot-IV: 29-12-2017	3/4/2020	-	100	-	complete d project	0

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Sr	Name of the Project	Need Assessment Submitted by Petitioner	Project Cost as requested by Petitioner	Project Completion Details as submitted by Petitioer		Details of Cost Over Run	Progres as of December 2023		NEPRA's Approval	
				Commencement Date	Completion Date		Physical	Financial w.r.t to original PC-I Cost	Basis	Cost
C	**Reliability Project**									
	220-KV Dera Ismail Khan - Zhob Transmission Line alongwith 220-KV Zhob Sub-Station.	•Improvement in Voltage Profile = 3.1% to 18.1 % •Reduction in Transmission Losses = 14.7 MW •IFRR = 10.41% Improvement in power supply position at/around 220 kV Zhob. Increase in the system capacity to meet future load demand of the area	2,948	Grid Station: 15.03.2021 Transmission Line: 31.05.2019	Grid Station: 31.12.2023 Transmission Line: 08.04.2023	YES, PC-I to be revised	80	194	COST OVER RUN	0
	220 kV Jauharabad Grid Station	Enhance of MVA capacity of NTDC system. Improvement in power supply position. Increase in the system capacity to meet future load demand of Jauharabad and nearby area. Improvement in voltage profile of existing grid network. Reduction in transmission system losses. Improvement in reliability of NTDC and FESCO system networks.	5,566	7/7/2022	3/6/2024	NIL	19	24	Reliability of NTDC and FESCO network	3,068

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	Conversion of Existing 220 kV Substations at Bund Road, Kala Shah Kaku, Ravi and Nishatabad to GIS Technology (NTDC)	The objective of the proposed project is conversion of four 220/132 kV Air Insulated Substations to Gas Insulated Substation (GIS) which become deteriorated due to aging factor as well as due to extraordinary pollution from nearby running drain and Chemical Industries causing erosion of all metal parts and differential settlement of the equipment foundations.	-	07-05-2018 (Hiring of Project Design and Procurement Consultant)	1/31/2024	NIL	0	1	Re-assessment of need for the project is being done at NTDC managemen t level.	0
	220kV Transmission System Network Reinforcement in Islamabad & Burhan	The stress on the Tarbela-Burhan-ISPR transmission line will reduce which will help create sufficient margin to meet future load growth. It will also help in evacuation of power from Tarbela 4th (1410 MW). Improvement in reliability of NTDC 220 kv network around IESCO. Reduction transmission line losses The project will help in voltage Profile improvement of IESCO region.	239	Phase-I: 01/03/2017, Phase-II: Yet to be awarded	Phase-I: 28/02/2019: Phase-II: 2024-25	NIL	55	17	Reliability of IESCO network	92

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	220kV Dharki - Rahim Yar Khan - Bhawalpur D/C T/L	Improvement of Power Supply System in southern areas. Alternate source of supply during contingency conditions. Improvement in reliability & un-interrupted power supply.	8,355	-	2024-25	NIL	0	0	System reliability during N-1 contigency	8,173
	220kV Larkana Substation	Improvement in voltage profile at/around Larkana Reduction in transmission system losses Reduction in loading of 500/220kV and 220/132kV transformers at Shikarpur, Dadu & Rohri G/S Improvement in reliability of NTDC and SEPCO system networks Provision of N-1 contingency Increase in available system capacity to meet future load growth at/around proposed project	1,540	-	2024-25	NIL	0	0	Improvement in reliability of NTDC and SEPCO system networks	1,211

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	220-KV Mastung G/S slongwtih allied T/Ls.	Improvement in power supply position at/around 220kV Mastung G/Station. Improvement in voltage profile of existing 132kV Grid Station in the vicinity of 220kV Mastung Grid Station. Increase in the system capacity to meet future load demand of QESCO. Reduction in transmission line losses.	7,590	-	2024-25	NIL	0	2		4,473
	Installation of SVCs at 220kV Quetta Industrial (Revised Name "250 MVAR SVS at 132 kV Quetta Industrial)	Installation of this dynamic reactive compensation device (SVS) will improve voltage stability in QESCO region.	10	-	-	NIL	0	0	PC-I Not approved	-
	500kV Ghazi Barotha-Faisalabad West T/L (Revised Name In/Out of Islamabad West to Ghazi Barotha T/L at - Faisalabad West)	This project is required for the power disposal of hydro-power projects in North. The project provides improved system reliability under N-1 contingency	1,005	-	-	NIL	0	0	PC-I Not approved	-

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	220kV Head Faqiran G/S alongwith allied T/Ls.	Improvement of Power Supply Position At/Around 220 kV Head Faqirian. Increase in the system capacity to meet future load demand of the area. Improvement in voltage profile of existing 132 kV grid station in the vicinity of Head Faqirian. Reduction in transmission system losses. Improvement in reliability of NTDC and FESCO system networks.	5,470		2024-2025	NIL	0	5	Improvement in reliability of NTDC and FESCO system networks.	4,913
	Re-conducting/Underground cabling of existing 220 kV Bund Road - NKLP D/C T/L (17 km)	Increase of ampacity of line Improvement in reliability of NTDC system.	205	-	-	NIL	5	4	PC-I Not approved	-
	Re-enforcement of Sahiwal along with 2x500kV Line Bay	This will increase System Reliability and Voltage Stability.	1,720	-	-	NIL	0	0	PC-I Not approved	-
	220 kV Zero Point Grid Station at Islamabad	Improvement of Power Supply and meeting the increasing load demand of Federal Region.	6,366	-	2024-25	NIL	0	0	PC-I Not approved	-

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	220 MVAR SVS AT 132 kV Khuzdar	This project will improve voltage stability in QESCO Region.	1,902	-	-	NIL	0	0	PC-I Not approved	-
	Reactive Power Compensation 220 &132 kV G/Ss	This shall improve system voltage stability of the G/Ss	5,969	-	-	NIL	0	0	PC-I Not approved	-
	Mitigation of High Fault level at 132 kV Burhan	The Current Limiting Reactor shall improve system stability by reducing short circuit currents at the said G/S	110	-	-	NIL	0	0	PC-I Not approved	-
	220 KV G/Station at Kassowal with 132 KV Expension System	Reduction in the loading of 500/220kV transformers at sahiwal and vehari regions. Reduction in transmission line losses. Improvement in overall system reliability of NTDC network with respect to export of southern generation to the northern load centers.	270	G/Station: 01.06.2011 T/Line: 12.09.2009	G/Station: 17.04.2015 T/Line: 06.08.2012	YES, PC-I to be revised / PC-IV to be submitted	100	137	cost over run	0
	220 kV Mansehra Grid Station	This project aims the installation of new 220 kV substation at Nowshera to meet the upcoming load demand & voltage Profile improvement of Nowshera area in PESCO.	520	G/S 02.05.2018 T/L 16.11.2017	Completed	NIL	100	182	cost over run	0

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	3rd 500kV Jamshoro-Moro-R.Y Khan Single Circuit T/Line.Tranch-III	The main objective of 500kV Transmission line in association of substations is to transfer of power to be generated from power generation plants in south areas to enhance the capacity of transmission line, and provide the transmission link between South & North in order to facilitate transfer of bid blocks of power to either side under different generation scenarios, which contributes to increase the electrification, development of industries and alleviate poverty of the area.	239	Package-I Lot-I: 20.01.2015 Lot-II: 07.01.2015 Lot-III: 28.01.2015 Package-II: 28.01.2015	Package-I Lot-I: 24.01.2019 Lot-II: 06.09.2022 Lot-III: 22.05.2019 Package-II 02.05.2019	NIL	100	61	South to North power transfer	82
	New 220 kV G/Station at Khuzdar/220 kVDadu - Khuzdar D/C T/Line	The project is envisaged to meet power demand of remote areas of Baluchistan and various development activities in Khuzdar and surrounding areas. According to the load flow simulation of the existing QESCO system network, voltage profile of the system at Khuzdar and in its vicinity is extremely low. The completion of this project will strengthen the power supply situation which is presently through 132 kV line from Quetta.	280	Transmission Line: Lot-I: 01-07-2008 , Lot-II: 30-06-2008 Grid Station: 30-06-2008	09.06.2014	YES, PC-I to be revised / PC-IV to be submitted	100	420	cost over run	0

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	220 kV D.I Khan Grid Station & allied T/Lines	This project aims the installation of new 220 kV substation at D.I Khan to meet the upcoming load demand & voltage Profile improvement of PESCO Region	400	06.11.2016	Grid Station: 18-02-2019 T/Lines: 18-02-2019	NIL	100	92	Cater the upcoming load demand & voltage Profile improvement of PESCO Region	366.5
	220 KV G/S at Ghazi Road, Lahore with 220 KV D/C T/Line 132 KV Expansion System EDCF Loan No.PAK-2 & KFW	After completion of subject Grid Station voltage profile has been improved system stability strength, reduction in line losses of 132 kV LESCO Network.	17	01.07.2015	18.04.2019	YES, PC-I to be revised / PC-IV to be submitted	100	226	Cost over run	0
	220 kV Nowshera Grid Station	This project aims the installation of new 220 kV substation at Nowshera to meet the upcoming load demand & voltage Profile improvement of Nowshera area in PESCO.	367	220 kV Grid Station: 26.11.2016 220 kV T/L: 12.07.2016	220 kV Grid Station: 19.04.2019 220 T/L: 18.12.2018	YES, PC-I to be revised / PC-IV to be submitted	100	150	Cost over run	0
	220 kV Chakdara Grid Station	This project aims the installation of new 220 kV substation at Chakdara to meet the upcoming load demand & voltage Profile improvement of Chakdara area in PESCO region.	467	Grid Station: 06.11.2016 Transmission Line: 12.07.2016	Grid Station: 16.09.2018 Transmission Line: 16.09.2018	NIL	100	102	Cater upcoming load demand & voltage Profile improvement of PESCO Region	404

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	4 Nos. New Projects to be Financed by JBIC (i) 500 KV Rahim Yar Khan Grid Station & Transmission Line (ii) 220 KV Chistian Grid Station & 220 KV Vehari –Chistian Transmission Line (iii) 220 KV Gujrat Grid Station & 220 KV Transmission Line (iv) 220 KV Shamamar Grid Station & 200 KV Transmission Line (Japan)	Improvement of voltage profile of Lesco, Mepco and Gepco regions. To fulfilment of future load demand. Reduction in the loading of 220/132kV transformers at Guddu and Bahawalpur substations feeding R.Y.Khan and its surrounding network. Removal of 132kV transmission bottlenecks in MEPCO network feeding R.Y.Khan and its surrounding network. Reduction in transmission line losses. Improvement in voltage profile. Improvement in system reliability especially at/around R.Y.Khan.	600	Chishtian : 12.03.2012 Gujrat: 27.09.2013 Shalamar : 22.12.2010 500kV R.Y.Khan: G/Station: 09.11.2010 ; T/Line: 08.10.2016	Chishtian: 24.10.2016 Gujrat: 27.04.2017 Shalamar: 07.03.2014 500kV R.Y.Khan GS & TL: 03.02.2018	NIL	99	106	System reliability in MEPCO area	506

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Sr	Name of the Project	Need Assessment Submitted by Petitioner	Project Cost as requested by Petitioner	Project Completion Details as submitted by Petitioer		Details of Cost Over Run	Progres as of December 2023		NEPRA's Approval	
				Commencement Date	Completion Date		Physical	Financial w.r.t to original PC-I Cost	Basis	Cost
D	**System Constraints Removal Projects**									
	Power Transmission Enhancement Project, Tranche-II (Ten Sub Projects of 500 & 220 KV T/Line)	The main objective of the project is enhancement in the Power Transmission system by extension, augmentation and expansion of existing 500kV and 220kV transmission system of NTDC to meet the requirements of growth of power demand in the country. It is not only to strengthen the existing transmission system but also to help evacuate additional power from IPPs.	225	220kV Loralai G/S & T/L G/S: 14.03.2011 , T/L: 17.09.2010 500kV D.G.Khan G/S & T/L G/S: 19.03.2012 , T/L: 16.08.2011 220 kV Okara G/S: G/S: 26.08.2010 T/L : 30/05/2011 220 kV T.T.Singh G/S & T/L: G/S: 26.08.2010 T/L : 19/05/2011	220kV Loralai G/S & T/L: 03.08.2014 500kV D.G.Khan G/S & T/L: G/S: 26.07.2014 ; T/L: 25.04.2014 220 kV Okara G/S: G/S: 09.06.2016 T/L : 26/05/2012 220 kV T.T.Singh G/S & T/L: G/S: 18.11.2014 T/L : 05/10/2013	YES, PC-I to be revised / PC-IV to be submitted	100	116	cost over run	0
	2nd source of supply to 220kV Jaranwala Road Substation	Enhance Transmission Capacity of NTDC system	590	tender under process			NIL 1	7	Removal of sstem constraints	503
	2nd Source of supply to 500 kV Sheikh Muhammadi	Peshawar (Sheikh Muhammadi) 500kV Circuit is fed from Tarbela power plant. This second circuit shall reinforce the network in Peshawar region and improve system reliability.	7,560	-	-		NIL 0	0	PC-I Not approved	-

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	Upgradation of Existing 220kV Vehari G/S to 500 kV Vehari G/S	To meet with the additional load demand & voltage profile improvement of the areas which fall under the jurisdiction of Multan Electric Supply Company (MEPCO).	2,790	Tender for procurement of transformers are under evaluation.	2025-26 (as per PC-I)	Nil	5	0	Removal of sstem constraints	2,408
	500/220kV Chakwal G/S alongwith allied T/Ls	Improvement of Power Supply Position At/Around 220 kV Chakwal G/S. Increase in the system capacity to meet future load demand of the area. Improvement in voltage profile of existing 132 kV grid station in the vicinity of Chakwal Reduction in transmission system losses. Improvement in reliability of NTDC and IESCO system networks	5,470	-	2024-25	NIL	7	10	Removal of sstem constraints	3,038
	220kV Arifwala Substation	Reduction in 220/132 kV Transformer loading at Yousafwala, Vehari and Kassowal G/S Improvement in Voltage Profile by 4.2% to 5.9 % Reduction in Transmission Losses = 18 MW	8,355	Tender for procurement of transformers has been published on 24-10-2023.	2025-26 (as per PC-I)	NIL	5	1	Removal of sstem constraints	8,173

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	500kV Sialkot G/S alongwith allied T/Ls.	Improvement & enhancement in overall power system efficiency and reliability. Reduction in loading at 500/220 kV T/F of Nokhar, Lahore North and 220/132 kV T/F of Gujranwala, Ghakkar, Nokhar and Gujrat G/S Improvement in Voltage Profile =4% to 13.6% Reduction in Transmission Losses = 54 MW	10,210	-	2025-26	NIL	5	0	Removal of sstem constraints	8,500
x	220kV Mirpur Khas G/S alongwith allied T/Ls	Improvement in power supply position at/around 220kV Mirpurkhas. Increase in the system capacity to meet future load demand of the area. Improvement in voltage profile of existing 132kV grid station in the vicinity of Mirpurkhas. Reduction in transmission system losses. Reduction in the loading of 220/132kV transformers at T.M.Khan Road, Hala Road & Jamshoro. Elimination of overloading of 132kV T/Lines from Tando Jam to T.A Yar & from hala Road to Matiari. Improvement in reliability of NTDC and HESCO system networks.	4,735	Grid Station: 17.01.2020 Transmission Line: Yet to commence	Grid Station: 31.12.2023 Transmission Line: Lot-I: 18 months from the date of commencement Lot-II: 24 months from the date of commencement	NIL	35	31	Reliability of NTDC and HESCO network	3,512

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11	500/220/132 kV Lahore North G/S	Approval from ECNEC. Power dispersal from coal power projects of South from HVDC T/L. Reduce voltage dip of Lesco region. Improvement in power supply position. Improvement in voltage profile of existing grid network. Reduction in transmission system losses. Improvement in reliability of NTDC and Discos system networks	34,790	G/S: 01/07/2022 500kV T/L: 04/02/2022 220kV T/L: 01/11/2019	G/S: 22/03/2024 500kV T/L: 03/02/2024 220kV T/L: 30/12/2023	NIL after FEC Revision	90	115	Full utilization of HVDC transmission line and system reliability improvement in Lahore region	27,042
	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations	PC-I Approved by ECNEC. The enhancement of transformation capacity of NTDC system by installation of additional transformers & augmentation of transformers at various grid stations has been prepared for optimal utilization of existing grid stations to provide relief to overloaded transformers and to enhance the transformation capacity of NTDC system to meet the growing power demand of DISCOs.	22,059	Multan & Vehari: 31-03-2021 Shikarpur: 04-08-2021 Quetta Industrial: 30-07-2021 Rohri, Daharki &Bahawalpur: 13-08-2021 Sibbi & Loralai: 20-09-2021 T.M.Khan, Hala Road & Jamshoro: 27-09-2021 Ludewala, Isd. University & NKLP: 09-06-2022 Sammundri Rd. & Ghakkar: 27-08-2021 WAPDA Town & Sheikhupura: 27-09-2021	Multan & Vehari: 01-01-2023 Shikarpur: 04-02-2023 (completed) Quetta Industrial: 18-03-2024 Rohri, Daharki &Bahawalpur: 31-03-2024 Sibbi & Loralai: 29-03-2024 T.M.Khan, Hala Road & Jamshoro: 13-07-2024 Ludewala: 28-02-2024 Isd. University: 09-02-2024 NKLP: 28-02-2024	NIL after FEC Revision	70	87	Reduction in loading of existing 500/220 & 220/132 kV transformers in NTDC system and Improvement in voltage profile.	21,919

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	Exentension and Augmentation of existing 500kV and 220kV G/S (New). Now: Additon & Augmentation of 500kV and 220kV T/Fs at the Existing G/S for Removal of NTDC System Constraints	Reduction in transformer loading Improvement in voltage profile Reduction in Transmission Losses	4,455	-	2024-25	NIL	5	1	Removal of sstem constraints	4,051
	220kV Kohat G/S along with allied T/Lines.	The main objective of the project is the installation of new 220 kV substation Kohat to remove transmission constraint will also help in improvement of power supply and loss reduction in PESCO region.	2,505	Project yet to be awarded	2024-2025	NIL	1	0	PC-I not approved	0
	220kV Gujranwala II G/S alongwith allied T/Ls.	The main objective of the project is the installation of new 220 kv substation Gujranwala-II to remove transmission constraint of Gujranwala and its surrounding and meet the growing demand of GEPCO.	3,010	-	2024-2025	NIL	4	1	PC-I not approved	
	220kV Nag Shah G/S	This project will relieve the overloading in the neighboring grid stations of Multan and Muzaffargarh and improve the voltage profile in MEPCO. The project will reduce the loading on the 132kV transmission lines of MEPCO as well, which otherwise get overloaded under N-1 contingency.	2,259	-	2025-26	NIL	0	0	PC-I not approved	0

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	220kV Punjab University G/S	Removal of System Constraints. Provision of reliable supply of electricity to consumers Improvement of voltage profile in the vicinity of 220kV Punjab University G/S to increase the system capacity to meet future load demand of LESCO To reduce transmission losses.	455	Land could not be acquired due to non-availability.	-	NIL	0	0		400
	220kV KAMRA Grid Station	Improvement of Power Supply and meeting the increasing load demand of the Region. Removal of System Constraints. Provision of reliable supply of electricity to consumers Improvement of voltage profile in the vicinity of 220kV Kamra G/S to increase the system capacity to meet future load demand of IESCO. To reduce transmission losses	3,010	---	2026-27	NIL	0	5	PC-I not approved	[redacted]
	Augmentation of 2x160 MVA T/Fs with 2x250 MVA Yousaf Wala	Removal of system constraints	1,615	-	-	NIL	0	0	PC-I not approved	0
	Extension of 3rd Transformer Guddu	Removal of system constraints	805	-	-	NIL	0	0	PC-I not approved	0
	Augmentation of remaining 2x160 MVAT/Fs with 2x250 MVA Yousaf Wala	Removal of system constraints	861	-	-	NIL	0	0	PC-I not approved	0

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	Power Transmission Enhancement Project Tranch-I	The main objective of the project is to enhance the transformation capacity at different NTDC Grid Stations which will help to meet the power demand of the country as well as the system losses will also be reduced.	100	Extension at Bahawalpur: 20-05-2008 Extension at Yousufwala: 01-07-2008 Extension at Hala Road: 20-05-2008 Augmentation at Kotlakhpat: June-2008 Extension at Multan: 09-05-2009	Extension at Bahawalpur: 06-09-2009 Extension at Yousufwala: 15-12-2009 Extension at Hala Road: 05-10-2009 Augmentation at Kotlakhpat: 27-04-2011 Extension at Multan: 18-06-2010	YES, PC-I to be revised / PC-IV to be submitted	100	137	cost over run	0
	220/132 kV Lalian G/S & Allied T/L	It is system constraint project, necessary to fulfil load demand of chiniot region. Improvement in power supply position. Improvement in voltage profile of existing FESCO grid network. Reduction in transmission system losses. Improvement in reliability of NTDC and Discos system networks	430	17/05/2021	28.11.2022 (Actual completion date)	YES, PC-I to be revised / PC-IV to be submitted	100	248	cost over run	0

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	500 kV Substation Faisalabad West Grid Station (Phase-I)	The project fulfil the load demand of FESCO region. Reduce voltage dip of FESCO region. Remove constraint of system (over loading of respective region T/Fs). Improvement in power supply position. Improvement in voltage profile of existing grid network. Improvement in reliability of NTDC and FESCO system networks	3050	24-Oct-2019	08.03.2023	YES, PC-I to be revised / PC-IV to be submitted	100	162	cost over run	-
	Extension/Augmentation at 500/220 kV Rawat Substation	The project will help in reduction of overall loading of transformers and will help increasing of overall power transfer capability of 500/220 kV Rawat Grid station.	10	23-06-2018	4/5/2019	NIL	100	95	Removal of sstem constraints	3
			119,316							75,115

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Sr	Name of the Project	Major Scope of Project	Need Assessment Submitted by Petitioner	Project Cost as requested by Petitioner	Project Completion Details as submitted by Petitioer		Details of Cost Over Run	Progres as of December 2023		NEPRA's Approval	
					Commencement Date	Completion Date		Physical	Financial w.r.t to original PC-I Cost	Basis	Cost
F	**Others**										
	Enterprise Resource Planning (ERP). (Now Implementation of Integrated Solution to improve Productivity and Control in NTDC by ERP System)	1.Owner Agent-Project Management & Quality Assurance (PMQA) to provide facilitation to NTDC in all aspects of procurement, project management, quality assurance of outputs, record keeping, issue management and risk management 2.Tier-3 Data Center involving Primary & Secondary Data centers, Structured Cabling Outlets and Conditioned Power Supply Outlets 3.Networking of all +130 sites 4.ICT-Office automation (OA) 5.End User Equipment 6.ICT-ENTERPRISE RESOURCE PLANNING (ERP) Implementation ·Human Resource and Administration ·Financial Management ·Procurement/Inventory Management/Warehouse Management ·Enterprise Asset Management ·Extension of existing help desk services ·Sales & Services ·Supply Chain ·Projects Management Business Intelligence	NTDC's ICT Modernization & ERP Program will help to enter into a new era of digital transformation while implementing SAP S4/HANA as our ERP system. As a result, we are enhancing strategic and organizational capabilities by implementing a state-of-the-art suite of software along with ICT enhancement; which ensures transparency, efficiency and effectiveness of day-to-day business operations & activities.	3,462	-	Marh 2024	NIL	64	29	Modernization Project to bring transparency, efficiency and effectiveness of day to day business operations	2,302
	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station	Installation of Battery Energy Storage System at Jhampir-I Capacity Buildings in various stakeholders	The main objectives of project are: Develop a Pilot BESS to improve the frequency regulation capability of NPCC Voltage support for the southern part of the NTDC grid, especially during contingencies. Capacity building in energy storage systems which will form an essential part of future energy systems	2,830	7/5/2022	2/11/2024	NIL	5	31	Modernization project to improve frequency regulation in wake of intermitanc of renewable technology.	941

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	Construction of 600 kV HVDC Transmission Line From Matiari to Lahore	Land acquisition for HVDC Converter Stations, Lahore & Matiari; Grounding Electrode Station at Syedwala, Punjab and Khipro, Sindh; 03 No Repeater Stations and Central Warehouse Feroza along with boundary walls at all stations.	Transfer of 4000 MW power from the power plants in southern part of the country to upcountry load centers.	250	2017	2024-25 (expected)	YES, PC-I to be revised / PC-IV to be submitted	90	278	Cost over run	0
	Upgradation/Extension of NTDC's Telecommunication & SCADA System at NPCC	i) Upgradation of existing SCADA System at NPCC. ii) Integration of 116 RTUs with new SCADA System at NPCC. iii) Field wiring works of existing 49 RTUs from LDS-II. iv) Microwave System (64 sites) as a backup. v) OPGW Live Line Installation of 4085 kms. vi) SMS Meters (246 sites) data transportation over NTDC Telecom network. vii) Telecom network revamping.	i) Improved efficiency in power supply from NPCC ii) Improved quality of Supply iii) Ensuring reliability of supply iv) Fuel saving through optimized unit commitment. v) Reduction in Transmission losses through proper VAR scheduling vi) Reduction in loss of load due to transmission fault / system collapse vii) Timely and accurate data for most economical despatch of power. viii) Complete visibility of power network.	12,250	6/25/2021	6/24/2024	NIL	45%	88	Grid modernization project	11,604
	Feasibility study for enhancing the transmission capacity of NTDCs 500-kV Transmission System by applying series compensation	NTDC 500kV network (Southern Part)	To enhance the transmission capacity of NTDC's 500kV transmission system by exploring the impacts of introducing advanced technology such as Flexible AC Transmission System (FACTS) including series/shunt compensation and Power System Stabilizers (PSSs)	125	5/1/2019	Study in progress	NIL	0	51	Modernization project	125
	Provision of Secured Metering System at Delivery Point		The main objective of the project is to install accurate and secured metering system with dedicated CTs/PTs of 0.2 accuracy class at all. Metering Delivery Point located at various grid stations and power stations in separate air conditioned rooms, with provision for remote meter reading / data collection through the Public Switched Telephone Network (PSTN) and/or SCADA.	145	Jul-09	ongoing process	NIL	100	105	Accuracy of metering data and grid code complaince	29

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	Strengthening of TSG Centre for Grid System Operations and Maintenance.	Up gradation of GSO operation Training Simulator to include 765kV, 500kV, ±660kV HVDC, Solar Power System and wind Power System Preparation of Scenarios for Simulator Trainings Additional Scope of the Project: Study, Investigate and Recommend Countermeasure to prevent Blackout on Guddu Power Station incident on 09.01.2021 Training of Trainers at Japan of 10 Nos. TSG/GSO Training Instructors/ Experts Provision of 32 Nos. PC Type GSO Simulators Provided at different Grid Stations of NTDC Pakistan	Improvements in skills of trainees ·Practical Knowledge through GSO and P&I Simulators ·Practical Knowledge through Training Purpose Model Grid Station ·GSO Simulators are the part of Training Courses that are being imparted at TSG Training Centre i.e. Technical Induction Training Program, Technical Refresher Courses, Sector Specific Courses, Promotion Criteria Courses of Grid Operation and Maintenance, Protection and Instrumentation, Transmission lines, Skill Enhancement courses of P&I and Grid Maintenance and Operation Staff and other Short Courses. ·TSG training Capacity enhanced. ·32Nos. of PC Type GSO Simulator are handed over to different grid stations	22	11.06.2021	Dec-23	NIL	99	98	Capacity building measures	

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			for improvement of O&M on job training practices. Last AEC/JICA team visit is expected to be scheduled in November 20								
	LOAD Dispatch Upgradation Project LDSUP	• Installation & Commissioning of new Remote Terminal Units (RTUs) at NTDC/WAPDA GENCO stations. • Interfacing of existing RTUs at IPPs through Protocol Converters (Software) • Replacement of old Supervisory Control and Data Acquisition (SCADA) System at NPCC, Islamabad. • Construction of residential accommodation for NPCC staff	Up-gradation/extension of old Telecom System with new state of the art system including laying of Optical Ground Wire (OPGW) on existing transmission lines and integrated Telephone System.	32	Contract date 31-03-2010 Substantial TOC Issued 14-09-2014	Settlement agreement signed for the closure of the said project on 15-06-2023 after the approval of BOD NTDC now the expected completion date September 2024.	YES, PC-I to be revised / PC-IV to be submitted	85	160	Cost over run	0

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