"IN THE NAME OF ALLAH MOST GRACIOUS MOST MERCIFUL"

صلی اللہ علی سیدنا محمد

وآلہ وسلم

کی محمدؐ سے وفا تو نے تو ہم تیرے ہیں

یہ جہاں چیز ہے کیا لوح و قلم تیرے ہیں

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

FY 2023-2025

Dated 22nd & 23rd November 2023

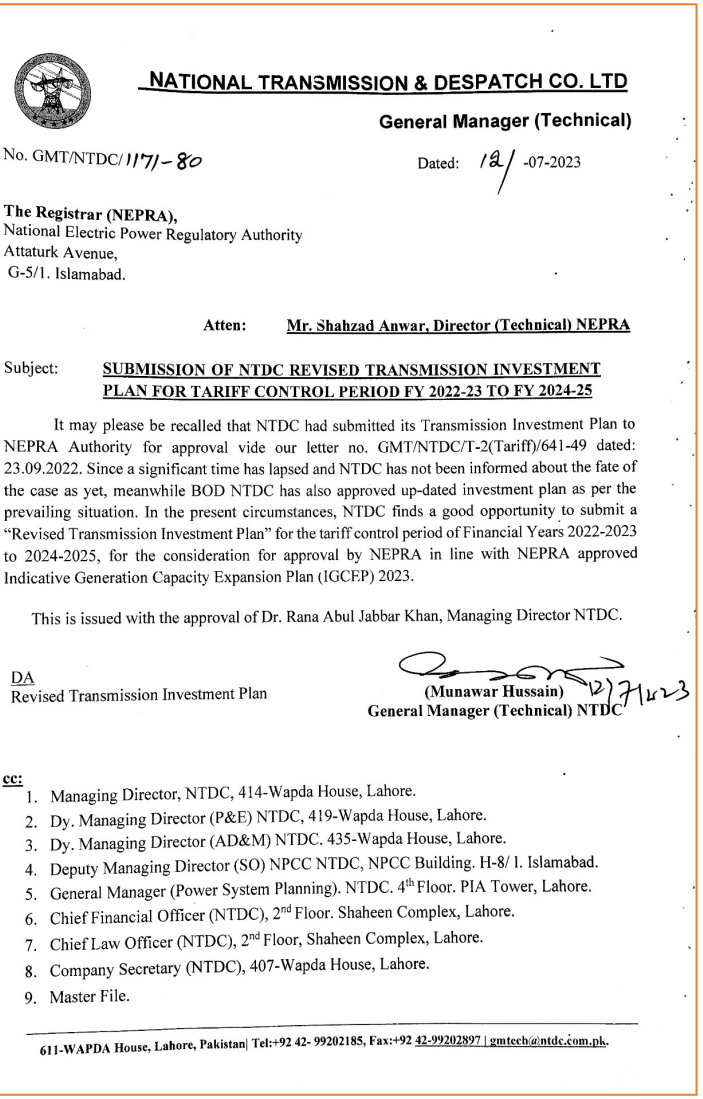
SEQUENCE OF PRESENTATION

1	NTDC Revised Transmission Investment Plan FY 2023-2025	
	(i)	Statuory Provisions and Importance
	(ii)	Timeline of Submission
	(iii)	Salient Features
	(iv)	NTDC Network Statistics and Outlook
	(v)	Transmission Investment Plan Process
	(vi)	Categorization – "*Project Type*", "*Province-wise*" & "*Major Funding Source*"
2	Issues Framed by NEPRA	
3	Additional Submissions	

REVISED TRANSMISSION INVESTMENT PLAN FY 2023-25

AT A GLANCE

- NTDC Network Statistics and Future Outlook
- NTDC Transmission Investment Plan Process
- Status of IGCEP and NTDC TSEP
- NTDC Investment Plan Projects as approved by BoD NTDC
  - Categorization *By Project Type*
  - Categorization *By Major Source of Funding*
  - Categorization *By Province*
- NTDC Investment Plan Project Profiles/Briefs
- NTDC Human Resource Improvement Plan
- Losses Improvement Plan (Subject to Consultant Study)



NATIONAL TRANSMISSION & DESPATCH CO. LTD

General Manager (Technical)

No. GMT/NTDC/1171-80 Dated: 12/ -07-2023

The Registrar (NEPRA),
National Electric Power Regulatory Authority
Attaturk Avenue,
G-5/1. Islamabad.

Atten: Mr. Shahzad Anwar, Director (Technical) NEPRA

Subject: **SUBMISSION OF NTDC REVISED TRANSMISSION INVESTMENT PLAN FOR TARIFF CONTROL PERIOD FY 2022-23 TO FY 2024-25**

It may please be recalled that NTDC had submitted its Transmission Investment Plan to NEPRA Authority for approval vide our letter no. GMT/NTDC/T-2(Tariff)/641-49 dated: 23.09.2022. Since a significant time has lapsed and NTDC has not been informed about the fate of the case as yet, meanwhile BOD NTDC has also approved up-dated investment plan as per the prevailing situation. In the present circumstances, NTDC finds a good opportunity to submit a "Revised Transmission Investment Plan" for the tariff control period of Financial Years 2022-2023 to 2024-2025, for the consideration for approval by NEPRA in line with NEPRA approved Indicative Generation Capacity Expansion Plan (IGCEP) 2023.

This is issued with the approval of Dr. Rana Abul Jabbar Khan, Managing Director NTDC.

DA
Revised Transmission Investment Plan

(Munawar Hussain) 12/7/2023
General Manager (Technical) NTDC

cc:
1. Managing Director, NTDC, 414-Wapda House, Lahore.
2. Dy. Managing Director (P&E) NTDC, 419-Wapda House, Lahore.
3. Dy. Managing Director (AD&M) NTDC. 435-Wapda House, Lahore.
4. Deputy Managing Director (SO) NPCC NTDC, NPCC Building. H-8/ I. Islamabad.
5. General Manager (Power System Planning). NTDC. 4th Floor. PIA Tower, Lahore.
6. Chief Financial Officer (NTDC), 2nd Floor. Shaheen Complex, Lahore.
7. Chief Law Officer (NTDC), 2nd Floor, Shaheen Complex, Lahore.
8. Company Secretary (NTDC), 407-Wapda House, Lahore.
9. Master File.

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STATUORY PROVISIONS AND IMPORTANCE

LICENSE OBLIGATION	**NTDC LICENSE (MODIFICATION-III 2023)**
	• ARTICLE 3.2(D) – **FUNCTIONS OF LICENSEE**
	• ARTICLE 36 – **INVESTMENT PROGRAMMES**
TARIFF REQUIREMENT	**NEPRA UoSC GUIDELINES SRO 241 (I)/2017 DATED 6TH APRIL 2017**
	• SECTION 3.5 – **PRE-REQUISITE FOR NTDC TARIFF PETITION**
	• SECTION 6.2(G) – **INFORMATION REQUIREMENTS FROM NTDC**
REGULATORY COMPLIANCE	**NEPRA GRID CODE 2023 (PLANNING CODE)**
	• CLAUSE 2.2.(E) – **RESPONSIBILITY OF TNO**
	• CLAUSE 4.4 – **INTEGRATED SYSTEM PLANNING**

NATIONAL TRANSMISSION & DESPATCH COMPANY LIMITED

NTDC FY23-25 TIP SUBMISSION TIMELINE

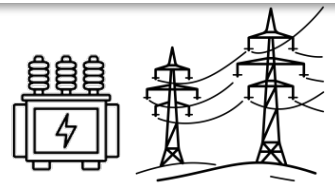
Sr.No.	Milestone	Date(s)
1	Initial Investment Plan FY23-25 Submission	**29-06-2022**
2	Re-submission after NEPRA observations	**23-09-2022**
3	1st Public Hearing by Authority	**14-12-2022**
4	Consultations with Provincial Energy Depts	**19-12-2022 to 26-12-2022**
5	2nd Public Hearing by Authority	**02-01-2023**
6	Final Submission of Revised NTDC TIP FY23-25	**12-07-2023**
7	**Pre-Hearing Consultative Session by Authority**	**20-11-2023**
8	**3rd Public Hearing by Authority**	**22-11-2023 to 23-11-2023**

REVISED TRANSMISSION INVESTMENT PLAN FY 2023-25

99
Projects

Addition of
35,000 MVA
Transformation Capacity

55%
Increase in
Transformation Capacity



510
Billion Rupees
Investment Outlay

Addition of
6,500 km
Transmission Lines

30%
Increase in
Transmission Lines Length

NTDC NETWORK STATISTICS AND FUTURE OUTLOOK

Category	Grid Stations (Nos.)	Transmission Lines (km)	Transformation Capacity (MVA)
Existing System (June 2023)			
500 kV	19	8,825	25,950
220 kV	50	11,672	37,190
±660 kV HVDC	-	2 x 886	-
Total	**69**	**22,269**	**63,140**
Future System (June 2026)			
765 kV	2	508	3,600
500 kV	26	11,121	41,050
220 kV	68	15,295	54,880
±660 kV HVDC	-	2 x 886	-
±500 kV HVDC	-	2 x 113	-
Total	96	28,922	99,530

NTDC TRANSMISSION INVESTMENT PLAN PROCESS

For preparing the NTDC Transmission Investment Plan, NTDC is required to study the financial implications of a baseline scenario developed under TSEP for bulk transmission network expansion to evacuate power from generation facilities proposed in the IGCEP, to meet load demand of DISCOs & bulk consumers, to improve system stability and to import/export with other TNOs/countries. General best practice process is as follows:

DEMAND LOAD FORECAST

(In co-ordination with DISCOs)

→

INDICATIVE GENERATION CAPACITY EXPANSION PLAN

(IGCEP)

→

TRANSMISSION SYSTEM EXPANSION PLAN

(TSEP)

→

TRANSMISSION INVESTMENT PLAN

(TIP)

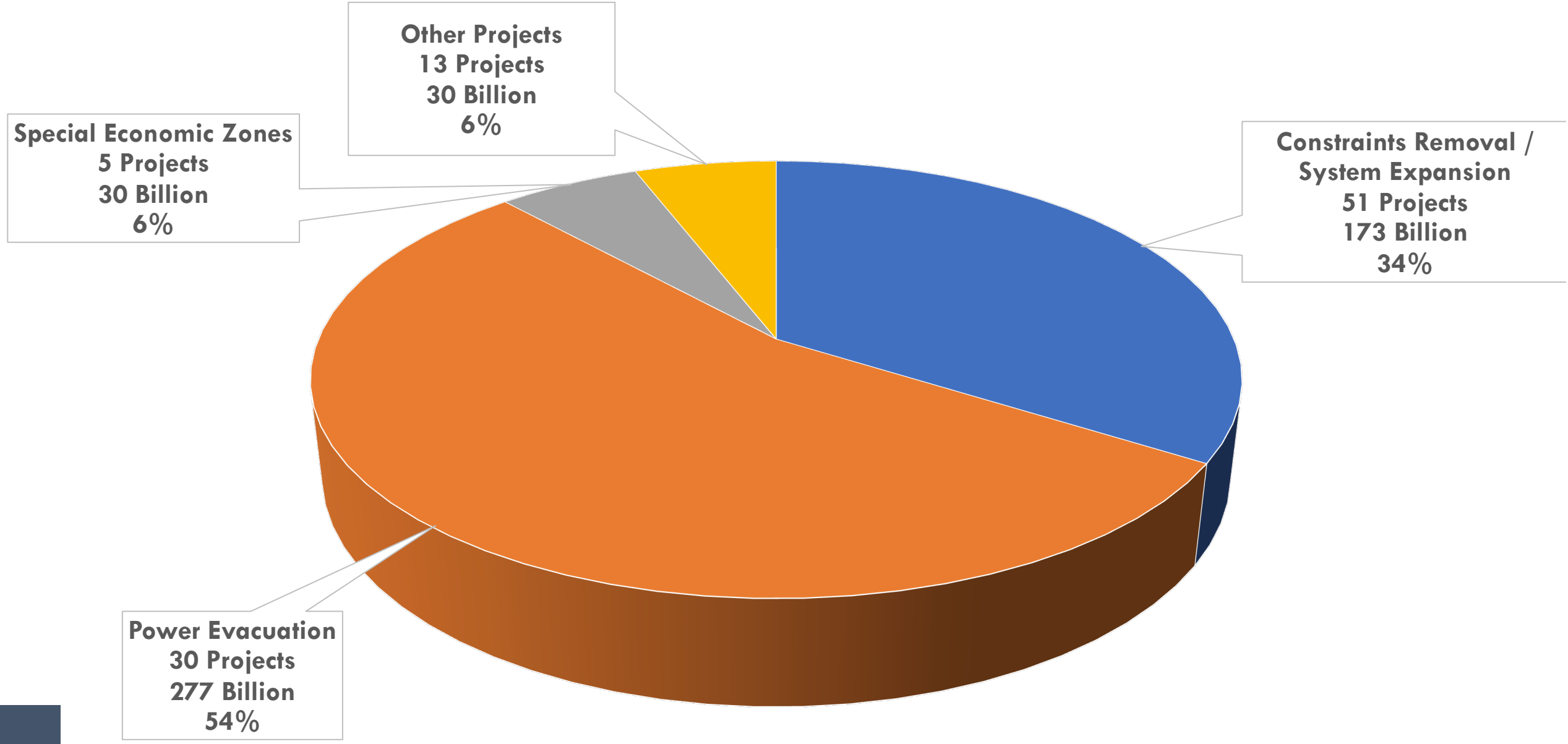
STATUS OF IGCEP AND TSEP

With the use of state-of-the-art generation planning and optimization tools, adherence to global best practices, IGCEP 2022-31 was submitted to NEPRA on 20th Sep 2022. The revised IGCEP, after incorporation of comments received during NEPRA hearing, was submitted to NEPRA on 2nd December 2022. Subsequently, IGCEP 2022-31 was approved by NEPRA on 1st February 2023.

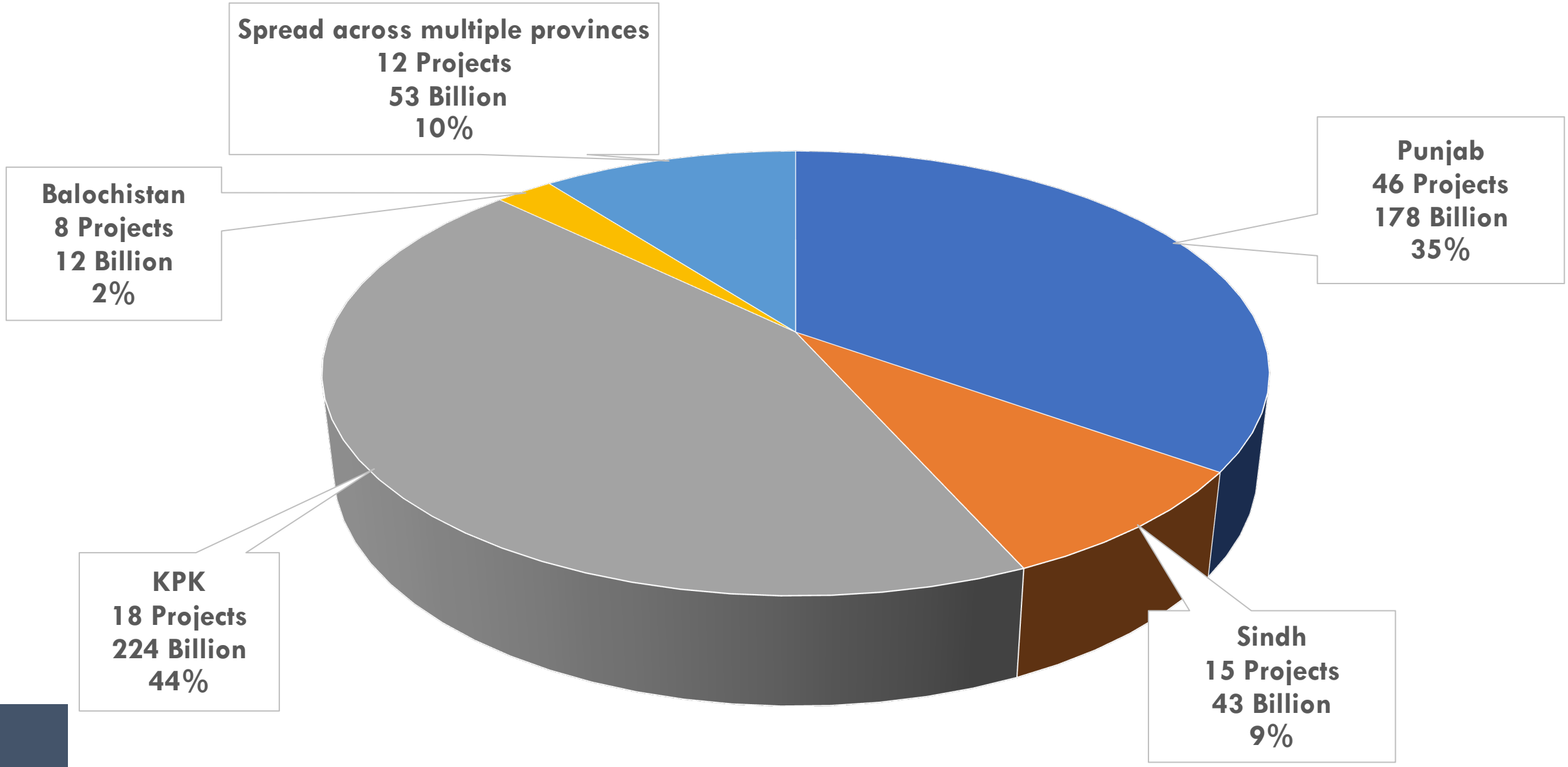
Subsequently, TSEP 2022 Phase-1 was submitted to NEPRA on 30th Nov 2022. During approval of IGCEP on 1st Feb 2023, NEPRA directed to submit TSEP for next 10 years in line with next iteration of IGCEP.

SR. NO.	MILESTONE	DATE
1	IGCEP 2022-31 SUBMISSION	20-09-2022
2	REVISED IGCEP 2022-31 SUBMISSION	02-12-2022
3	TSEP PHASE-I SUBMISSION	30-11-2022
4	IGCEP 2022-31 APPROVAL	01-02-2023

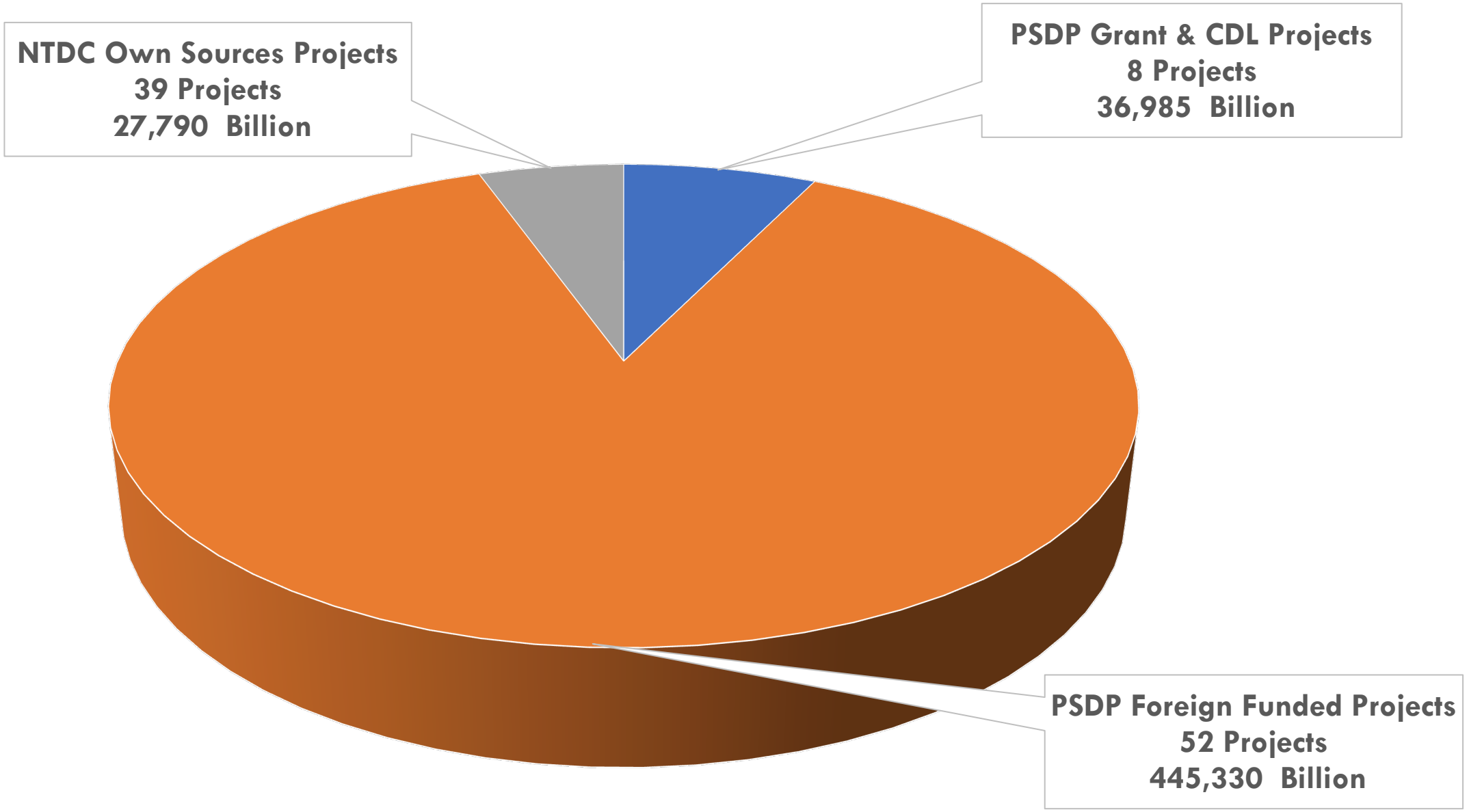
PROJECTS IN NTDC REVISED TIP FY23-25 (BY TYPE)



PROJECTS IN NTDC REVISED TIP FY23-25 (BY PROVINCE)



PROJECTS IN NTDC REVISED TIP FY23-25 (BY FUNDING SOURCE)



NTDC
REVISED TRANSMISSION INVESTMENT PLAN

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2. ISSUES FRAMED BY NEPRA

ISSUES FRAMED BY NEPRA

i	Whether proposed investment takes into account Demand Forecast of DISCOs.
ii	Whether Investment Plan has Constraint Removal Schemes. NTDC to provide firm timelines.
iii	Whether NTDC has prioritized critical projects and their investment requirements.
iv	NTDC to brief Authority regarding projects delay due to RoW issues.
v	Whether cost over-run of 180,382 Million in 42 projects justified. NTDC to explain reasons.
vi	Whether NTDC has included investment for technological advancements.
vii	Whether 3rd party study regarding T&T losses has been completed. NTDC to apprise timelines.
viii	Whether 3rd party audit for evaluation of proposed projects conducted by NTDC.
ix	Whether objections by DISCOs, Provinces, and other stakeholders addressed.
x	Whether investment allowed in previous financial years fully utilized.

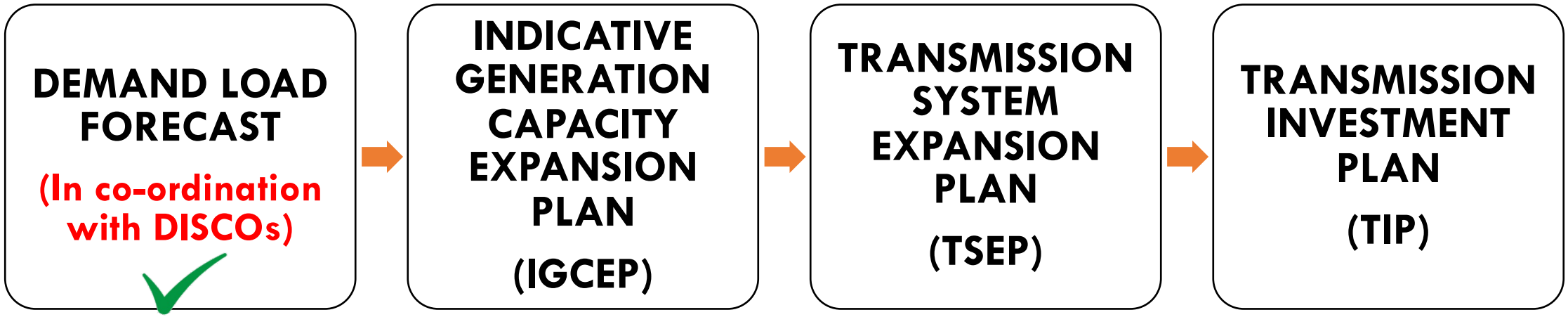
ISSUES FRAMED BY NEPRA

xi	Whether investment of 30,269 Million for SEZ is justified.
xii	Whether investment of 6,616 Million for land acquisition of solar plants is justified.
xiii	Whether investment of 335,098 Million for PSDP funded ongoing projects is justified.
xiv	Whether investment of 110,232 Million for PSDP funded new projects is justified.
xv	Whether investment of 15,340 Million for Self-Financed ongoing projects is justified.
xvi	Whether investment of 4,255 Million for completed projects via PSDP/Own Resources is justified.
xvii	Whether investment of 8,195 Million for completed works via foreign funding is justified.
xviii	NTDC to provide project-wise rationale, and techno-commercial benefits in terms of MVA addition, reliability & continuity of supply etc. against requested investment.

ISSUE # 1

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

- **YES**, as explained in earlier slides, NTDC Transmission Investment Plan is based on the Transmission System Expansion Plan (TSEP) in which all proposed projects are technically justified.
- During preparation of Transmission System Expansion Plan (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.



ISSUE # 2

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.

- **YES**, NTDC Transmission Investment Plan certainly comprises of Constraint Removal Schemes.

a. NTDC Projects for Removal of **Important NTDC Constraints** and their indicative completion timelines are shown in next slides.

   i. **500kV Gatti**
   ii. **500kV Muzaffargarh**
   iii. **500kV Multan**
   iv. **220kV Sarfaraz Nagar**
   v. **Under-utilization of HVDC/Unable to Dispatch existing Power Plants in/from South**

b. Due to operational dependencies (variation patterns in generation fuel cost, fuel mix, and the actual dispatch of generation), the exact financial impact of system constraint cannot be pre-determined with certainty.

PROJECTS FOR REMOVAL OF IMPORTANT SYSTEM CONSTRAINTS

Constraint Type : Overloaded 500/220kV Auto Transformers				
Sr. #	**Grid Station/ Circuit**	**Equipment under Constraint**	**NTDC Constraint Removal Project**	**Timeline / Remarks**
1	**500kV Gatti Grid Station**	500/220kV (4x450MVA) Auto T/Fs Overloading	**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.
			2nd Source of Supply to Jaranwala Road Faisalabad	G/S Extension : June, 2025 T/L : December, 2025

PROJECTS FOR REMOVAL OF IMPORTANT SYSTEM CONSTRAINTS

Constraint Type : Overloaded 500/220kV Auto Transformer				
Sr. #	**Grid Station/ Circuit**	**Equipment under Constraint**	**NTDC Constraint Removal Project**	**Timeline / Remarks**
2	**500kV Muzaffargarh Grid Station**	500/220kV (2x600MVA) Auto T/Fs Overloading	**Upgradation of Vehari from 220kV to 500 kV level.**	June, 2026

Note 1:	**In presence of 500 MW KAPCO, there will be no constraint at 500kV Muzaffargarh. This constraint is due to pendency in KAPCO generation extension coming online, for which NTDC is not at fault.**
Note 2:	**Other Solution for Muzaffargarh constraints: 3rd 600 MVA, 500/220 kV T/F at Muzaffargarh along with reactive power compensation which shall be examined in TSEP 2024.**

PROJECTS FOR REMOVAL OF IMPORTANT SYSTEM CONSTRAINTS

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

Note 1:	**With the addition of 3rd 450 MVA ATB at Multan in July 2022, the severity of the constraints has reduced. The above constraint will be overcome with the above projects.**
Note 2:	**In presence of KAPCO generation, there will be no constraint at 500kV Multan. This constraint is due to pendency in KAPCO generation extension coming online, for which NTDC is not at fault.**

PROJECTS FOR REMOVAL OF IMPORTANT SYSTEM CONSTRAINTS

Constraint Type : Overloaded 220/132 Auto Transformer

Sr. #	Grid Station/ Circuit	Equipment under Constraint	NTDC Constraint Removal Project	Timeline / Remarks
4	**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 it 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

Note 1:	**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 220kV G/S at Kasur. Both options shall be studied in TSEP 2024.**

PROJECTS FOR REMOVAL OF IMPORTANT SYSTEM CONSTRAINTS

Constraint Type : Overloaded 500kV Transmission Line / Underutilization of HVDC			
Sr. #	**Constraint Description**	**NTDC Constraint Removal Project**	**Timeline / Remarks**
5	**Unable to Dispatch existing Power Plants in/from South** **-** **Underutilization of HVDC**	• 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 Link from Jhimpir-II to KE thru Dhabeji	• *June, 2024. Scope of K-Electric*

SUMMER 2023 vs SUMMER 2024 – IMPROVEMENT IN OFFTAKE OF GENERATION FROM/IN SOUTH

LINK TO DETAILS OF OTHER PROJECTS FOR REMOVAL OF NTDC SYSTEM CONSTRAINTS

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 situation of the country.

- All the projects included in the NTDC Transmission Investment Plan are **critical** and required against the years mentioned in the plan.
- Investment Plan includes following transmission projects of critical nature:
  - ✓ Power evacuation schemes for upcoming generation projects
  - ✓ System reinforcement/expansion for constraints removal & to meet future load demand
  - ✓ System stability improvement and dynamic voltage support

NTDC Transmission Investment Plan is based on the Transmission System Expansion Plan (TSEP) which is prepared in line with Integrated Generation Capacity Expansion Plan (IGCEP), both of which have a ***specified procedure regarding selection of projects.***

ISSUE # 4

NTDC is required to brief the Authority regarding projects delayed due to Right of Way (RoW) issues along with the financial implications incurred to national exchequer. Moreover, NTDC to submit way forward to mitigate the RoW issues.

RIGHT OF WAY CHALLENGES
- Resistance in construction activities by Project Affected People (PAP)
- No compensation policy in past for the land under the towers and the corridor.
- Compliance with social safeguards requirements of International Financing Institutions (IFIs)
- Insufficient & impracticable compensations of WAPDA Composite Schedule Rates (WCSR) in past
- Inadequate & Outdated Legal Cover for dealing with Land Acquisition & Right of Way Issues

CONSEQUENTIAL EFFECT ON NTDC PROJECTS
Delay in project completion resulting in
- Imposition of Penalties / Liquidated Damages
- Loan issues with the lenders / IFIs
- De-mobilization of contractors & re-bidding
- **Project Cost-overun**

ISSUES PERTAINING TO RIGHT OF WAY IN NTDC PROJECTS

FINANCING ISSUES	Arrangement of Financing for Projects
	Increase in Exchange Rates & Inflation (Oil Prices, LME Rates, Land Rates)
	Interest during construction (IDC)
LITIGATION ISSUES	**Severe Right of Way issues for T/L Projects**
	Land Acquisition Issues for G/S Projects
PROJECT/ CONTRACT ISSUES	Increase in Scope of Project
	Disputes with Contractors and/or Subcontractors
OTHER ISSUES	Security Issues
	Force-Majure Issues (COVID-19, Floods, Earthquake)
	International Sanctions

Note:	Financial Implication of RoW issues in NTDC Projects is reflected in corresponding Project Cost-Overun details.

NTDC EFFORTS TO MITIGATE RIGHT OF WAY ISSUES IN NTDC PROJECTS

DRAFT LEGISLATION : TRANSMISSION OF ELECTRICITY (RIGHT OF WAY) BILL
- A **draft bill/law** has been prepared by Law Directorate NTDC by including all the suggestions and covering other issue also such as Railways / National Highways / Motorways crossings etc.
- The said draft has been sent to the Ministry of Energy to be presented in the legislature to pass as law, and the same is pending legislation.
- NTDC is constantly making efforts to get the said draft passed, once new legislature is in session to resolve this issue effectively.

DRAFT OF THE PROPOSED LEGISLATION

COMPENSATION POLICY FOR RIGHT OF WAY & LAND ACQUISITION

NEW "NTDC Compensation Policy for RoW & Land Acquisition" has been approved by BoD NTDC.

SALIENT FEATURES OF NEWLY APPROVED POLICY		
1	**ALIGNMENT WITH REQUIREMENTS OF IFIs**	
2	**RESETTLEMENT ALLOWANCES BOTH FOR G/S AND T/L including:**	
	-	**Vulnerability Allowance**
	-	**Shifting/Transport/Relocation Assistance**
	-	**Business Interruption Allowance**
	-	**Severe Impact Allowance**
3	**DEVELOPMENT OF NEW SOPs**	
4	**ONE-TIME ADDITIONAL COMPENSATIONS FOR TRANSMISSION LINES**	

Sr. No.	NAME OF TL/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
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

RIGHT OF WAY ISSUES IN NTDC PROJECTS

In the following projects, severe Right of Way (RoW) issues are expected.

During survey work locals fully equipped with weapons held the staff hostage and later released. Remaining work was carried out with help of police.

Sr. No.	Name of TL/Project facing RoW Issues
1	220kV T/L from Mohmand Dam to Nowhsehra
2	220kV T/L from Mohmand Dam to Jamrud

ISSUE # 5

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.

- NEPRA has calculated 180 Billion cost-overrun in 42 projects. However, after **careful indexation of Foreign Exchange Component in PC-I Cost of NTDC Projects,** and **consideration of revision in PC-I,** the actual cost-overrun is **27.6 Billion,** against which project-wise details is given. (which is due to various factors **beyond NTDC's control**)

- Cost Overrun calculation includes the following factors:
  - Cost-overrun in completed old projects [PC-I approvals 2005-2011. **$ escalation >200%**]
  - Cost-overrun in recent projects [PC-I approvals in 2016-2018. **$ escalation >100%**]
  - Cost-overrun due to future projected expenditure on Projects on **which work has yet to be started, and PC-I is under revision/revised.**

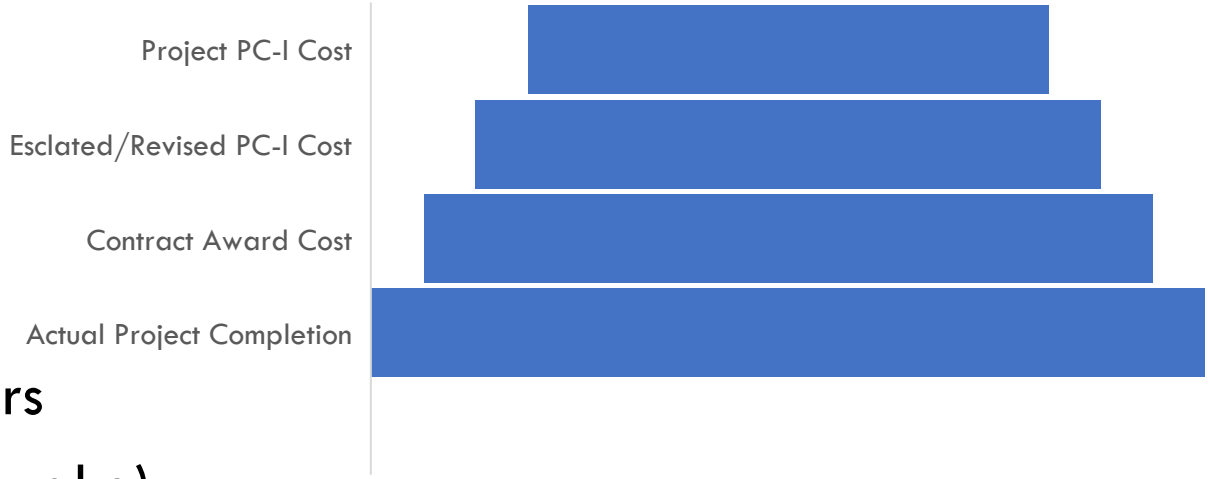
Overall NTDC Projects Cost Overrun is 27.6 Billion which is < 5.4% of the total NTDC revised TIP outlay of 510 Billion!

SUMMARY OF COST OVERRUN IN NTDC PROJECTS

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**

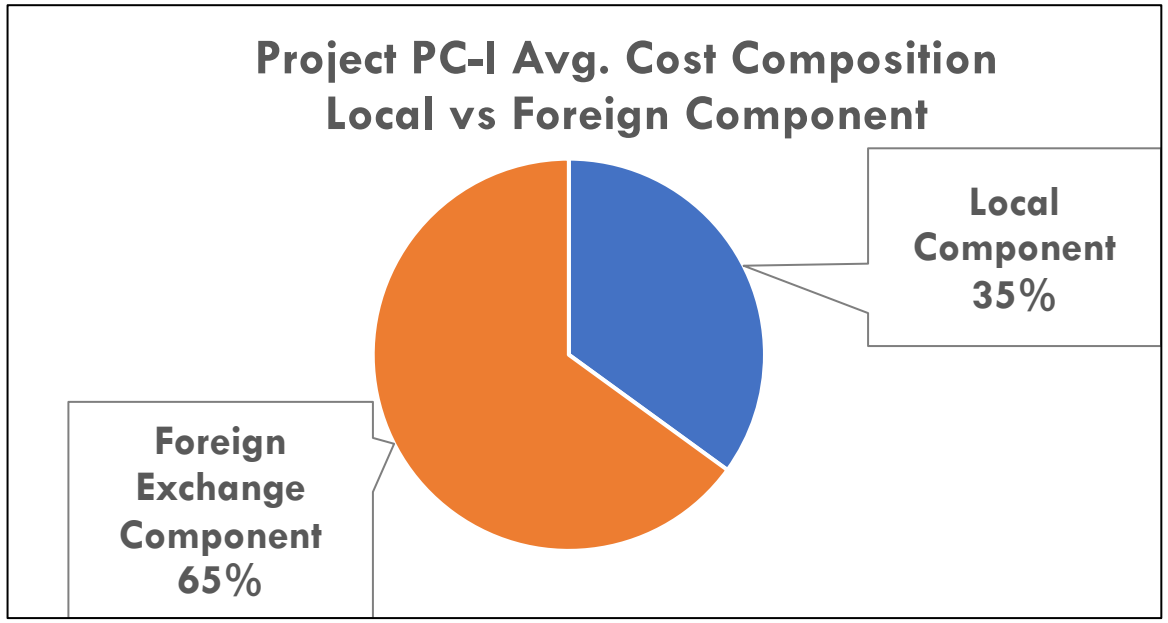
GENERAL REASONS FOR COST-OVERRUN IN NTDC PROJECTS

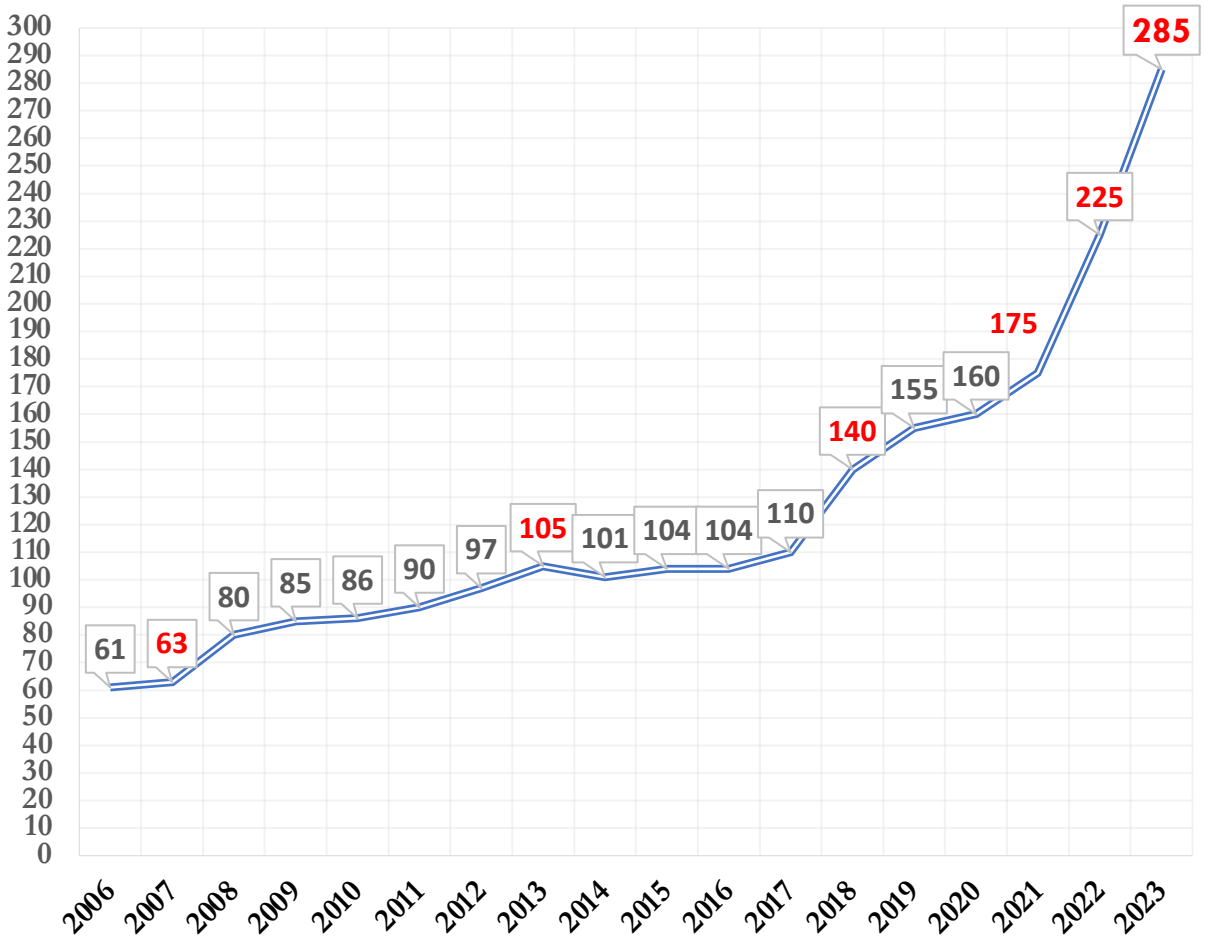
1. Increase in exchange rates in recent years
2. Increase in Inflation in recent years (Oil Prices, LME Rates, Land Rates)
3. Severe Right of Way issues for T/L Projects (Change of Route)
4. Land Acquisition Issues for G/S Projects (Site Selection issues)
5. Arrangement of Financing for Projects
6. Security Issues
7. Litigation Issues
8. Increase in Scope of Project
9. Disputes with Contractors and/or Subcontractors
10. Force-Majure Issues (COVID-19, Floods, Earthquake)
11. Interest during construction (IDC)
12. International Sanctions



IMPACT OF CURRENCY DEVALUATION

- Approx. 65% foreign exchange component in PC-I Cost of NTDC Projects.
- USD to PKR trend has heavily impacted Project Costs:
  - 25% increase in recent 1-year
  - 75% increase in recent 3-years
  - 100% increase in recent 5-years
  - 167% increase in recent 10-years
  - 250% increase in recent 15-years





NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH NO COST OVERRUN AFTER REVISION OF PC-I

PROJECTS WITH NO COST OVERRUN AFTER REVISION OF PC-I

Sr. #	Name of Project	PC-I Cost (M PKR)		Expenditure projected upto 2024-25	Cost Overrun (M PKR) [Calculated by]		Remarks
		Original	Revised		NEPRA	NTDC	
1	500 kV Allama Iqbal Industrial City (AIIC) G/S for SEZ in the FIEDMC area	5,975.8	**18,462**	10,209	4,233	-	Submitted to Planning Commission
2	**500 kV → 765 kV Islamabad West**	**8,288.0**	**59,801**	**42,120**	**33,832**	**-**	**Submitted to MoE**
3	220 kV D.I. Khan - Zhob T/Line along with 220 kV Zhob G/S	6,878.5	**22,809**	14,448	7,569	-	PC-I under Revision
4	Installation of Pilot Battery Energy Storage System (BESS) at 220kV Jhampir G/Station	940.4	**5,703**	2,808	1,867	-	PC-I under Revision
5	220-kV Jamrud G/S alongwith allied T/Ls.	2,398.0	**18,256**	13,233	10,835	-	Under approval from BoD NTDC
6	220-kV Mastung G/S slongwtih allied T/Ls.	14,155.3	**25,732**	7,685	2,785	-	Under approval from BoD NTDC.
7	500kV Faisalabad West alongwith allied T/Ls	9,379.5	**20,813**	15,842	6,462	-	Under approval from BoD NTDC
	TOTAL				**67,583**	-	

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH NO COST OVERRUN AFTER FEC INDEXATION

PROJECTS WITH NO COST OVERRUN AFTER FEC INDEXATION

Sr. #	Name of Project	PC-I Cost (M PKR)			FEC Indexed PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [Calculated by]	
		Total	FEC	Exch. Rate			NEPRA	NTDC
1	220kV Haripur Substation	3,806.0	2,427.8	156.0	**5,827**	4,717	911	-
2	220 kV Quaid-e-Azam Apparel and Business Park (QABP) G/S for supply to PIEDMC SEZ	3,054.1	1,837.9	159.1	**4,517**	3,603	549	-
3	500kV HVDC Transmission System between Tajikstan and Pakistan (CASA-1000)	46,804.0	30,751.0	123.8	**87,055**	71,690	24,886	-
4	500-kV Lahore, North.	20,732.0	11,508.0	105.3	**40,452**	36,048	15,316	-
5	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations	16,526.0	11,986.6	104.7	**37,250**	25,022	8,496	-
6	220kV Mirpur Khas G/S alongwith allied T/Ls	3,857.0	1,854.7	106.0	**7,003**	3,980	123	-

PROJECTS WITH NO COST OVERRUN AFTER FEC INDEXATION

Sr. #	Name of Project	PC-I Cost (M PKR)			FEC Indexed PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [Calculated by]	
		Total	FEC	Exch. Rate			NEPRA	NTDC
7	Implementation of Integrated Solution to improve Productivity & Control in NTDC by ERP	2,583.1	1,390.6	105.5	**4,960**	3,625	1,041	-
8	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC	11,638.0	8,466.1	110 (EUR)	**26,752**	15,508	3,870	-
9	Feasibility study for enhancing the transmission capacity of NTDCs 500kV Transmission System by applying series compensation	133.2	106.83	103	**323**	193	59	-
	TOTAL						**55,250**	-

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH LESS THAN 15% COST OVERRUN

PROJECTS WITH LESS THAN 15% COST OVERRUN

Sr. #	Name of Project	Total PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun	
				M PKR	%
1	Evacuation of Power from 1224MW Wind Power Plants at Jhampir Clusters	10,752.6	12,064	1,312	**12.2%**
2	Provision of Secured Metering System at Delivery Point. (Local Bank)	1,009	1,099	90	**9.0%**
3	Traansmission Scheme for Dispersal of power from Neelam-Jehlum, Karot and Azad Patan Hydro Power Project	21,697	21,770	73	**0.3%**
4	Transmission Interconnection for Dispersal of Power From UCH-II Tranch-III	2,508	2,775	267	**10.6%**
5	220kV Chakdara S/S	4,397	4,539	142	**3.2%**
6	Evacuation of power from wind power projects at Jhimpir and Gharo Wind Clusters (Revised)	13,406	13,638	232	1.7%

PROJECTS WITH LESS THAN 15% COST OVERRUN

Sr. #	Name of Project	Total PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun	
				M PKR	%
7	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)	13,152	14,392	1,240	**9.4%**
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)	24,528	24,833	305	**1.2%**
9	Construction of New 220kV Guddu-Uch-Sibbi Single Circuit Transmission Line for Improvement of Power Supply System in South Areas	8,366.6	9,494	1,128	**13.5%**
	TOTAL			**4,789**	

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH LESS THAN 15% COST OVERRUN AFTER FEC INDEXATION

PROJECTS WITH <15% OVERRUN AFTER FEC INDEXATION

Sr. #	Name of Project	PC-I Cost (M PKR)			Escalated PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [NEPRA]	Cost Overrun [NTDC]	
		Total	FEC	Exch. Rate				M PKR	%
1	220kV Jauharabad G/S alongwith T/Ls.	2,961.0	1,758.0	112.1	**5,687**	5,984	3,023	298	5.2%
2	220kV Kamra G/S alongwith T/Ls.	3,232.0	1,834.9	145.7	**4,997**	5,151	1,919	155	3.1%
3	Evacuation of Power from K2/K3 Nuclear Power near Karachi (In/Out of 500kV Port Qasim to Matiari S/C and 500kV Hub to Matiari S/C at K2/K3).	7501	3782	105	**14,013**	14,546	7,045	**532**	4%
4	Evacuation of Power from 1320 MW Hub Power Company Ltd.	16,415	8,050	101.6	**20,646**	22,475	6,060	**1,829**	9%

PROJECTS WITH <15% OVERRUN AFTER FEC INDEXATION

Sr. #	Name of Project	PC-I Cost (M PKR)			Escalated PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [NEPRA]	Cost Overrun [NTDC]	
		Total	FEC	Exch. Rate				M PKR	%
5	500kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	4,086	2,620	104.62	**6,333**	6,857	2,051	523	8%
6	Improvement & Upgradation of Protection System to Avoid Frequent Trippings in South Areas	887	655	102.45	**1,027**	1,141	254	**114**	11%
	TOTAL						**20,351**	**3,667**	

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH LESS THAN 15% COST OVERRUN AFTER REVISION OF PC-I

PROJECTS WITH <15% OVERRUN AFTER REVISION OF PC-I

Sr. #	Name of Project	PC-I Cost (M PKR)		Expenditure projected upto 2024-25	Cost Overrun (M PKR) [NEPRA]	Cost Overrun [NTDC]		Remarks
		Original	Revised			M PKR	%	
1	Construction of 600 kV HVDC Transmission Line From Matiari to Lahore (Land Acquisition for Converter and Grounding Station - Both Ends) (CPEC)	1,568.0	**4,002**	4,359	2,791	**357**	**8.9%**	Revised PC-I submitted to MoE
2	220kV G/S at Ghazi Road, Lahore with 220 kV D/C T/Line 132kV Expansion System EDCF Loan No.PAK-2 & KFW	2,562	**5,664**	5,854	3,292	**190**	**3.5%**	Revised PC-I submitted to MoE
3	220kV Sub Station Lalian	1,581.0	**3,550**	4,014	2,433	**464**	**13%**	Under approval from BoD NTDC
	TOTAL				**8,517**	**1,012**		

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

PROJECTS WITH MORE THAN 15% COST OVERRUN

PROJECTS WITH >15% COST OVERRUN

Sr. #	Name of Project	PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [NTDC]	Cost Overrun (M PKR) [NEPRA]
		Total			
1	220 KV G/Station at Kassowal with 132kV Expansion System (World Bank Loan No. 7565-Pk, Credit No. 4463-PK & 4464-PK)	2,017	3,030	1,013	1,013
2	220kV G/S Mansehra Tranch-III	905	2,061	1,156	1,156
3	New 220kV G/Station at Khuzdar/220kV Dadu - Khuzdar D/C T/Line JICA Loan No. PK-56 ***(PC-I under Revision from MoE)***	**8,540**	12,417	**3,877**	9,516
4	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	20,193	23,546	3,353	3,353
5	Power Transmission Enhancement Project Tranch-I (19 Sub Projects of 500/220kV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290- PAK	12,617	17,397	4,780	4,780
6	220kV Nowshera S/S	1,876	3,124	1,248	1,248

PROJECTS WITH >15% COST OVERRUN

Sr. #	Name of Project	PC-I Cost (M PKR)	Expenditure projected upto 2024-25	Cost Overrun (M PKR) [NTDC]	Cost Overrun (M PKR) [NEPRA]
		Total			
7	Evacuation of power from 1320MW Power Plant at Sahiwal	1,115	2,081	966	966
8	Load Despatch System Upgradation Project (Phase-II)	2,895	4,642	1,747	1,747
Total		**44,519**	**68,297**	**18,139**	**23,778**

Individual project wise detailed justification of Cost Overrun is attached here. PDF Excel

ISSUE # 6

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.

- **YES, every NTDC Project** incorporates the implementation of best-suited technologies.
- NTDC Investment Plan includes different specific projects regarding mentioned technological advancements. Examples include:

1. **BATTERY ENERGY STORAGE SYSTEM AT 220kV JHAMPIR**
2. **STATIC VAR SYSTEM (SVS) AT 220kV QUETTA INDUSTRIAL & KHUZDAR**
3. **ENTERPRISE RESOURCE PLANNING (ERP)**
4. **SCADA-III**
5. **HVDC TECHNOLOGY**

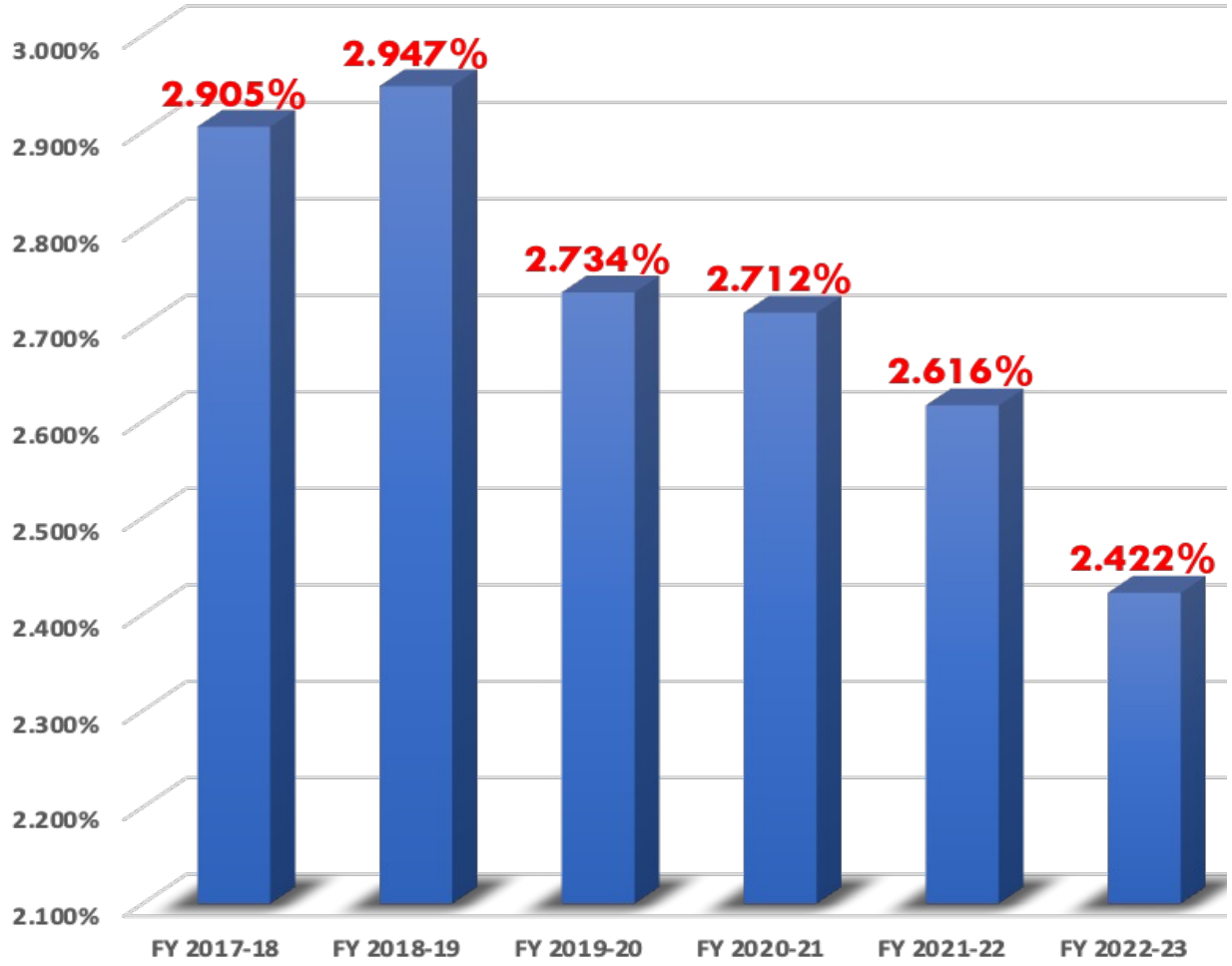
ISSUE # 7

Whether the 3rd 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.

Sr. No.	Action Item	Tentative Completion Date/Status
1	Preparation of TOR	✓ **Completed**
2	Administrative Approval, Technical Sanction & Budget Allocation	✓ **Completed**
3	Preparation of Tender Document	December 2023
4	Publication of Tender Advertisement and Tender Opening	January 2024
5	Bids Evaluation & Approval for Acceptance of Tender	February 2024
6	Notification of Award	February 2024
7	Completion of Study	August 2024

TORs FILE LINK

NTDC T&T LOSSES STATISTICS (CDP-WISE CALCULATION)



Despite 30% increase in Network Loading & Inadequate Reactive Compensation at DISCOs end!

15% YoY Improvement in NTDC %T&T Losses in last 5 years

NTDC T&T LOSSES DETAILED SLIDES

ISSUE # 8

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

- For all proposed projects, PC-1 is approved from CDWP/ECNEC which can be considered as a 3rd party validation.
- Moreover, at the time of financing, donor agencies also conduct 3rd party validation for evaluation of the proposed projects.

ISSUE # 9

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

- **YES**, objections raised by DISCOs, Provinces and other stakeholders have already been addressed and replies have been given in different meetings held with different stakeholders.
- Detailed NTDC response to different stakeholders' queries is attached in the presentation.

CONSULTATIVE SESSIONS WITH PROVINCIAL ENERGY DEPTS & DISCOS

- As per the directions of Authority in the previous Hearing of NTDC Transmission Investment Plan, a series of consultative sessions were held between NTDC, Provincial Energy Departments, PGCs, and DISCOs under the umbrella of NEPRA team through online meetings.

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

- 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.
- Written Comments and Observations of Provincial Energy Departments + DISCOs were invited and NTDC responses are attached.

ISSUE # 10

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

- **It is apprised that Investment for FY2020 and FY2021 was trued-up by Authority.**
- **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."

- **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."

ISSUES # 11 – 17 & 18

11. Whether claimed investment of Rs. 30,269 Million for Special Economic Zones (i.e. Dhabeji, Swabi, Haripur, Lahore and Faisalabad) are justified.
12. Whether claimed investment of Rs. 6,616 Million for land acquisition of solar power plants in Muzafargarh, Jhang and Layyah are justified.
13. Whether claimed investment of Rs. 335,098 Million for PSDP funded ongoing works related to power evacuation and load growth projects are justified.
14. Whether claimed investment of Rs. 110,232 Million for PSDP funded new works related to power evacuation and load growth projects are justified.
15. Whether claimed investment of Rs. 15,340 Million for Self-Financed ongoing scheme are justified.
16. Whether claimed investment of Rs. 4,255 Million for completed works through Own Resources are justified.
17. Whether claimed investment of Rs. 8,195 Million for completed works through foreign funding are justified.
18. **Petitioner must provide 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.**

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS

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

- **Increase in system capacity** for removal of transmission system constraints and for meeting future load demand.
- **Reduction in loading** of the transmission lines and transformers at/in the vicinity of the proposed projects.
- **Improvement in the voltage profile** of the substations.
- **Reductions in transmission system losses.**
- **Increase in NTDC Revenue**

Other Benefits include : SCADA Implementation, ERP Modernization, Skill Enhancement.

QUANTIFICATION OF TECHNO-COMMERCIAL BENEFITS

1. **Project Cost:**
   a) Investment/capital cost
   b) Annual O&M Cost
2. **Project Benefits:**
   a) Power Flow per Annum (as per load flow studies) in first year.
   b) Incremental flow in subsequent years upto project life of 40 years as per load growth rate upto max. allowable loading capacity of T/F.
   c) Revenue per annum on the basis of power flow using the latest rate of UoSC determined by NEPRA as follows:
      i. Fixed UoSC (@ Rs. 235.30/kW/month)
      ii. Variable UoSC @ Rs. 0.22/kWh by using System Load Factor
3. Net Project Benefit is calculated on yearly basis by subtracting Project Cost from Project Benefit.
4. IFRR is calculated using total Benefit for Project life of 40 years using discount rate of 10%.

QUANTIFICATION OF TECHNO-COMMERCIAL BENEFITS

WORKING OF INTERNAL FINANCIAL RATE OF RETURN

VARIATION IN IRR:

- IRR depends on investment cost and power flow which varies due to scope of work.
- 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.

SAMPLE IRR CALCULATIONS:

- 250MVA T/F @ RYK G/S
- 220kV Arifwala G/S
- 750MVA T/F @ Faisalabad West G/S

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

TECHNOCOMMERCIAL BENEFITS OF PROJECTS (PUNJAB)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
4	220 kV Quaid-e-Azam Apparel and Business Park (QABP) Grid Station for Provision of Electricity to PIEDMC SEZ	• To cater load demand of QABP up to 240 MW • IFRR = 23.7 % • Annual benefits per annum = 1033.47 MRs.
5	500 kV Allama Iqbal Industrial City for 600 MW Demand of the Special Economic Zone in the FIEDMC area	• To cater load demand of FIEDMC and AIIC up to 600 MW • IFRR = 17.34 % • Annual benefits per annum = 1763.03 MRs.
11	500 kV Lahore North.	• Power dispersal from coal power projects of South from HVDC T/L • Reduction in loading of 500/220 kV transformers of Lahore, Gujranwala & Lahore South and 220/132 kV transformers of Lahore & Gujranwala • Improvement in Voltage Profile = 2.8% to 4.6% • Reduction in Transmission Losses = 36.6 MW • IFRR = 10.60 % • Annual benefits per annum = 2656.47 MRs. • ProjectBriefs/11-LahoreNorth.pdf

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
13a	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Stations (220 kV Daud Khel, 220 kV Islamabad University, 500 kV Nokhar, 220 kV NKLP, 220 kV WAPDA Town, 220 kV Ludewala, 220 kV Bahawalpur, 220 kV Multan, 500 kV Lahore (Sheikupura) 500 kV Multan, 220 kV Ghakkar, 220 kV Sangjani, 220 kV Sammundari Road, 220 kV Vehari)	• Reduction in loading of existing 500/220 & 220/132 kV transformers in NTDC system • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 38.17 % • Annual benefits per annum = 8650.66 MRs. • ProjectBriefs/13a-Enhancement.pdf
14	500 kV Islamabad West	• 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-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. • ProjectBriefs/14-IslamabadWest.pdf

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
16	220 kV Jauharabad G/S alongwith allied T/Ls. ProjectBriefs/16-Jauharabad.pdf	• Reduction in 220/132 kV transformer loading at Ludewala • Improvement in voltage profile = 1.8% to 11.7% • Reduction in transmission losses = 12.3 • IFRR = 23.7 % • Annual benefits per annum = 1099.93 MRs.
18	220 kV Transmission System Network Reinforcement in Islamabad & Burhan	• Power Evacuation of Tarbela 4th Extension • Reduction in loading of Tarbela-Burhan-ISPR 220 kV lines by 61%. • Reduction in Transmission Losses = 17.4 MW • IFRR = 13.47 % • Annual benefits per annum = 543.17 MRs.
19	Conversion from 220kV Substations at Bund Road, Kala Shah Kaku, Ravi and Nishatabad to GIS Technology	• The life cycle of the GIS equipment is more as compared to AIS • It is maintenance free • Reduction in trippings • IFRR = 20.54 % • Annual benefits per annum = 1192.21 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
26	220 kV Dharki - Rahim Yar Khan - Bahawalpur D/C T/L.	• Additional source of supply to 220 kV Bahawalpur & Lal Suhanra Grid Station • The proposed project will provide the re-synchronization of the NTDC network during collapse due to severe bad weather conditions • Improvement in system reliability of NTDC, HESCO and MEPCO • IFRR = 11 % • Annual benefits per annum = 1517.45 MRs.
28	500 kV Chakwal G/S along with allied T/Ls ProjectBriefs/28-Chakwal.pdf	• Reduction in loading of 500/220 kV transformers of Rewat and 220/132 kV transformers of Rawat & Mangla • Improvement in Voltage Profile = 6.3% to 14.9% • Reduction in Transmission Losses = 23 MW • IFRR = 20.27 % • Annual benefits per annum = 2071.88 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
29a	Extension and Augmentation of existing 500 kV and 220 kV Grid Stations (New) At Faisalabad West, RY.Khan, Multan and Lahore (Sheikhupura) ProjectBriefs/29a-Extension.pdf	• Reduction in transformer loading • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 20.7 % • Annual benefits per annum = 699.45 MRs.
30	220 kV Arifwala Substation ProjectBriefs/30-Arifwala.pdf	• 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 • IFRR = 10 % • Annual benefits per annum = 1164.31 MRs.
31	500 kV Sialkot Substation ProjectBriefs/31-Sialkot.pdf	• 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 • IFRR = 9.7 % • Annual benefits per annum = 3728.91 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
32	Upgradation of Existing 220 kV Vehari Substation to 500 kV Vehari Substation ProjectBriefs/32-Vehari.pdf	• Reduction in loading at 500/220 kV T/F at Multan and 500/220 kV & 220/132 kV T/F at Yousafwala • Improvement in Voltage Profile = 3.1% to 7.4% • Reduction in Transmission Losses = 45.3 MW • IFRR = 16.78 % • Annual benefits per annum = 3894 MRs.
36	220 kV Gujranwala-II Substation ProjectBriefs/36-Gujranwala-II.pdf	• Reduction in 220/132 kV T/F loading at Nokhar, Ghakkar and Gujrat • Improvement in Voltage Profile by 2.5% to 3.4% • Reduction in Transmission Losses = 14 MW • IFRR = 8.3 % • Annual benefits per annum = 1331.07 MRs.
37	220 kV Nag Shah Grid Station (PC-1 has yet not been prepared, however, benefits have been provided based on preliminary analysis) ProjectBriefs/37-Nagshah.pdf	• Reduction in 220/132 kV Transformer loading at Muzaffargarh New, Multan and NGPS • Reduction in Transmission Losses = 7.8 MW • Improvement in Voltage Profile • IFRR = 15.68% • Annual benefits per annum = 2039.25 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
40	220 kV Punjab University Grid Station ProjectBriefs/40-PunjabUniversity.pdf	• Reduction in 220/132 kV transformer loading at NKLP, Bund Road G/S • Improvement in voltage profile = 1.0% to 1.8% • Reduction in transmission losses = 8.2 MW • IFRR = 21.6 % • Annual benefits per annum = 821.94 MRs.
41	500 kV Ghazi Brotha – Faisalabad West D/C T/L (PC-1 to be prepared)	• Removal of NTDC network constraints under N-1 contingency condition for reliable dispersal of power from Hydro Power Projects (HPPs) from Northern part of the country to the mid country load center during summer/High water season in future.
42	220 kV Head Faqirian G/S alongwith allied T/Ls. ProjectBriefs/42-HeadFaqirian.pdf	• Reduction in 220/132 kV transformer loading at Ludewala • Improvement in Voltage Profile =2% to 3.9% • Reduction in Transmission Losses = 10 MW • IFRR = 6.8 % • Annual benefits per annum = 556.86 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
44	220 kV Kamra G/S alongwith allied T/Ls ProjectBriefs/44-Kamra.pdf	• Reduction in 220/132 kV T/F loading at Burhan & Islamabad West • Improvement in Voltage Profile • Reduction in Transmission Losses = 6.3 MW • IFRR = 15.5% • Annual benefits per annum = 621.84 MRs.
45	500 kV Ludewala G/S along with 500 kV Nowshera –Ludewala – Faisalabad West D/C T/L	• PC-I to be prepared
46	Re-conductoring/Underground cabling of existing 220 kV Bund Road - NKLP D/C T/L (PC-I was not prepared as the project is proposed to be executed through O&M budget)	• Enhancement in transmission line capacity to cater future load demand
48	Re-enforcement of Sahiwal along with 2x500 kV Line Bays (PC-1 to be Prepared)	• To avoid voltage collapse under N-1 contingency condition.
50	600 MW Solar Power Plant near Muzaffargarh (PC-1 to be Prepared)	• Fuel substitute for expensive power generation during day time

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
51	600 MW Solar Power Plant near Trimmu Jhang (PC-1 to be Prepared)	• Fuel substitute for expensive power generation during day time
52	1200 MW Solar Power Plant near Haveli Bahadur Shah (PC-1 to be Prepared)	• Fuel substitute for expensive power generation during day time
53	220/132 kV Zero Point G/S Islamabad and allied T/L (PC-1 has yet not been prepared, however, benefits have been provided based on preliminary analysis) ProjectBriefs/53-ZeroPoint.pdf	• Reduction in 220/132 kV Transformer loading at Islamabad University, ISPR and Rewat • Reduction in Transmission Losses = 17.9 MW • Improvement in Voltage Profile • IFRR = 11.82% • Annual benefits per annum = 1392.74 MRs.
55	Reactive Power Compensation at 220 & 132 kV Grid Stations	• Control steady state voltage profile of the 220 & 132 kV network • Reduction in loading of 220/132 kV transformers
56	Mitigation of High Fault level at 132 kV Burhan	• Reduction in fault level at 132 kV Burhan from 45.9 kA to 36.4 kA (Installed switchgear rating is 40 kA)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
57 & 59	Augmentation of 4x160 MVA, 220/132 kV T/Fs with 4x250 MVA at Yousafwala (PC-1 has yet not been prepared, however, benefits have been provided based on preliminary analysis) ProjectBriefs/57&59-YousafwalAugmentation.pdf	• Reduction in 220/132 kV T/F loading at Yousafwala • Reduction in quantum of expensive/out of merit generation at Saif Power Plant • Reduction in Transmission Losses = 1.6 MW • IFRR = 59.65% • Annual benefits per annum = 2912.81 MRs.
58	Extension of 3rd 250 MVA, 220/132 kV T/F at Guddu (PC-1 has yet not been prepared, however, benefits have been provided based on preliminary analysis)	• Reduction in 220/132 kV Transformer loading at Guddu • IFRR = 30.47% • Annual benefits per annum = 693.59 MRs. • ProjectBriefs/58-GudduExtension.pdf
62	2nd source of supply to 220 kV Jaranwala Road Substation	• Reduction in loading of existing 220 kV T/Ls in the vicinity of Jaranwala Road and Samundari Road Grid Stations • Improvement in power supply position in the vicinity of Jaranwala Road and Samundri Road • Improvement in voltage profile • IFRR = 20.6% • Annual benefits per annum = 932 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
66	220 kV G/Station at Kassowal along with allied T/L	• Reduction in loading of 220/132 kV transformers at Yousafwala, Vehari and Pirangaib • Improvement in voltage profile • Reduction in Transmission Losses = 11.4 MW • IFRR = 11.42 % • Annual benefits per annum = 167.57 MRs. • ProjectBriefs/66-Kassowal.pdf
68	3rd 500 kV Jamshoro-Moro- R.Y Khan Single Circuit T/Line	• Dispersal of power generation from southern part of the country up to load centers to meet the power demand of the country • Reduction in the loading of existing 500 kV line from Jamshoro-Dadu-Shikarpur upto Multan • Reduction in Transmission line losses • IFRR = 1.57 % • Annual benefits per annum = 2228.08 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
71a	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects (i) 9 Sub Projects of 500 kV & 220 kV S/S & T/Lines ADB Loan No. 2396-PAK	
i	Extension of 500 kV G/S Ghazi Brotha (Ext. of 1*600 MVA 500/220 kV T/F)	• Reduction in loading of 500/220kV transformers at Peshawar and Tarbela • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 25.59 % • Annual benefits per annum = 534.72 MRs.
ii	Augmentation of 220 kV Ravi (Aug. of 3*160 MVA to 3*250 MVA 220/132 kV T/Fs)	• Reduction in loading of 220/132 kV transformers by 8%, 5% and 17% at KSK, Bund Road and Ravi respectively. • Improvement in voltage profile • Reduction in transmission losses = 2.5 MW • IFRR = 33.15 % • Annual benefits per annum = 288.39 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
71a	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects (i) 9 Sub Projects of 500 kV & 220 kV S/S & T/Lines ADB Loan No. 2396-PAK	
iv	500 kV DG Khan Substation	• Reduction in loading of transformers at/around D.G.Khan • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 0.17 % • Annual benefits per annum = 509.59 MRs.
v	220 kV G/S Okara & Associated T/L	• Reduction in loading of 220/132 kV transformers by 17% at Yousafwala G/S • Reduction in Transmission Line loading by 31% and 22 % from Yousafwala to Qadirabad and Balloki to Bhaiperu respectively. • Improvement in voltage profile • Reduction in transmission Losses = 6.45 MW • IFRR = 19.94 % • Annual benefits per annum = 558.86 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
71a	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects (i) 9 Sub Projects of 500 kV & 220 kV S/S & T/Lines ADB Loan No. 2396-PAK	
vi	220 kV Toba Tek Singh	• Reduction in 220/132 kV Transformer loading at Jaranwala Rd, Summundri Rd, Yousafwala G/S etc. • Improvement in Voltage Profile: 8.6% to 19.4% • Reduction in Transmission Losses = 39.7 MW • IFRR = 27.21 % • Annual benefits per annum = 625.37 MRs.
ix	Dispersal of Power from IPP Star/Jarwar CCPP	• Reduction in loading of 220/132 kV transformers at Guddu • Reduction in loading of 132 kV transmission lines from Guddu to Sadiqabad • Improvement in voltage profile • IFRR = 18.05 % • Annual benefits per annum = 129.85 MRs.
Click the link for details: ProjectBriefs/71a-PowerTransmissionEnhancement.pdf		

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
73	Quaid-e-Azam Solar Park at Lal-Suhanra (Phase-II) Evacuation of 600 MW Solar	• Addition of 600 MW power in National Grid • Increase in available system capacity to meet load growth • Improvement in power supply position of NTDC and MEPCO • Improvement in voltage profile of 132 kV grid stations in MEPCO area • IFRR = 19.27 % • Annual benefits per annum = 876.26 MRs.
77	Evacuation of power from 1200 MW RLNG based Power Project at Jhang (Haveli Bahadur Shah)	• Power evacuation from Haveli Bahadur Shah Power Plant to National Grid • Improvement in power supply position • IFRR = 67.7% • Annual benefits per annum = 1205.76
78	Evacuation of power from 1230 MW RLNG Power Plant at Trimmu Jhang	• Power evacuation from Trimmu Jhang Power Plant to National Grid • Improvement in power supply position • IFRR = 30.3% • Annual benefits per annum = 1932.57 MRs

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/Lines) ADB Loan No. 2289 & 2290-PAK	
i	Extension at 500 kV Lahore (Ext. of 1*600 MVA 500/220 kV T/F)	• Reduction in 220/132 kV Transformer loading by 21% at Lahore G/S • Improvement in voltage profile • Reduction in Transmission Losses = 3.3 MW • IFRR = 28.35 % • Annual benefits per annum = 313.9 MRs. • ProjectBriefs/81a(i)-Lahore.pdf
ii	Extension at 500 kV Gatti (Ext. of 1*450 MVA 500/220 kV T/F)	• Reduction in loading of transformer at Gatti from 97% to 79% • Improvement in voltage profile • Reduction in transmission system losses = 1.81 MW • IFRR = 40.7% • Annual benefits per annum = 360.9 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290-PAK	
iv	Extension at 500 kV Muzaffargarh (Ext. of 1*600 MVA 500/220 kV T/F) ProjectBriefs/81a(iv)-M.Garh.pdf	• Reduction in loading of Muzaffargarh 500/220 kV transformers by 23% • Improvement in voltage profile • Reduction in transmission system losses = 5.52 MW • IFRR = 52.16 % • Annual benefits per annum = 645.94 MRs.
vi	Extension at 220 kV Mangla (Ext. of 1*138 MVA 220/132 kV T/F)	• Reliable power evacuation from the hydropower source • IFRR = 21.84 % • Annual benefits per annum = 108.44 MRs.
vii	Extension at 500 kV Multan (Ext. of 3*160 MVA 220/132 kV T/F) ProjectBriefs\81a(vii)-Multan.pdf	• Reduction in loading of 220/132 kV Muzaffargarh and Pirangaib transformers by 7% and 39% respectively • Improvement in voltage profile • Reduction in Transmission system losses = 5.52 MW • IFRR = 23.94 % • Annual benefits per annum = 289.5 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/Lines) ADB Loan No. 2289 & 2290-PAK	
ix	Extension at 220 kV Yousafwala (Ext. of 1*160 MVA 220/132 kV T/F) ProjectBriefs/81a(ix)-Yousafwala.pdf	• Reduction in loading of T/F at 220/132 kV Yousafwala by 18% and at 220/132 kV Kassowal by 16% • Improvement in voltage profile • Reduction in transmission system losses = 2.24 MW • IFRR = 37.26 % • Annual benefits per annum = 136.58 MRs.
x	Extension at 220 kV Bhawalpur (Ext. of 1*160 MVA 220/132 kV T/F) ProjectBriefs/81a(x)-Bahawalpur.pdf	• Reduction in loading of transformer at 220/132 kV Bahawalpur by 32% • Improvement in voltage profile at/around Bahawalpur G/S, Ahmadpur-East G/S etc • Reduction in transmission system losses = 2.70 MW • IFRR = 33.15 % • Annual benefits per annum = 120.52 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290-PAK	
xi	Extension at 220 kV Ludewala (Ext. of 1*160 MVA 220/132 kV T/F) ProjectBriefs/81a(xi)-Ludewala.pdf	• Reduction in T/F loading at 220kV Ludewala G/S by 25% • Improvement in voltage profile • Reduction in transmission system losses = 2.16 MW • IFRR = 17.63 % • Annual benefits per annum = 63.69 MRs.
xiii	Extension at 220 kV Ghakkar (Ext. of 1*160 MVA 220/132 kV T/F) ProjectBriefs/81a(xiii)-Ghakkar.pdf	• Reduction in loading of T/F at 220/132 kV Ghakkar G/S by 27% and 220/132 kV Sialkot by 6% • Improvement in voltage profile • Reduction in transmission system losses = 9.05 MW • IFRR = 40.94 % • Annual benefits per annum = 151.29 MRs.
xiv	Augmentation at Islamabad University (Aug. of 2*160 MVA to 2*250 MVA 220/132kV T/Fs) ProjectBriefs/81a(xiv)-IslamabadUniversity.pdf	• Reduction in loading of T/F at 220/132 kV Islamabad University G/S by 18% and 220/132 kV Sangjani by 5% • IFRR = 26.74 % • Annual benefits per annum = 141.16 %

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/Lines) ADB Loan No. 2289 & 2290-PAK	
xv	Augmentation at NKLP Lahore (Aug. of 3*160 MVA to 3*250 MVA 220/132 kV T/Fs) Project Briefs\81a (xv)-NKLP.pdf	• Reduction in loading of transformer at 220/132 kV NKLP G/S by 17% and 220/132 kV Bund Road by 10% • IFRR = 22.29 % • Annual benefits per annum = 202.5 MRs.
xvi	Upgradation of Existing 132 kV GIS Substation to 220 kV at Wapda Town Lahore Project Briefs\81a (xvi)-WAPDA Town.pdf	• Reduction in loading of transformer at 220/132 kV NKLP G/S by 15% and 220/132 kV Bund Road by 9% • IFRR = 7.17 % • Annual benefits per annum = 202.41 MRs.
xvii	Upgradation of Existing 132 kV GIS Substation to 220 kV at Bandala	• Reduction in transmission line and transformer loadings at the subject G/S and its vicinity • Improvement in voltage profile • Reduction in transmission losses • IFRR = 15.92 % • Annual benefits per annum = 363.92 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
81a	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290-PAK	
xviii	Installation of SVC at 220 kV NKLP Lahore	• Provides reactive power reserve for instantaneous voltage support in the system during faults to improve system stability
85	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 ProjectBriefs/85-GhaziRoad.pdf	• Reduction in Transformer loading at KSK, NKLP, Bund Road and Ravi G/S • Improvement in voltage profile • Reduction in Transmission Losses = 14.8 MW • IFRR = 17.74 % • Annual benefits per annum = 909.82 MRs.
88	220 kV Substation Lalian ProjectBriefs/88-Lalian.pdf	• Reduction in 220/132 kV transformer loading at Ludewala, Nishatabad • Improvement in voltage profile from 9.2% to 17.4% • Reduction in transmission losses = 37.05 MW • IFRR = 38.29 % • Annual benefits per annum = 628.24 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
89	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 Shalamar G/S & 220 kV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	
(i)	500 kV RY Khan G/S	• Reduction in 220/132 kV transformer loading at Guddu and Bahawalpur • Improvement in voltage profile • Reduction in transmission losses = 35.7 MW • IFRR = 4 % • Annual benefits per annum = 349.36 MRs.
(ii)	220 kV Chishtian G/S & Allied T/L	• Reduction in 220/132 kV transformer loading at Vehari and Kassowal • Improvement in voltage profile • Reduction in transmission losses = 40 MW • Reduction in load shedding = 50 MW • IFRR = 11.87 % • Annual benefits per annum = 381.67 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
89	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 Shalamar G/S & 220 kV T/L (4 Projects - JBIC Loan) (JICA Loan No. PK-58)	
(iii)	220 kV Gujrat G/S & 220 kV T/L	• Reduction in 220/132 kV transformer loading at Mangla, Ghakkar and Gujranwala • Improvement in voltage profile • Reduction in transmission losses = 24.97 MW • IFRR = 39.20% • Annual benefits per annum = 899.88 MRs.
(iv)	220 kV Shalamar G/S & 220 kV T/L	• Reduction in 220/132 kV transformer loading at Ravi, Ghazi Road, KSK, NKLP, Bund Road G/S • Improvement in voltage profile • Reduction in transmission losses = 2.26 MW • IFRR = 11.60 % • Annual benefits per annum = 516.75 MRs.
For more details click on the link: ProjectBriefs/89-JICAProjects.pdf		

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
90	500 kV Faisalabad New (2x750) (Now 500 kV Faisalabad West alongwith allied T/Ls) ProjectBriefs/90-FaisalabadWest.pdf	• Reduction in 500/220 kV and 220/132 kV Transformer loading at Gatti, Jaranwal, Nishatbad and Sammundri G/S • Reduction in 220 kV transmission line loading from Nishatabad to Gatti • Improvement in Voltage Profile = 4% to 6% • Reduction in Transmission Losses = 34.7 MW • IFRR = 16.80 % • Annual benefits per annum = 2041.58 MRs.
91a	Addition of 500/220 kV Sub Station T/L for Strengthening the existing NTDC system	
(i)	500 kV Lahore New	• Reduction in Transmission Losses = 20.22 MW • IFRR = 9.64 % • Annual benefits per annum = 1635.42 MRs.
93	Evacuation of power from 1320 MW Power Plant at Sahiwal	• Inclusion of 1320 MW power to National Grid • Improvement in power supply to the country's load center • IFRR = 12.04 % • Annual benefits per annum = 175.41 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - PUNJAB

Sr. No.	Name of Project	Techno - Commercial Benefits
94	Extension/Augmentation at 500/220 kV Rawat Substation (Aug. of 2*160 MVA to 2*250 MVA + Ext. of 1*250 MVA)	• Reduction in Transformer loading of existing 220/132 kV transformers at Rawat by 27% • Improvement in voltage profile • Reduction in Transmission Losses = 5.6 MW • IFRR = 18% • Annual benefits per annum = 100.80 MRs.
96	500 kV HVAC T/Line for inter connection of HVDC Converter Station at Lahore with existing HVAC System.	• Power Evacuation of 4000 MW from Bulk generation planned in the southern regions • IFRR = 11.2 % • Annual benefits per annum = 5901.48 MRs. • ProjectBriefs/96-HVAC-HVDC.pdf

NTDC
REVISED TRANSMISSION INVESTMENT PLAN

TECHNOCOMMERCIAL BENEFITS OF PROJECTS (KPK)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
2	220 kV Haripur Substation	• To cater the load demand of Hattar SEZ • IFRR = 15.9 % • Annual benefits per annum = 872.27 MRs. • ProjectBriefs/2-Haripur.pdf
3	220 kV Swabi Substation	• To cater the load demand of Rashkai SEZ • IFRR = 13.5 % • Annual benefits per annum = 1232.66 MRs. • ProjectBriefs/3-Swabi.pdf
9	500 kV HVDC Transmission System between Tajikstan and Pakistan for Central Asia-South Asia Transmission Interconnection (CASA-1000)	• Reduce the supply/demand gap by import of power from Tajkistan • Improvement in Voltage Profile = 2 to 4% • Reduction in Transmission Losses = 16 MW • IFRR = 4.5% • Annual benefits per annum = 3246.34 MRs. • ProjectBriefs/9-CASA.pdf

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
10	Evacuation of power from 2160 MW Dasu HPP Stage-I	• Power evacuation from Dasu HPP to National Grid • Improvement in power supply position • IFRR = 11.27 % • Annual benefits per annum = 27064 MRs.
12	Evacuation of Power from Suki Kinari, Kohala, Mahal HPPs	• Power evacuation from hydropower projects to National Grid • Improvement in power supply position • IFRR = 13.1 % • Annual benefits per annum =10337.98 MRs.
13b	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Station (500 kV Sheikh Muhammadi, 220 kV Bannu) ProjectBriefs/13b-Enhancement.pdf	• Reduction in loading of existing 500/220 & 220/132 kV transformers in NTDC system • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 38.17 % • Annual benefits per annum = 8650.66 MRs.
21	Evacuation of Power from Tarbela 5th Extension.	• Power evacuation from hydropower projects to National Grid • Improvement in power supply position • IFRR = 36.70 % • Annual benefits per annum =2099.47 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
27	220 kV Jamrud G/S alongwith allied T/Ls.	• Reduction in 220/132 kV Transformer loading at Peshawar and Shaibagh • Improvement in Voltage Profile = 2.9% to 5.7% • Reduction in Transmission Losses = 14.8 MW • IFRR = 20.10 % • Annual benefits per annum = 601.83 MRs. • ProjectBriefs/27-Jamrud.pdf
35	220 kV Kohat G/S alongwith allied T/Ls.	• Reduction in 220/132 kV transformers loading at Peshawar • Improvement in Voltage Profile = 1.3% to 6.2% • Reduction in Transmission Losses = 21 MW • IFRR = 12.4 % • Annual benefits per annum = 1065.87 MRs. • ProjectBriefs/36-Kohat.pdf
39	Interlinking of 765 kV Mansehra with 220 kV Mansehra (PC-1 to be prepared)	• Power evacuation from Dasu HPP to PESCO load center • Improvement in power supply position in PESCO area

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
43	Evacuation of power from 816 MW Mohmand Dam	• Power evacuation from Mohmand Dam to National Grid • Improvement in power supply position • IFRR = 25.1 % • Annual benefits per annum = 2246 MRs.
49	2nd Source of Supply to 500 kV Sheikh Muhammadi (PC-1 to be Prepared)	• N-1 contingency provision for 500 kV Sheikh Muhammadi • Improvement in power supply position in PESCO area
60	Extension of 3rd 160 MVA, 220/132 kV T/F at Allai Khwar (PC-1 has yet not been prepared, however, benefits have been provided based on preliminary analysis) ProjectBriefs/60-AllaiKhwar.pdf	• Reduction in 220/132 kV T/F loading at Allai Khwar • Reliable dispersal of power from hydel generation in the vicinity of Allai Khwar ' • IFRR = 18.66% • Annual benefits per annum = 417.73 MRs.
67	220kV G/S Mansehra Tranche-III ProjectBriefs/67-Mansehra.pdf	• Reduction in 220/132 kV T/F loading at Burhan and ISPR • Improvement in Voltage Profile = 10.4% to 14.9% • Reduction in Transmission Losses = 7.4 MW • IFRR = 35.91 % • Annual benefits per annum = 418.38 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
71b	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects (i) 9 Sub Projects of 500 kV & 220 kV S/S & T/Lines ADB Loan No. 2396-PAK	
vii	220 kV Nowshera	• Reduction in 220/132 kV Transformer loading at Peshawar, Mardan and Shahibagh • Improvement in voltage profile at Nowshera and its vicinity • Reduction in Transmission Losses = 8.31 MW • IFRR = 27.34 % • Annual benefits per annum = 669.56 MRs. • ProjectBriefs/71b-PowerTransmissionEnhancement.pdf
74	Transmission Scheme for Dispersal of power from Neelam- Jhelum, Karot and Azad Patan Hydro Power Project	• Power evacuation from hydropower projects to National Grid • Improvement in power supply position • IFRR = 23 % • Annual benefits per annum =1975 MRs.
80	Evacuation of power from 147 MW Patrind HPP	• Power evacuation from Patrid HPP to National Grid • Improvement in power supply position • IFRR = 13% • Annual benefits per annum = 154.52 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
81b	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/Lines) ADB Loan No. 2289 & 2290-PAK	
iii	Extension at 500 kV Sheikh Muhammadi (Ext. of 1*450 MVA 500/220 kV T/F) ProjectBriefs/81b(iii)-SheikhMuhammadi.pdf	• Reduction in loading of transformer at Sheikh Muhammadi • Improvement in voltage profile • Reduction in transmission system losses = 2.05 MW • IFRR = 21.12 % • Annual benefits per annum =241.92 MRs.
v	Extension at 500 kV Tarbela (Ext. of 1*237 MVA 500/220 kV T/F)	• Power evacuation from the hydropower source to meet the load demand • IFRR = 18.4 % • Annual benefits per annum = 194.9 MRs.
viii	Extension at 220 kV Bannu (Ext. of 1*160 MVA 220/132 kV T/F)	• Reduction in loading of transformer at Bannu from 105% to 73% • Reduction in transmission system losses = 2.71 MW • IFRR = 19.92 % • Annual benefits per annum = 70 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
81b	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/ Lines) ADB Loan No. 2289 & 2290-PAK	
xix	Looping in/out of Ghazi Barotha – Shahi Bhag at 220 kV Mardan	• Improvement in System Reliability for Mardan and surrounding Areas • Reduction in Transmission system losses = 2.07 MW • IFRR = 39.17 % • Annual benefits per annum = 303.96 MRs.
84	220 kV G/S & Allied T/L D.I Khan ProjectBriefs/84-D.I.Khan.pdf	• Reliable power dispersal of C-3/C-4 NPPs • Reduction in T/F loading of at Bannu & Daud Khel by 30% & 10%. • Improvement in Voltage Profile = 12% to 20% • Reduction in Transmission Losses = 29.8 MW • IFRR = 7.40 % • Annual benefits per annum = 415.58 MRs.
86	220 kV Nowshera S/S ProjectBriefs/86-Nowshera.pdf	• Reduction in T/F loading at Peshawar, Mardan and Shahibagh • Improvement in Voltage Profile • Reduction in Transmission Losses = 8.31 MW • IFRR = 27.34% • Annual benefits per annum = 669.56 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - KPK

Sr. No.	Name of Project	Techno - Commercial Benefits
87	220 kV Chakdara S/S	• Reduction in 220/132 kV Transformer loading at Mardan from 86% to 63% • Improvement in Voltage Profile = 6% to 18.3%. • Reduction in Transmission Losses = 27.3 MW • IFRR = 14.12 % • Annual benefits per annum = 1010.88 MRs. • ProjectBriefs/87-Chakdara.pdf
91b	Addition of 500/220 kV Sub Station T/L for Strengthening the existing NTDC system	
(iii)	220 kV D.I.Khan	• Reliable power dispersal of C-3/C-4 NPPs • Reduction in loading of transformers at Bannu & Daud Khel by 30% and 10% respectively. • Improvement in Voltage Profile = 12% to 20% • Reduction in Transmission Losses = 29.8 MW • IFRR = 7.46 % • Annual benefits per annum = 415.58 MRs. • ProjectBriefs/91b(iii)-D.I.Khan.pdf

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TECHNOCOMMERCIAL BENEFITS OF PROJECTS (SINDH)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
1	220 kV Dhabeji Substation	• To cater load demand of Dhabeji SEZ up to 250 MW • IFRR = 8.14% • Annual benefits per annum = 740.56 MRs.
13c	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Station (500 kV Guddu, 220 kV Rohri, 220 kV Hala road, 220 kV Jamshoro, 220 kV Daharki, 220 kV Shikarpur New, 220 kV Tando Muhammad Khan)	• Reduction in loading of existing 500/220 & 220/132 kV transformers in NTDC system • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 38.17 % • Annual benefits per annum = 8650.66 MRs. • ProjectBriefs/13c-Enhancement.pdf
17	220 kV Mirpur Khas G/S alongwith allied T/Ls ProjectBriefs/17-MirpurKhas.pdf	• Reduction in 220/132 kV Transformer loading at T.M.Khan, Hala Road and Jamshoro G/S • Reduction in transmission line loading • Improvement in Voltage Profile = 6.5% to 16.64% • Reduction in Transmission Losses = 68.8 MW • IFRR = 12.80% • Annual benefits per annum = 728.21 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
22	Evacuation of power from wind power projects at Jhimpir and Gharo Wind Clusters	• Power evacuation from Jhimpir and Gharo Wind Clusters to National Grid • Improvement in power supply position • IFRR = 29.77 % • Annual benefits per annum = 3280.82 MRs.
24	Evacuation of Power from 1224 MW Wind Power Plants at Jhimpir Clusters	• Power evacuation from Jhimpir Wind Cluster to National Grid • Improvement in power supply position • IFRR = 17.48% • Annual benefits per annum = 1097.65 MRs.
29b	Extension and Augmentation of existing 500 kV and 220 kV Grid Stations (New) At Dadu and Guddu G/S	• Reduction in transformer loading • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 20.7 % • Annual benefits per annum = 699.45 MRs. • ProjectBriefs/29b-Extension.pdf

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
33	220 kV Larkana Substation ProjectBriefs/33-Larkana.pdf	• Reduction in loading of T/F of Shikarpur, Dadu & Rohri G/S • Improvement in Voltage Profile =5.9% to 10.7% • Reduction in Transmission Losses = 16.2 MW • IFRR = 13.2% • Annual benefits per annum = 973.02MRs.
63	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).	• Power Evacuation from K-2/K-3 NPP to National Grid • Improvement in power supply position • IFRR = 44 % • Annual benefits per annum = 3112.65 MRs.
64	Evacuation of Power from 2x660 MW Thar Coal Based SSRL/SECL Power Plant at Thar	• Power Evacuation from Thar Coal to National Grid • Improvement in power supply position • IFRR = 9% • Annual benefits per annum = 1822.15 MRs.
65	Evacuation of Power from 330 MW Siddique Sons Ltd.	• Power Evacuation from Siddique Sons to National Grid • Improvement in power supply position • IFRR = 18.3 % • Annual benefits per annum = 554.29 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
69	Inter-Connection- Thar Coal Based , 1200 MW (Power Dispersal from 1200 MW Thar Coal Power Plant - 500kV Thar - Matiari T/L & Matiari 500kV S/station)	• Power Evacuation from Thar Coal to National Grid • Improvement in power supply position • IFRR = 3.73 % • Annual benefits per annum = 1735.47 MRs.
71c	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects	
viii	220 kV Rohri New ProjectBriefs/71c-PowerTransmissionEnhancement.pdf	• Power dispersal of Engro Energy and Fauji Foundation • Reduction in 220/132 kV transformer loading at Shikarpur G/S • Improvement in voltage profile from 8.9% to 11.5% at Rohri G/S, Khairpur G/S and their vicinity • Reduction in Transmission Losses = 21.1 MW • IFRR = 9.03 % • Annual benefits per annum = 554.5 MRs.
79	Evacuation of power from 1320 MW Power Plant at Bin Qasim	• Power Evacuation from Bin Qasim CFPP to National Grid • Improvement in power supply position • IFRR = 15.5 % • Annual benefits per annum = 1455.61 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
81c	Power Transmission Enhancement Project Tranche-I (19 Sub Projects of 500/220 kV Sub Stations and T/Lines	
xii	Extension at 220 kV Hala Road (Ext. of 1*160 MVA 220/132 kV T/F)	• Reduction in loading of transformer at 220/132 kV Hala Road G/S by 16% • IFRR = 41.86 % • Annual benefits per annum =155.03 MRs.
82	Evacuation of Power from 1320 MW Hub Power Company Ltd.	• Power Evacuation from Hub CFPP to National Grid • Improvement in power supply position • IFRR = 13 % • Annual benefits per annum = 1867.6 MRs.
83	Evacuation of Power from 660 MW from Lucky Electric Power Company Ltd.	• Power Evacuation from Lucky Electric to National Grid • Improvement in power supply position • IFRR = 68.1 % • Annual benefits per annum = 673.77 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - SINDH

Sr. No.	Name of Project	Techno - Commercial Benefits
91c	Addition of 500/220 kV Sub Station T/L for Strengthening the existing NTDC system	
(ii)	500 kV Shikarpur	• Reduction in loading of transformers from 107% to 83% at 220/132 kV at Gundu (study scenario: Off-peak Jan 2012) • Reduction in Transmission Losses = 8.4 MW • IFRR = 8.43% • Annual benefits per annum = 925.82MRs.
99	Evacuation of Power from 747 MW Guddu Power Project	• Power evacuation from Guddu Power Plant to National Grid • Improvement in power supply position • IFRR = 6.75% • Annual benefits per annum = 794.96 MRs.

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TECHNOCOMMERCIAL BENEFITS OF PROJECTS (BALOCHISTAN)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - BALOCHISTAN

Sr. No.	Name of Project	Techno - Commercial Benefits
13d	Enhancement in Transformation Capacity of NTDC System by Extension and Augmentation of Existing Grid Station (220 kV Sibbi, 220 kV Khuzdar, 220 kV Quetta Industrial, 220 kV Loralai) ProjectBriefs/13d-Enhancement.pdf	• Reduction in loading of existing 220/132 kV transformers in NTDC system • Improvement in voltage profile • Reduction in Transmission Losses • IFRR = 38.17 % • Annual benefits per annum = 8650.67 MRs.
15	220 kV Dera Ismail Khan - Zhob Transmission Line alongwith 220-kV Zhob Sub-Station ProjectBriefs\15-Dera Ismail Khan - Zhob TL with Zhob S/S.pdf	• Improvement in Voltage Profile = 3.1% to 18.1 % • Reduction in Transmission Losses = 14.7 MW • IFRR = 10.41% • Annual benefits per annum = 982.10 MRs.
34	220 kV Mastung G/S alongwtih allied T/Ls. ProjectBriefs\34-Mastung.pdf	• Reduction in 220/132 kV Transformer loading at Quetta, Sibbi and Khuzdar • Improvement in Voltage Profile = 9.7% to 14.5% • Reduction in Transmission Losses = 35 MW • IFRR = 6.2% • Annual benefits per annum = 1337.18 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - BALOCHISTAN

Sr. No.	Name of Project	Techno - Commercial Benefits
38	Installation of SVCs at 220kV Quetta Industrial	• Provides reactive power support in the system during steady state and emergency conditions to improve system stability and to avoid system collapse
47	Gwadar – Pak Iran Border T/L	• Supply of power from Iran to Gwadar/Makran area
54	200 MVAR SVS at 132 kV Khuzdar (PC-1 to be Prepared)	• Provides reactive power support in the system during steady state and emergency conditions to improve system stability and to avoid system collapse
70	New 220 kV G/Station at Khuzdar/220 kV Dadu - Khuzdar D/C T/Line	• To meet the power demand of Khuzdar area of QESCO • To provide an alternate route for power flow from Dadu to Quetta area • Better voltage control and stabilize power supply in Balochistan • IFRR = 1.3 % • Annual benefits per annum = 24.6 MRs.

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - BALOCHISTAN

Sr. No.	Name of Project	Techno - Commercial Benefits
71d	Power Transmission Enhancement Project (Tranche-II) (SET) 10 Sub projects	
x.	220 kV Loralai Substation ProjectBriefs/71d-PowerTransmissionEnhancement.pdf	• Reduction in T/F loading at Sibbi and Quetta Industrial • Improvement in voltage profile • Reduction in Transmission Losses = 34.5 MW • IFRR = 0.17 % • Annual benefits per annum = 509.59 MRs.
75	Transmission Interconnection for Dispersal of Power From UCH-II	• Strengthening of existing NTDC integrated system for dispersal of 395 MW power from Uch-II power plant • Increase in the available system capacity to meet future load growth • IFRR = 14.56 % • Annual benefits per annum = 401.73 MRs.
92	Construction of New 220 kV Guddu-Uch-Sibbi Single Circuit Transmission Line for Improvement of Power Supply System in South Areas	• Enhancement in transmission line capacity • IFRR = 12.6 % • Annual benefits per annum = 1067.15 MRs.

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TECHNOCOMMERCIAL BENEFITS OF PROJECTS (PROJECTS BASED ON OPERATION & MAINTENANCE FOR OVERALL NETWORK)

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - OTHERS

Sr. No.	Name of Project	Techno - Commercial Benefits
20	Enterprise Resource planning (ERP) (Now Implementation of Integrated Solution to improve Productivity and Control in NTDC by ERP System)	• Improvement in operational efficiency including online, on demand availability of information for management decision making • Increased Productivity / Cost Savings / Reduced Headcount • Staff Reductions • Functionality Enhancement • Technology Improvements • Risk Reduction • Transparency in all the field and accountability for all • Retiring multiple current administrative systems and their associated computer infrastructure, often built on obsolescent or standalone technology

ERP PRESENTATION - LINK

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - OTHERS

Sr. No.	Name of Project	Techno - Commercial Benefits
25	Upgradation/ Extension of NTDC's Telecommunication & SCADA System at NPCC	• Overall improvement in performance of the power system and its economical operation • Improvement in the control & monitoring facilities and quick restoration in case of system collapse which will result in increased revenue • 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

SCADA PRESENTATION - LINK

TECHNO-COMMERCIAL BENEFITS OF NTDC PROJECTS - OTHERS

Sr. No.	Name of Project	Techno - Commercial Benefits
61	Feasibility study for enhancing the transmission capacity of NTDCs 500-kV Transmission System by applying series compensation	• Draft Feasibility Study Report was submitted by international consultant JV (M/s TGS, Canada and M/s Dar Engg. KSA). After detailed review, NTDC later worked in close association with consultant for in-depth analysis and improvement of its outcome. • The solution shall be finalized after its verification of its usefulness in ongoing TSEP Phase-II. The feasibility study is expected to be completed in Q1-2023.
96	Strengthening of TSG Centre for Grid System Operations and Maintenance.	• Upgradation of TSG Lab to enhance the technical skills and knowledge of NTDC staff through hands on/on-job training through Training Simulator and Model Substation.
72	Provision of Secured Metering System at Delivery Point. (Local Bank)	• The project was proposed for accurate recording of energy and demand at the points of exchange between companies according to the requirement of applicable tariff and undisputed, reliable metering/billing arrangement.

NTDC
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ADDITIONAL SUBMISSIONS BY NTDC

CLARIFICATION REGARDING PHASE-II OF TSEP 2022

- NTDC Transmission Investment Plan is based on Phase-I of TSEP 2022.
- It was decided that TSEP 2022 would be submitted in two phases to optimize the timeline for its review/approval by the stakeholders.
- Transmission expansion requirements were identified upto June 2026 in Phase-I of TSEP, which was submitted to NEPRA on 30th November 2022 for approval.
- Transmission expansion requirements upto year 2030-31 were to be identified in Phase-II of TSEP.
- However, in the approval of IGCEP on 1st February 2023, NEPRA directed to submit the TSEP for the next ten years in line with next iteration of IGCEP.
- **Now, preparation of TSEP 2024 is under process which will be submitted to NEPRA on 31st March 2024 along with IGCEP 2024.**

COMPARISON OF PROJECTS IN TIP AND TSEP 2022 (PHASE-1)

S. No.	Projects in NTDC Transmission Investment Plan	Status of Project as per TSEP
1	220 kV Arifwala G/S	These projects have been assumed in Investment Plan up to year 2024-25. **In TSEP, these projects have been shifted in year 2025-26.**
2	220 kV Dharki-Rahim Yar Khan-Bahawalpur D/C T/L	
3	220 kV Gujranwala-II G/S	
4	220 kV Head Faqirian G/S	
5	220 kV Jamrud G/S	
6	220 kV Larkana G/S	
7	220 kV Mastung G/S	
8	220 kV Punjab University G/S	
9	Upgradation of 220 kV Vehari G/S to 500 kV	
10	500/220 kV Sialkot G/S	
11	500/132 kV Chakwal G/S	
12	500/220 kV Islamabad West G/S	
13	Evacuation of power from 2160 MW Dasu HPP	
14	Evacuation of Power from 816 MW Mohmand Dam HPP	

COMPARISON OF PROJECTS IN TIP AND TSEP 2022 (PHASE-1)

S. No.	Project in NTDC Transmission Investment Plan	Status of Project as per TSEP
15	220 kV Nagshah G/S	These project have been assumed in Investment Plan up to year 2024-25. However, in TSEP these projects have been assumed as newly proposed projects in year 2025-26.
16	220 kV Kohat G/S	
17	500 kV Ghazi Barotha – Faisalabad West D/C T/Line	
18	2nd Source of Supply to 500 kV Sheikh Muhammadi	
19	220 kV Zero Point G/S	
20	Extension of 3rd Transformer at Guddu	
21	Extension of 3rd Transformer at Allai Khwar	
22	Augmentation of 2x160 MVA T/Fs with 2x250 MVA at Yousafwala	
23	Mitigation of High Fault Level at 132 kV Burhan	

COMPARISON OF PROJECTS IN TIP AND TSEP 2022 (PHASE-1)

Sr. No.	Project in NTDC Transmission Investment Plan	Status of Project as per TSEP
24	220 kV Kamra G/S	This Project has been dropped from TSEP due to reduced load demand of IESCO. It shall be considered in next iteration of TSEP.
25	330 MW Siddiqsons	This project was not mentioned in TSEP because it is not included in IGCEP 2022.
26	500 kV Ludewala G/S along with 500 kV T/Lines	This project was not included in TSEP 2022 Phase-1 due to reduced load demand and lower quantum of generation up to 2025-26. It shall be considered in next iteration of TSEP.
27	Interlinking of 765 kV Mansehra with 220 kV Mansehra	This project was not included in TSEP 2022 Phase-1 due to low quantum of generation of Dasu HPP up to year 2025-26. It shall be considered in next iteration of TSEP.
28	Installation of SVC at 220 kV Quetta Industrial G/S	This project has also been included as newly proposed project in TSEP

NTDC
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ADDITIONAL SUBJECTS:

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1. OPTIONS FOR SUPPLY TO GAWADAR
2. HR IMPROVEMENT PLAN

THANK YOU