Pakistan Entering into the Era of HVDC Technologies

HVDC MATIARI -LAHORE TRANSMISSION PROJECT

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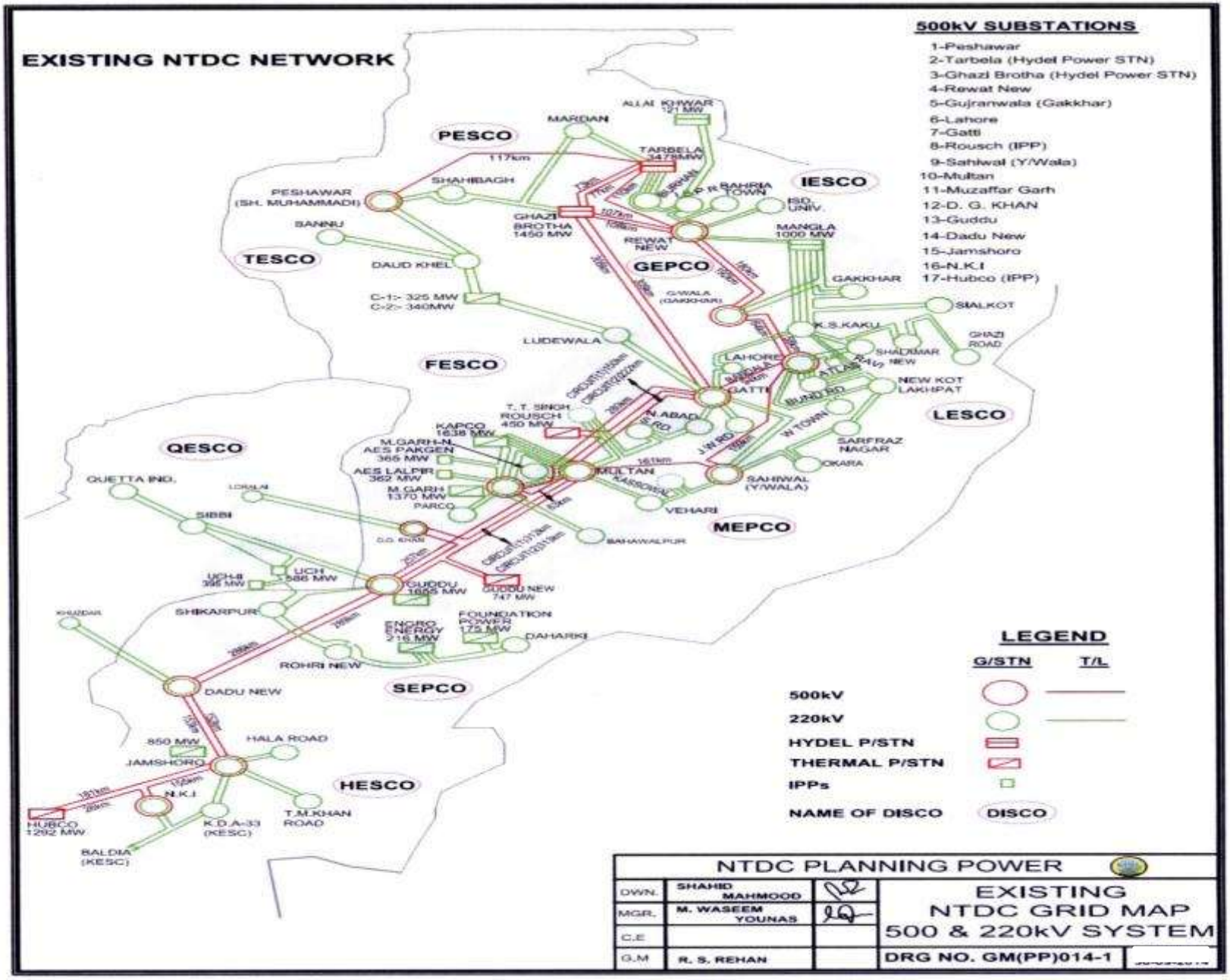
(GRID SYSTEM CONSTRUCTION PROJECTS) NTDC

SEQUENCE OF PRESENTATION

- OVERVIEW
- GENERATION PROPOSED IN SOUTH (2011)
- EVACUATION OF POWER GENERATION FROM LOCAL/ IMPORTED COAL POWER PROJECTS
- POWER SYSTEM STUDY (2011-13)
- SNC – LAVALIN RECOMMENDATIONS - BASIS OF FUTURE BULK POWER EVACUATION SCHEMES IN SOUTH
- UPCOMING POWER GENERATION IN SOUTH – PRESENT SCENARIO
- GOP TRANSMISSION POLICY – 2015 FOR DEVELOPMENT OF TRANSMISSION PROJECTS UNDER PRIVATE REGIME
- HVDC MATIARI-LAHORE TRANSMISSION PROJECT
- PROJECT FEASIBILITY REPORTS
- TECHNO-COMMERCIAL SUPPORT NEEDED

OVERVIEW

- ALLEVIATION OF POWER SHORTAGE / FUTURE GENERATION PLANS
- THAR / IMPORTED COAL LARGE THERMAL POWER GENERATION POTENTIAL
- NATIONAL POWER SYSTEM EXPANSION OF PAKISTAN FOR 2011-2030 ENVISAGES DEVELOPMENT OF THAR COAL FIELD TO ULTIMATE GENERATION CAPACITY OF ABOUT 40000 MW
- ISLAMABAD AND CENTRAL PUNJAB LOAD CENTRES - 60% OF TOTAL LOAD OF PAKISTAN
- SNC-LAVALIN ENTRUSTED (2011) SYSTEM STUDY FOR EVACUATION OF POWER FROM SOUTH
- STUDY SUBMITTED IN 2013.
- BASIS OF HVDC INDUCTION IN NTDC POWER SYSTEM



Geographic connection diagram of Pakistan's 220 kV and above power grids in 2013

THAR COAL BASED POWER GENERATION POTENTIAL

- NATIONAL POWER SYSTEM EXPANSION PLAN FOR THE PERIOD 2011-2030 ENVISAGES DEVELOPMENT OF THAR COAL FIELD UPTO 40000 MW
- YEAR 2011 COAL POWER GENERATION SCENARIO.
- 500 KV D/C THAR – MATIARI YEAR 2015-16 INSTALLED CAPACITY 1200 MW (THAR), 1200 MW (IMPORTED COAL AT KARACHI)
- 500 KV AC IN / OUT FROM EXISTING 500 KV HUB-JAMSHORO LINE
- YEAR 2017-18 REACH TO 4000 MW
- WHAT NEXT OPTIONS FOR EVACUATION OF POWER

GENERATION ADDITIONS PROPOSED INITIALLY IN SOUTH - 2011

Power Plant	Location	MW	COD
Imported Coal (Public Sector)	Karachi	1,000	2014-15
Imported Coal (IPP)	Karachi	1,200	2015-16
IPP	Thar	1,200	2015-16
Public Sector	Thar	1,200	2015-16
Additional IPPs	Thar	2,600	2017-18
Nuclear	Karachi	1,000	2018-19
Nuclear	Karachi	1,000	2019-20
Sub-total		9,200	
Additional lPPs	Thar	15,000	2019-2030
TOTAL		**24,200**	

POWER SYSTEM STUDY-KEY OBJECTIVES

- EVALUATION OF TRANSMISSION ALTERNATES AND SELECTION OF OPTIONAL TRANSMISSION SYSTEM BASED ON TECHNO – ECONOMIC CONSIDERATIONS.
- EVALUATION OF SYSTEM PERFORMANCE BY MEANS OF SYSTEM STUDIES (LOAD FLOW, SHORT CIRCUIT, TRANSIENT STABILITY STUDIES).
- FIELD INVESTIGATIONS / SURVEY, PRELIMINARY ROUTE.
- BASIC DESIGN, BOQ, COMPARISIONS, ECONOMIC ANALYSIS.
- COST ESTIMATE, TIMELINES

SYSTEM STUDY ASSIGNED TO SNC – LAVALIN CANADA

- SNC-LAVALIN ENTRUSTED FEASIBILITY STUDY REPORT FOR EVACUATION OF 2500-3000 MW IMPORTED COAL POWER GENERATION AT KARACHI TO NORTH REGIONS (2011)
- DUE TO UNCERTANITY OF IMPORTED COAL, FEASIBILITY STUDY SCOPE CHANGED TO TRANSMISSION PROJECT FOR LARGE COAL POWER GENERATION POTENTIAL AT THAR
- DRAFT FEASIBILITY STUDY SUBMITTED IN JULY 2012
- REVIEWED BY NTDC, GAVE COMMENTS JANUARY 2013.
- SUBMITTED FINAL FEASIBILITY REPORT MARCH – 2013.

FEASIBILITY STUDY - SCHEME OF PREPARATION

- PHASE – I :

  CONCEPTUAL PLANNING / DESIGN STUDY

  - SYSTEM STUDIES
  - SELECTION OF TECHNOLOGY & VOLTAGE
  - PRELIMINARY SURVEY / INITIAL ENVIRONTAL STUDY ETC

- PHASE –II:

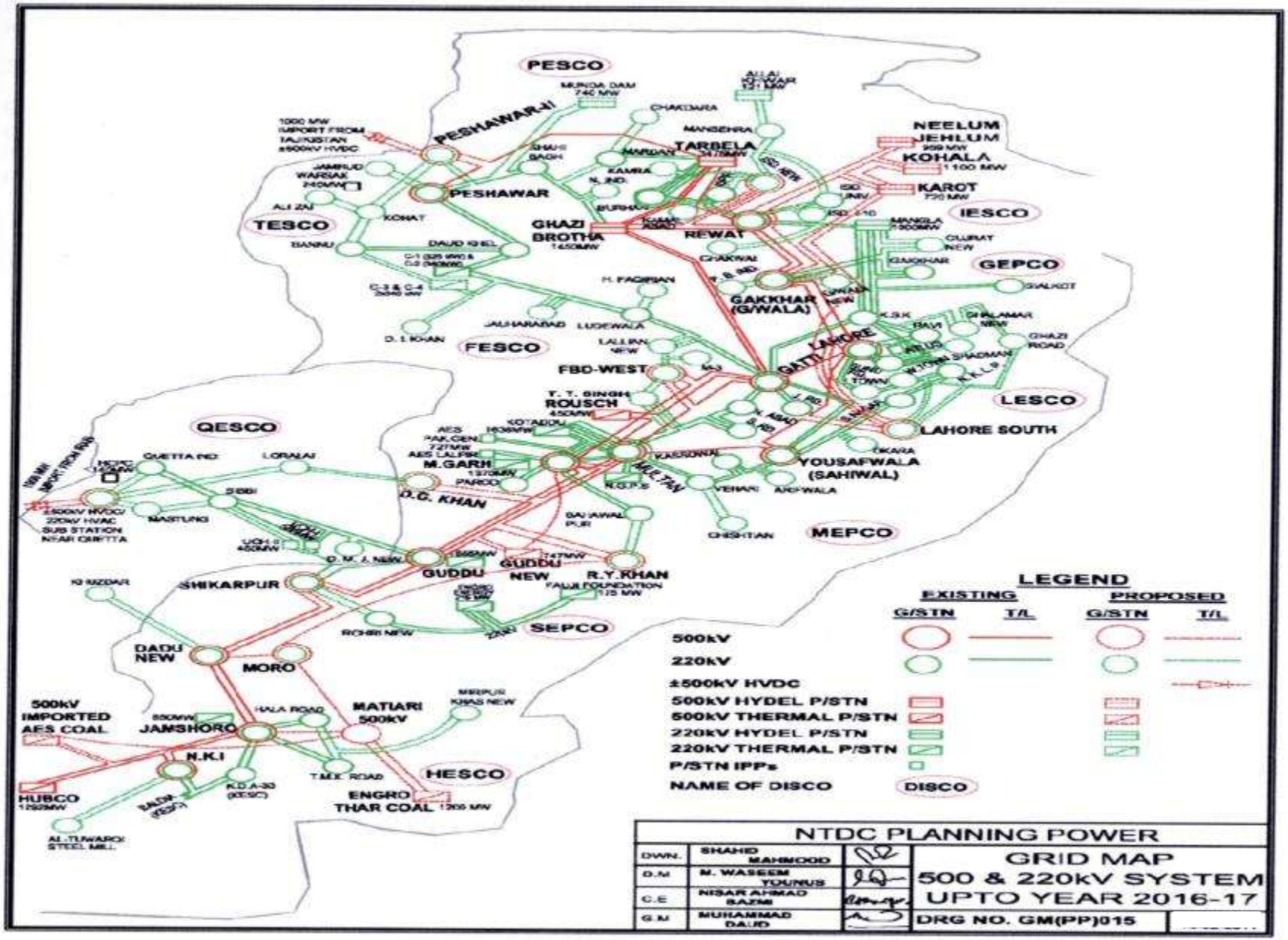
  PROJECT SPECIFIC DETAILED SYSTEM STUDIES FOR SELECTED TRANSMISSION OPTION

  - DETAILED SYSTEM STABILITY ANALYSIS PROPOSE MEASURES: NEW LINKS SYSTEM BEHAVIOUR, REACTIVE POWER COMPENSATION.
  - COSTING, EIA, LARP, IPSA
  - DESIGN, FUNCTIONAL SPECS

ALTERNATIVES EVALUATED BY SNC-LAVALIN

- 500 KV AC
- MIX OF 500KV & 765KV AC
- MIX OF 500KV AC AND ± 600 KV DC
- THE MOST FEASIBLE OPTION BASED ON TECHNO-ECONOMIC ANALYSIS
  - 500KV AC FROM THAR TO MATIARI, AND
  - ± 600KV DC FROM THAR TO LAHORE

Existing/Committed 500/200 kV System



CONCLUSIONS / RECOMMENDATION BY SNC – LAVALIN CANADA

- FOCUSSED ULTIMATE SPOT YEAR OF STUDY 2030
- CONSTRUCTION OF TOO MUCH 500 KV AC LINES UNDERSCORED DUE TO HIGHER COST, MORE LOSSES, CORRIDORS LIMITATIONS AND OTHER ADMINISTRATIVE.
- RECOMMENDED MIX OF 500 KV AC AND ±600 KV DC FOR DEVELOPMENT OF COAL POWER GENERATION AT THAR.
- 500 KV D/C FROM THAR TO MATIARI
- ±600 KV DC THAR TO 500 KV LAHORE (SOUTH)

UPCOMING POWER GENERATION IN SOUTH – PRESENT SCENARIO

THAR COAL FIRED PROJECT	**660 MW**
BIN QASIM IMPORTED COAL POWER PLANT	**1320 MW**
SSRL THAR COAL POWER PLANT	**1320 MW**
HUBCO COAL FIRED POWER PROJECT	**1320 MW**
SIDDIQUE SONS COAL POWER PLANT	**330 MW Contd.**

UPCOMING POWER PLANTS IN SOUTH - PRESENT SCENARIO

LUCKY POWER PROJECT (PORT QASIM)	660 MW
JAMSHORO (COAL FIRED) POWER PLANT	1320 MW
K-2 COASTAL AREA KARACHI	1100 MW
K-3 COASTAL AREA KARACHI	1100 MW
TOTAL CAPACITY:	9130 MW

GOP TRANSMISSION POLICY – 2015

- CPEC PROJECTS
  - PRIORITY PROJECTS
  - ACTIVELY PROMOTED PROJECTS.

- DEVELOPMENT OF TWO TRANSMISSION PROJECTS FOR EVACUATION OF POWER GENERATION IN SOUTH

  - ±660 KV HVDC MATIARI – LAHORE PROJECT
  - ±660 KV HVDC PORT QASIM – FAISALABAD PROJECT

SCOPE OF HVDC MATIARI-LAHORE PROJECT

- ± 660 kV HVDC Bipole T/Line from Matiari to Lahore (about 870 KM).

- HVDC Converter & Switching Control Stations at Matiari & Lahore

- Transmission capability of Power - 4000 MW

CONVERTER STATION LOCATIONS

- CONVERTOR STATION MATIARI SITE – NATIONAL HIGHWAY, ABOUT 8 KM NORTH MATIARI VILLAGE SIAKHART.

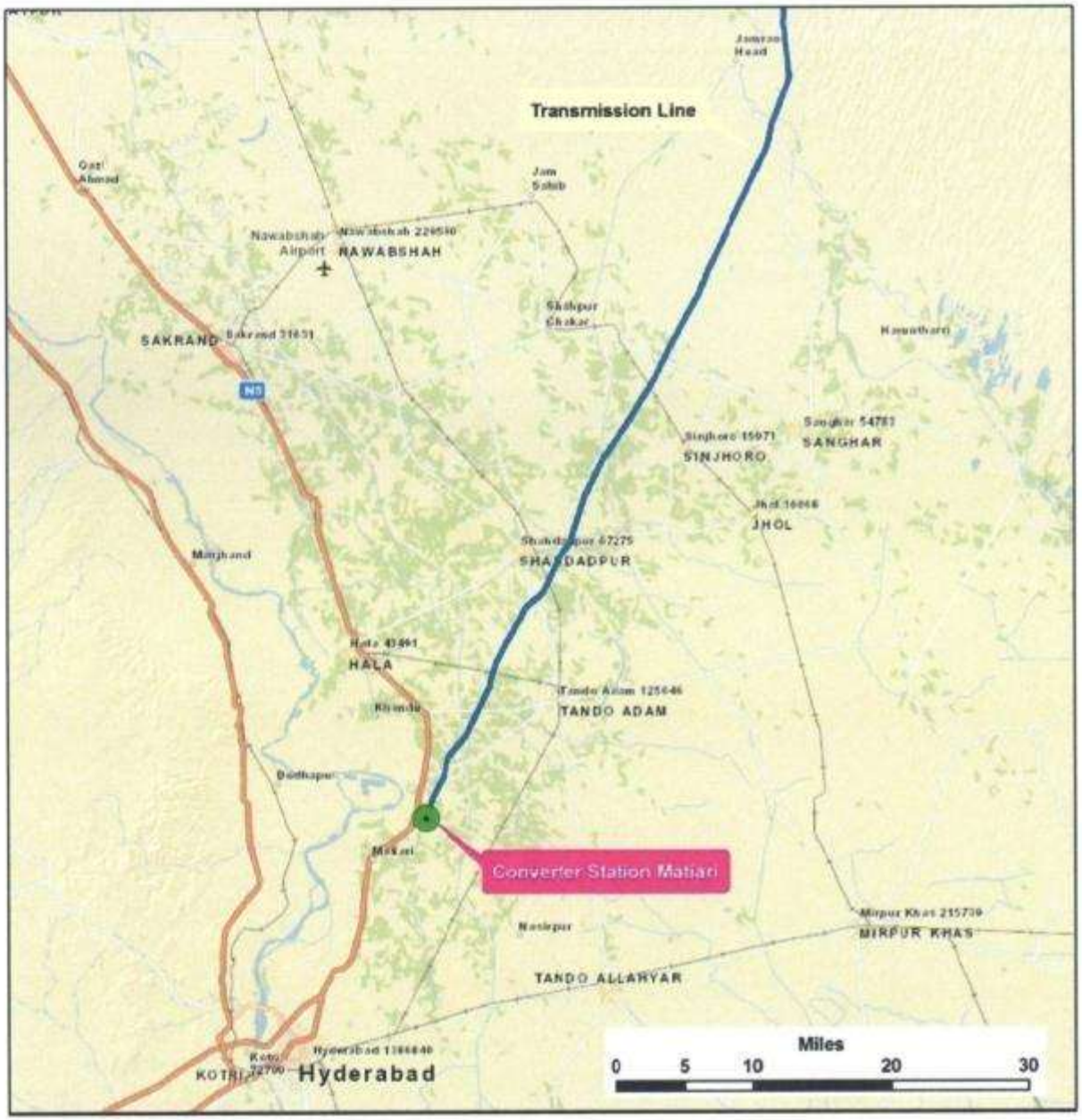
- CONVERTOR STATION LAHORE – PHOOL NAGAR MORE KHUNDA ROAD 4 KM WEST HEAD BALLOKI VILLAGE WAIZIR, ABOUT 60 KM TO LAHORE.

HVDC MATIARI-LAHORE TRANSMISSION LINE

- ABOUT 870 KM

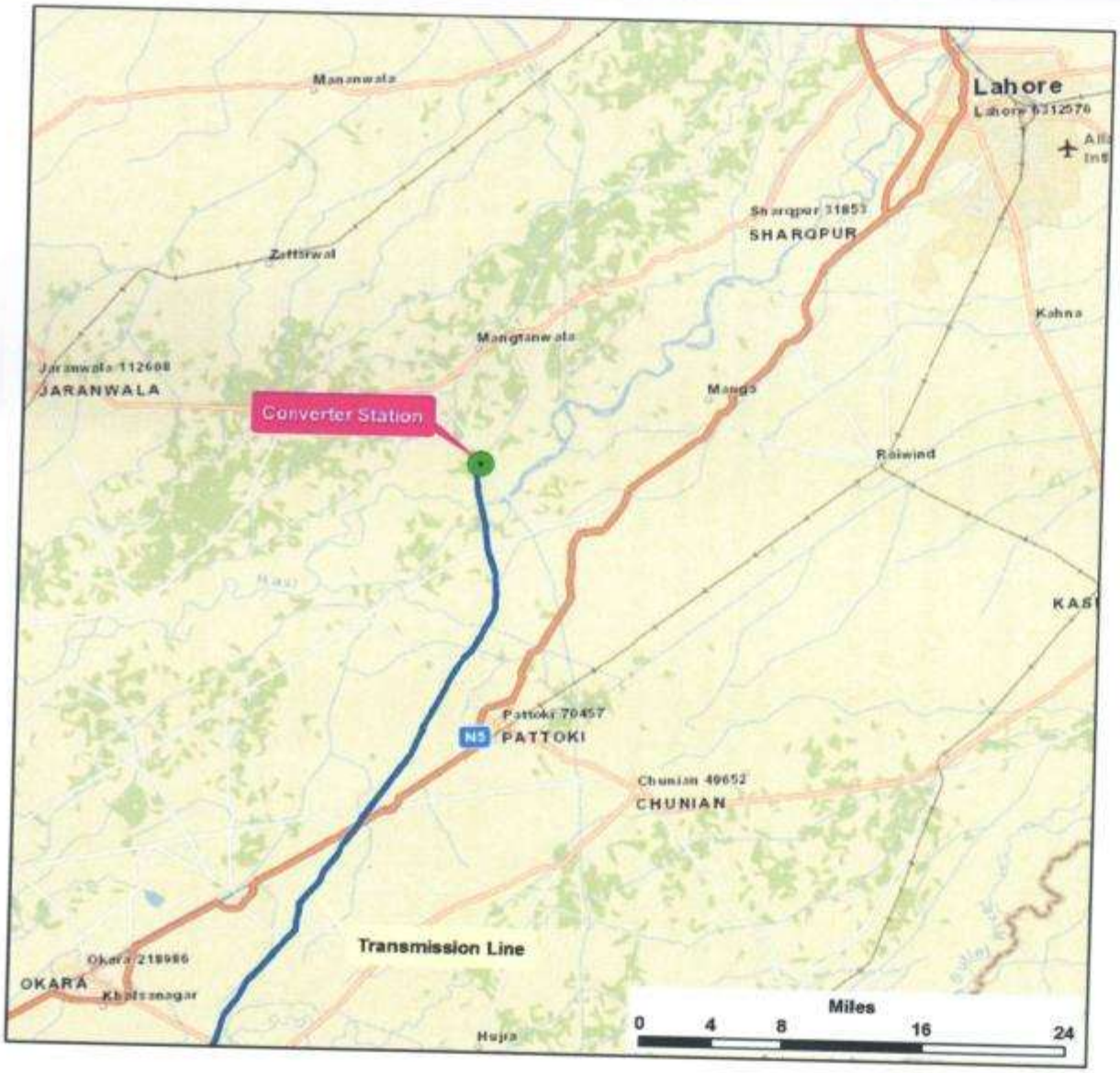
- IN SINDH PROVINCE, PASSES THROUGH DISTRICTS OF MATIARI, SANGHAR, KHAIRPUR, SUKKUR, GHOTKI (ABOUT 320 KM)

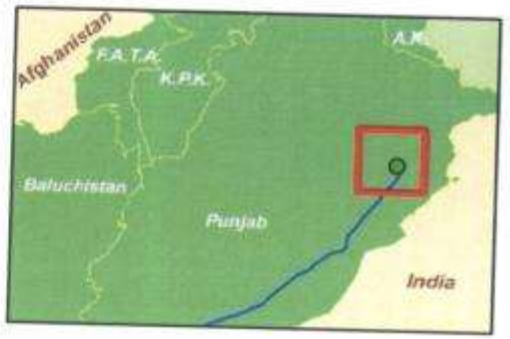
- IN PUNJAB PROVINCE, PASSES THROUGH DISTRICTS OF RAHIM YAR KHAN, BAHAWALPUR, BAHAWAL NAGAR, PAK PATTAN, OKARA, KASUR, NANKANA (ABOUT 550 KM).



PROPOSED LOCATION OF CONVERTER STATION NEAR MATIARI

±660kV HVDC Transmission Line from Matiari to Lahore

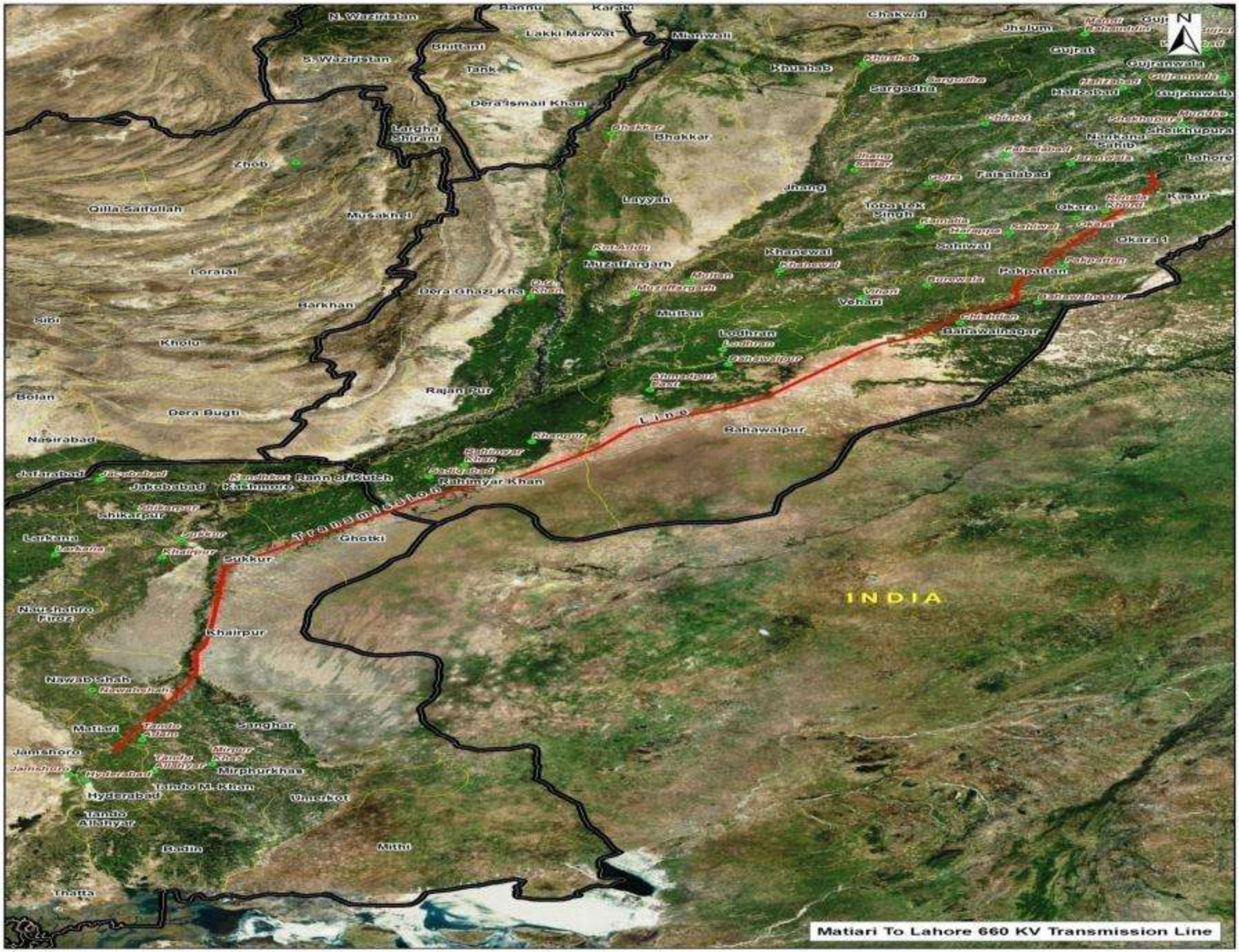




PROPOSED LOCATION OF CONVERTER STATION NEAR LAHORE

±660kV HVDC Transmission Line from Matiari to Lahore

Figure 4.2b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Bannu
Karak
Chakwal
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Gujrat
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Lakki Marwat
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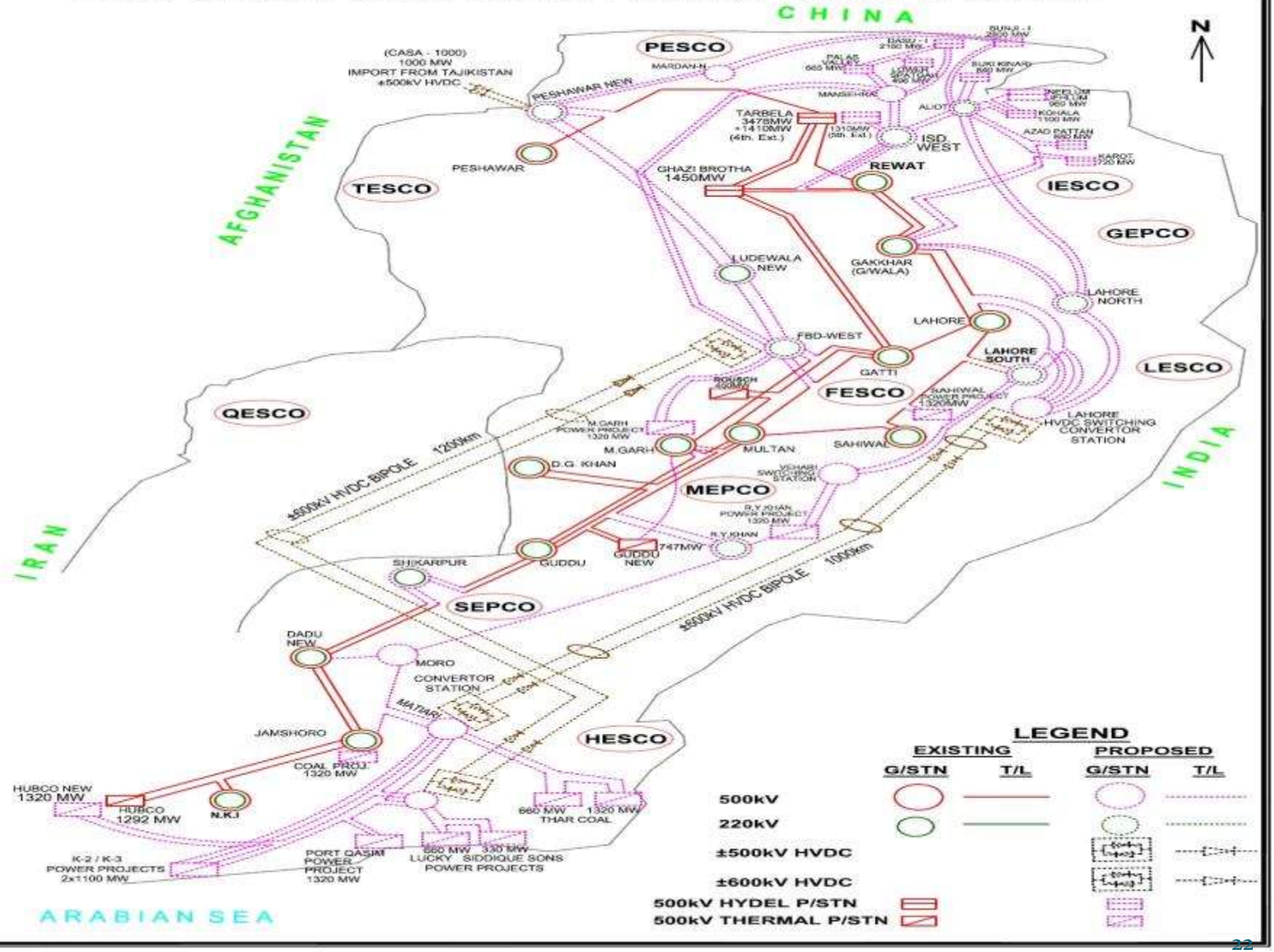
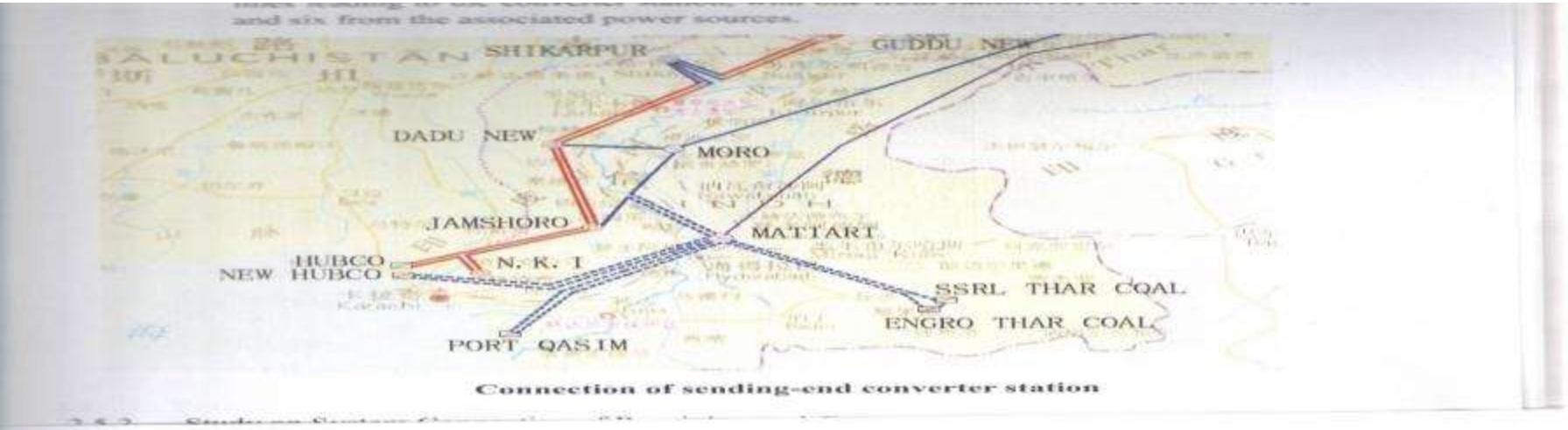
Bhittani
Tank
Khushab
Sargodha
Dera Ismail Khan
Bhakkar
Lorha Shirani
Zhob
Layyah
Jhang
Faisalabad
Lahore
Qilla Saifullah
Musakhel
Toba Tek Singh
Okara
Kasur
Sahiwal
Khanewal
Muzaffargarh
Multan
Pakpattan
Loralai
Dera Ghazi Khan
Barkhan
Vehari
Kohi
Kholu
Lodhran
Bahawalnagar
Bolan
Rajan Pur
Dera Bugti
Line
Bahawalpur
Nasirabad
Rann of Kutch
Jaffarabad
Jacobabad
Kashmore
Rahimyar Khan
Shikarpur
Larkana
Ghotki
Sukkur
Transmission
INDIA
Naushahro Feroz
Khairpur
Nawabshah
Matiari
Tando Adam
Sanghar
Jamshoro
Mirpur Khas
Mirpurkhas
Hyderabad
Tando M. Khan
Umerkot
Tando Allahyar
Badin
Mithi
Thatta
Matiari To Lahore 660 KV Transmission Line

INTEGRATED TRANSMISSION SCHEME FOR DISPERSAL OF POWER FROM COAL BASED POWER PLANTS IN SOUTH

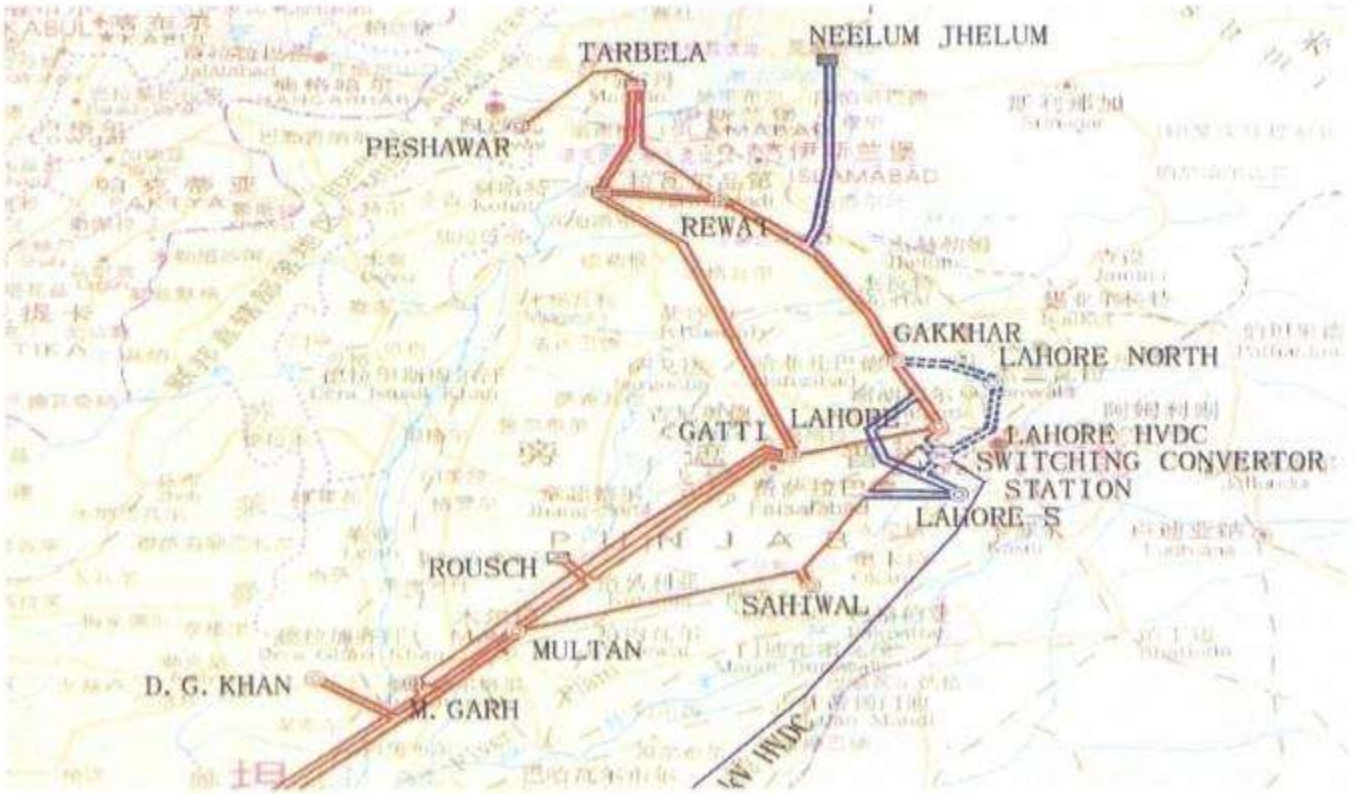


INTERCONNECTION SCHEME AT MATIARI



Connection of sending-end converter station

INTERCONNECTION SCHEME AT LAHORE



PROJECT FEASIBILITY REPORTS

- LOAD FLOW STUDY
- SYSTEM STABILITY ANALYSIS REPORT
- GENERAL REPORT
- TECHNICAL SPECIFICATION
- EPC COST
- UPFRONT TARIFF STRUCTURE

COMPLETION TIMELINES

As per Cooperation Agreement Between State Grid China and NTDC (20.04.2015):

- Feasibility study to be finalized by SGCC/CET upto end of July, 2015
- Design completed upto December, 2015
- Construction period 24 months after design finalized

PROJECT MANAGEMENT UNIT

- Abdur Razzaq Cheema — Team Leader
  Ex-GM GSC/Consultant
- Anjum Aziz — Coordinator
  Manager (GSC)
- Tariq Shafi — Progress Monitoring
  Manager (EHV-I)
- Muhammad Shabbir — Commercial Team Leader
  Dy. GM Finance (WPPO)

IMPLEMENTATION TEAM

- Chief Engineer (EHV-I) Lahore
- Chief Engineer (EHV-II) Hyderabad
- Chief Engineer (WPPO)
- Manager Environment NTDC
- Chief Security Officer NTDC
- Finance Director NTDC
- Legal Advisor NTDC
- Project Manager NESPAK

TECHNICAL / COMMERCIAL SUPPORT NEEDED

- Issues of system stability with proposed induction of HVDC Transmission Scheme.
- Protection & Control
- Telecom / SCADA
- System losses (Permissible / Recommended)
- Standards / controlling specifications adopted internationally dealing with:
- Availability of System
- Noise level / ROW
- Sending End / Receiving End System Topology
- Central Control Mechanism at NPCC for System Stability
- Lenders' concern-Insurance of T/Line Section


Thank You!