India-Pakistan
Energy Cooperation :
Rethinking Opportunities and Newer Approaches

Prof Mahendra P Lama

Jawaharlal Nehru University
New Delhi

ICRIER, New Delhi, 02-03 February 2015

Energy Security : Dual Dimensions

South Asian countries : two crucial perspectives
i) sustainable development
ii) security-militaristic

Sustainable development : energy security impinges upon : economic, environmental and social developments.

South Asia : very nature and direction of sources of energy supplies, demand, consumption and distribution and related geo-politics call for a regional approach to energy security

Macro depiction : energy resources Skewedly distributed

Therefore - no individual nation in South Asia could ensure and endure energy security alone.

Interdependence and sustained cross border exchanges : the only way out

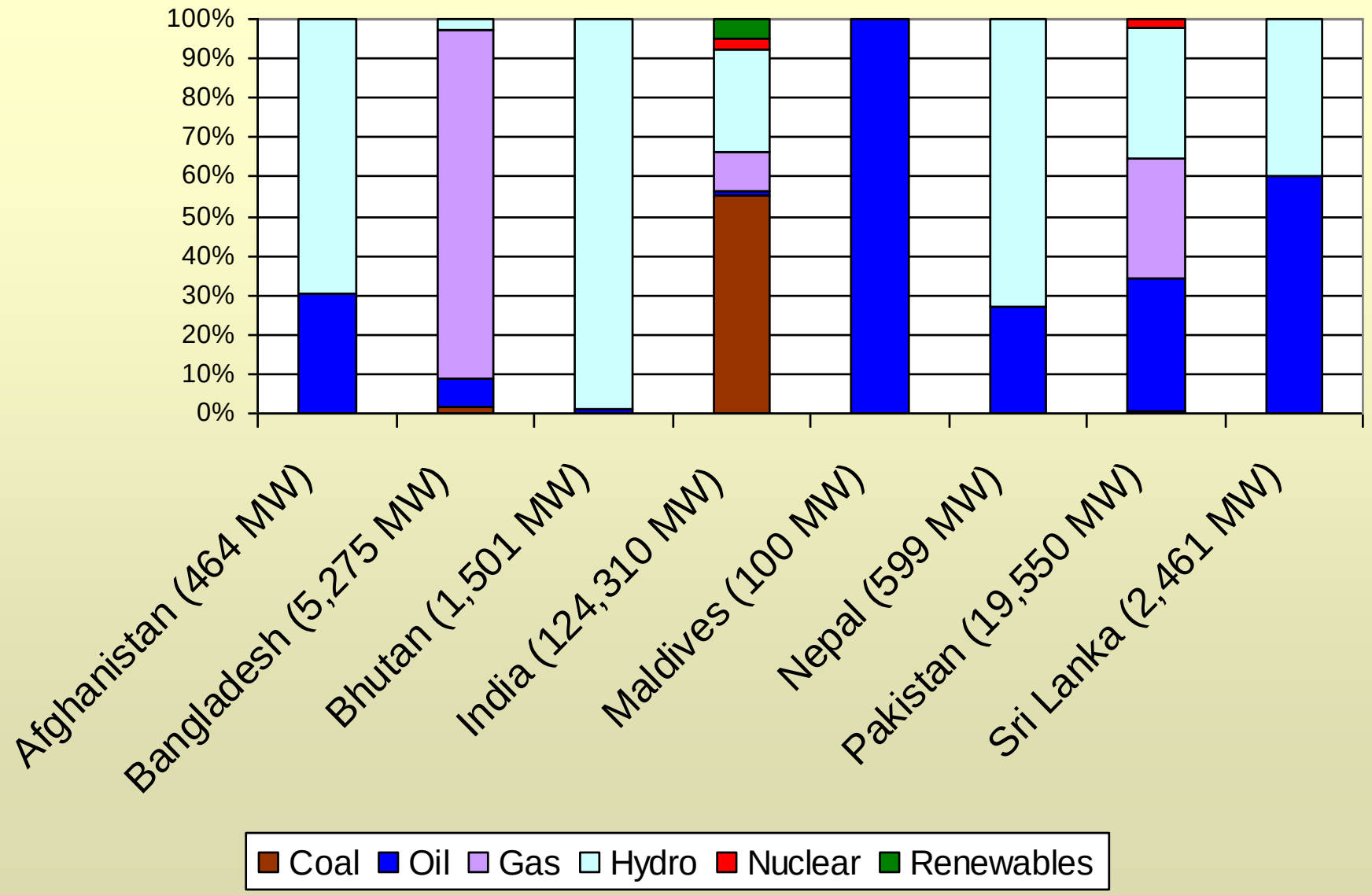
Geo-political Dimensions

Energy security : entangled in the geo-politics of the region.
India's centrality : size and its exclusive geographical location

Shares common border with all
No other two countries have common borders.
17 provincial states (out of 29) have international land borders.

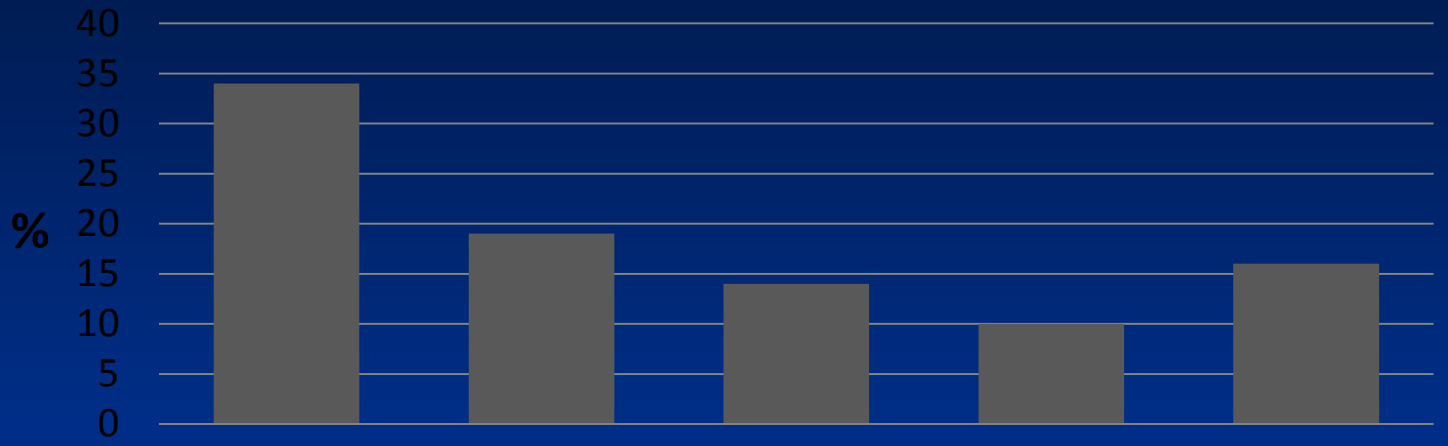
Borders – so far symbols of National Security threats
So Withdrawal Syndrome prevailed
Today borders represent the galore of opportunities

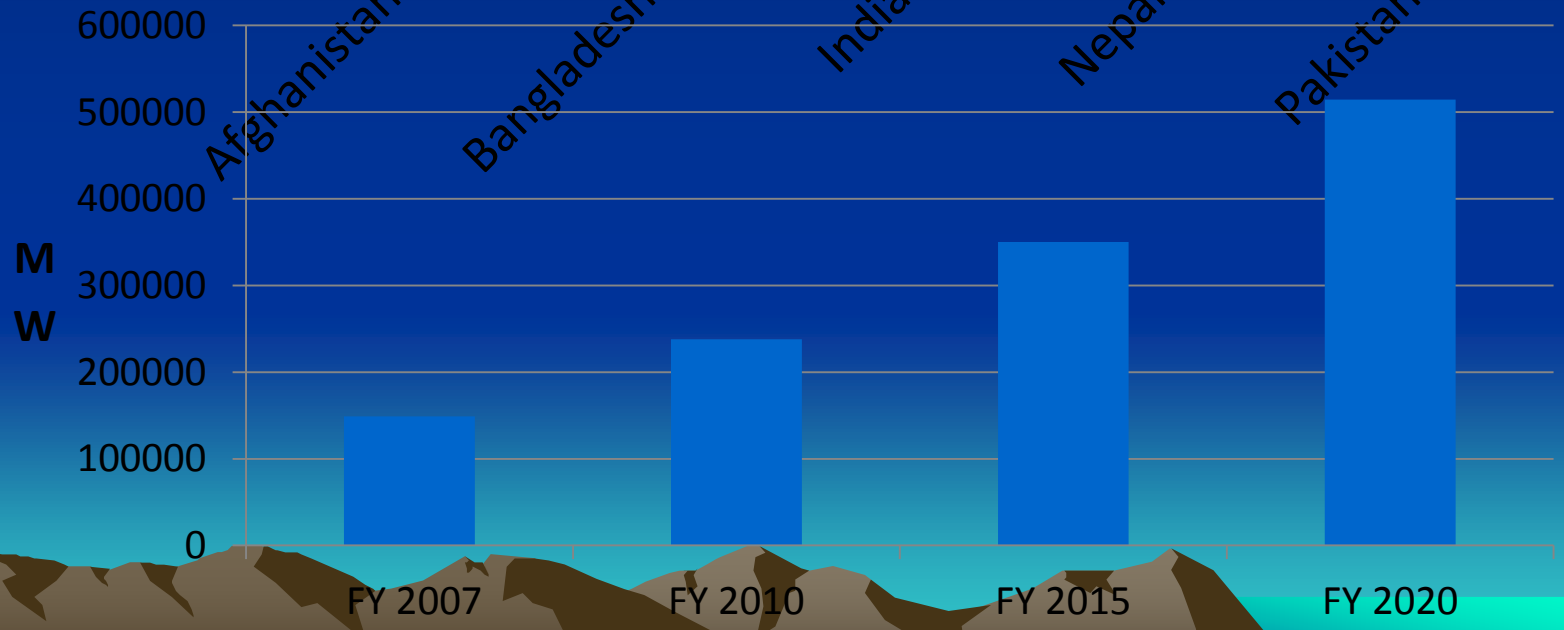
Energy Mix in Power Generation



Source: SEC

Shortages VS Growing Demand





Electricity Demand

Countries	Present Fuel dominance	Additional power requirement by 2020 (MW)
Bangladesh	Gas (85%)	15000
India	Coal (50%)	100000
Pakistan	Gas, Hydro, Oil (equal)	20000
Rest	Hydro, Oil	15000

Except Bangladesh, all SAARC countries have more than 50% of their hydro potential Unutilized (100,000 – 150,000 MW)

Energy Exchange and Trading : Rationale and Benefits

Difficulty : we were integrated, somehow we got disintegrated and Now anyhow we want to re-integrate

Cross border energy trade could lead to effective utilisation of natural resources,

increase in supply reliability, economy in operation & mutual support during contingencies,

bring about large scale transformation in sectors contributing to economic growth,

It will act as the single most effective confidence building measure (CBM) through the participation of multiple stakeholders and substantially promote market integration in energy related goods and services.

Savings in Capital & Operating Costs

Optimal Use of Available Generating Capacity

Seasonality factor in both generation and demand is highly noticeable.

Five reinforcing factors that are likely to promote power trading/energy cooperation

I High potentials yet huge deficit

Huge power crisis leading to long hours of load shedding
Affect : social and economic and commercial activities.

Tremendous public pressures on the respective govts to act upon.

This could even lead to political instability.

People are willing to pay for the electricity.

II Increasing realizations among leadership to Expedite process of energy exchange.

For instance : Declarations in various SAARC Summits.

18th Summit in Kathmandu Nov 2014:

"The Leaders directed the relevant SAARC bodies and mechanisms to identify regional and sub-regional projects in the area of power generation, transmission and power trade, including hydropower, natural gas, solar, wind and bio-fuel, and implement them with high priority with a view to meeting the increasing demand for power in the region"

Signed SAARC Framework Agreement for Energy Cooperation (Electricity).

Energy Cooperation SAARC Institutional Mechanism

- Ministerial Level Energy Forum
- Working Group on Energy
- Expert Groups for different energy commodities
- SAARC Energy Centre

- **Four Expert Groups preparing way forward in:**
  - Oil and Gas
  - Electricity
  - Renewable Energy
  - Technology Transfer (including Coal and Energy Efficiency)

III Various levels of sensitisations and preparations for energy trading.

A number of organizations (regional and outside) engaged.

Technical and professional public and private sector organizations are often meeting and seriously deliberating

And UNDP, ADB, World Bank, USAID are active agencies
Large number of studies and policy suggestion :

South Asia Network of Econ Research Institutes (SANEI),

Coalition for Action on South Asian Cooperation (CASAC),

BCIM Forum

IV Massive power sector reforms taken place

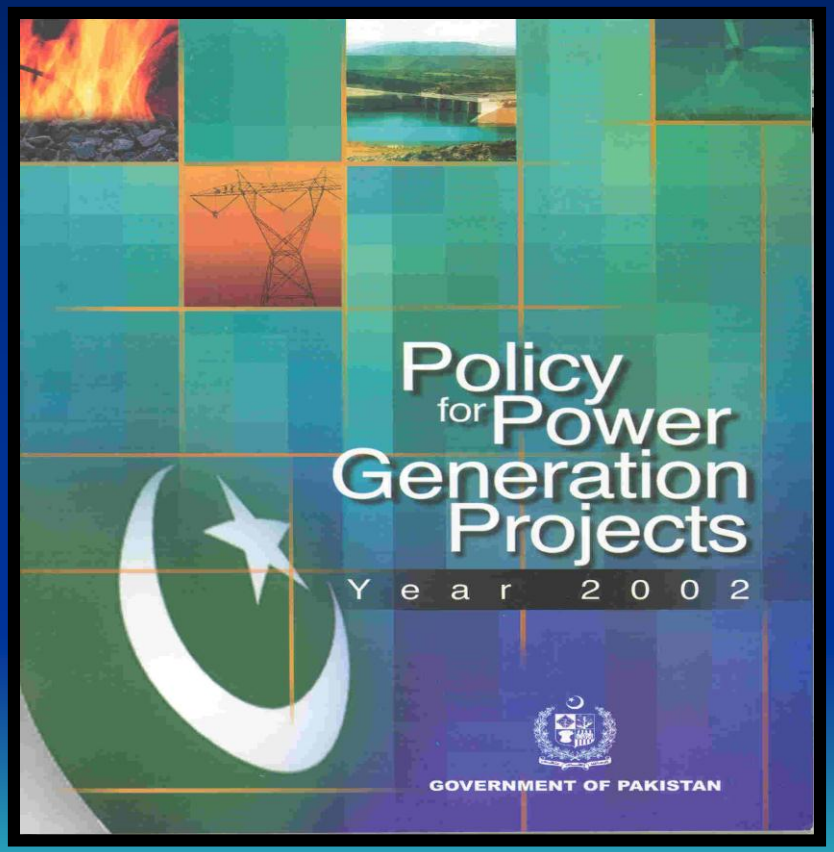
- India - Electricity Act 2003
- National Electricity Policy, 2005
- Integrated Energy Policy 2006

- First National level Power Exchange, Indian Energy Exchange (IEX) commenced operation in June, 2008

Financial institutions including multilateral agencies are keen to invest. China emerging as a new actor.

Pakistan - Commercial Framework for IPPs & Fiscal Concessions

Private Power & Infrastructure Board (PPIB) 1994

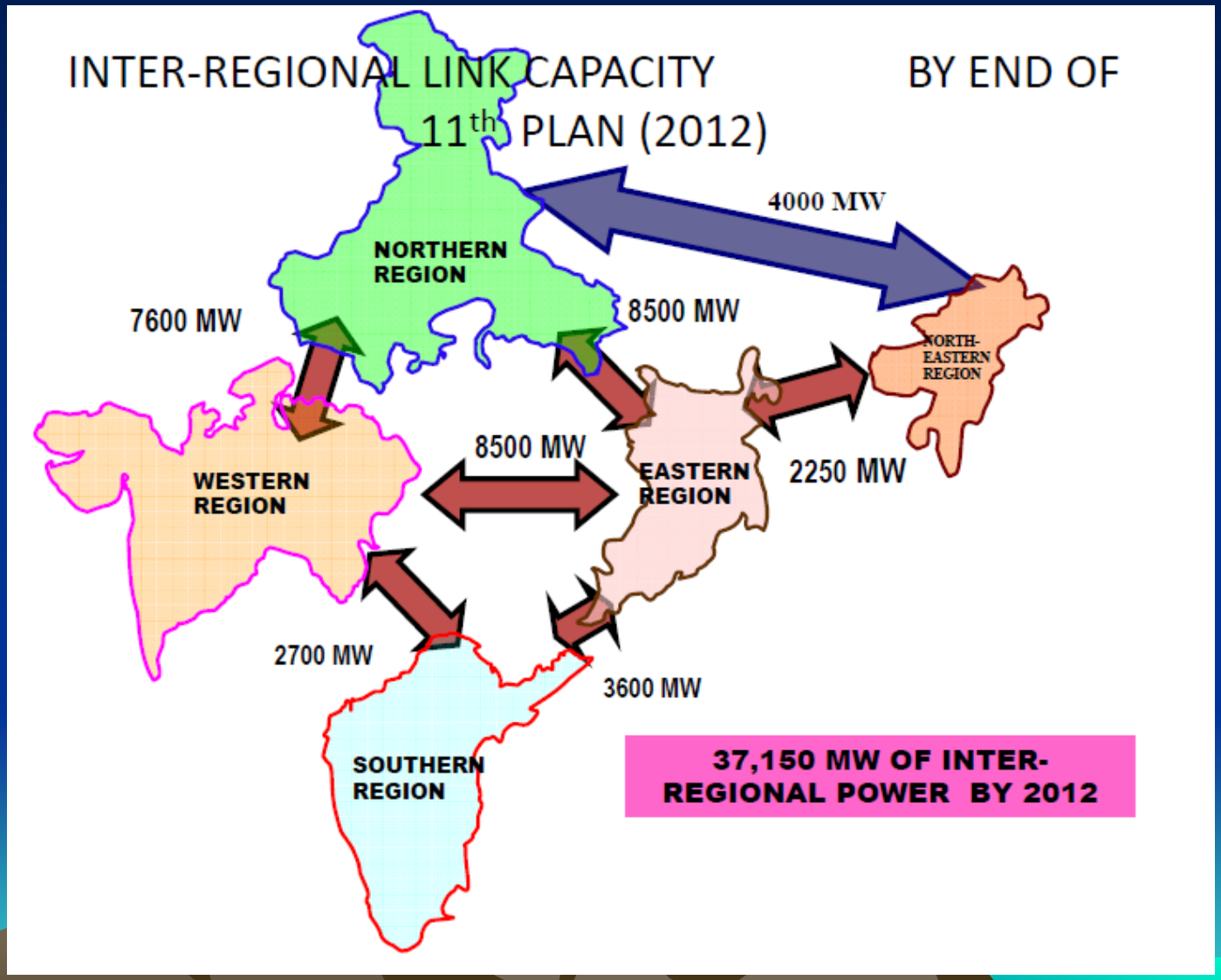


V Significant level of Transmission Systems are in place

India : two varieties of exchanges viz. Inter-state and Inter-regional

- Present installed capacity - **294000ckm**
  - ✓ 220kV Transmission Line - 150000ckm
  - ✓ 400kV Transmission Line - 125000ckm
  - ✓ HVDC 800/600kV Line - 3600ckm
  - ✓ HVDC 500kV Line – 7400 ckm
  - ✓ 765kV Transmission Line - 7600ckm
- Present Inter regional Capacity – **38650MW**
  - Expected by 2017 - **75000MW**
- Estimated Additions of Transmission Network in 12th Plan – **155000 to 180000ckm**

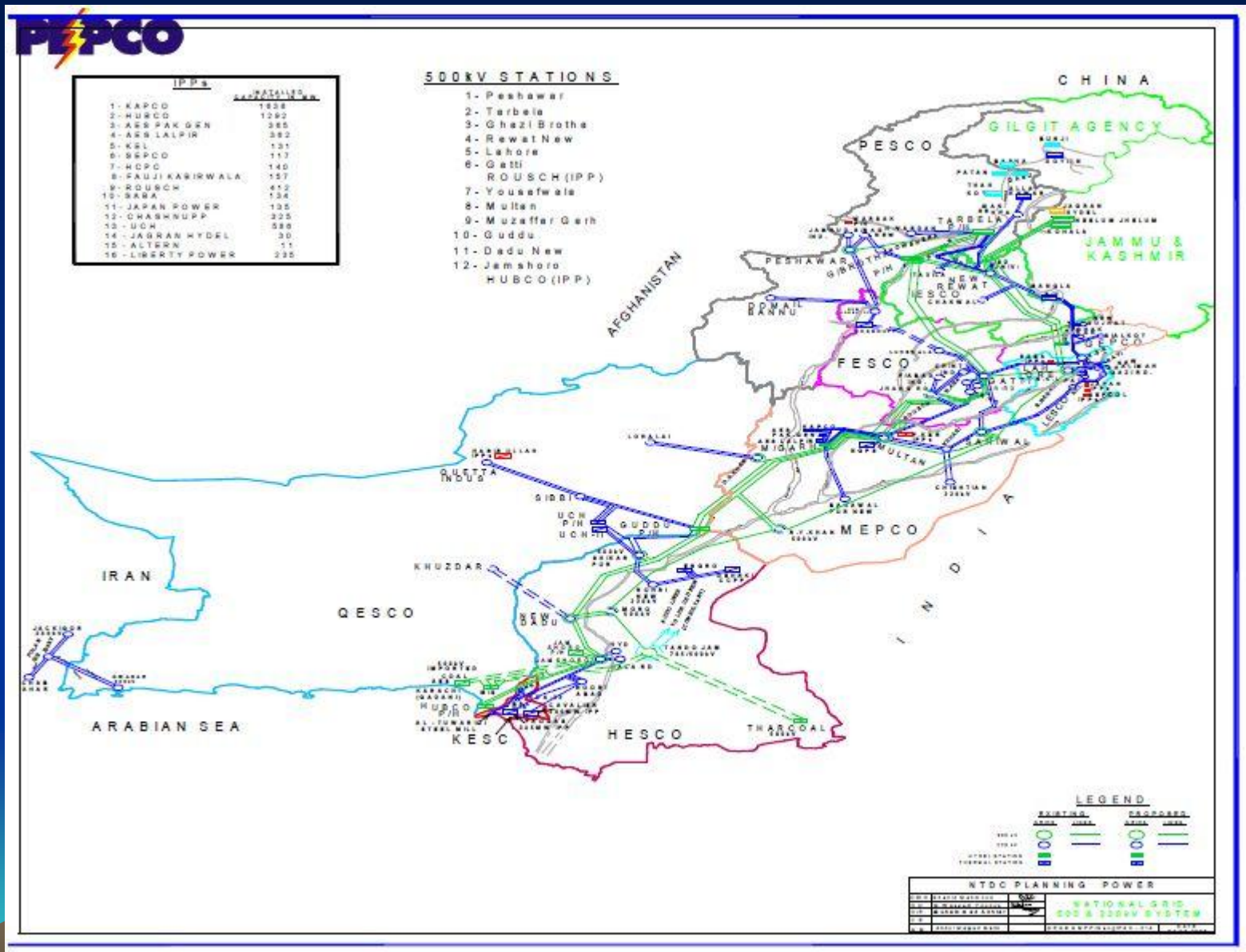
India - Transmission System



Source: CEA & Planning Commission reports

TRANSMISSION SYSTEM

Voltage	Sub Stations				Transmission Lines	
	WAPDA		KESC		WAPDA	KESC
	No.	MVA	No.	MVA	(circuit km)	
500 kV	11	13000	-	-	4490	-
220 kV	27	10369	6	2500	7218	276
132 kV	464	24404	40	3459	28894	604
66/33 kV	197	2629	6	215	7617	219
Total	699	50404	52	6174	48219	1099


PEPCO
IPPs
1- KAPCO 1638
2- HUBCO 1292
3- AES PAK GEN 365
4- AES LALPIR 362
5- KEL 131
6- SEPCO 117
7- HCPC 140
8- FAUJI KABIRWALA 157
9- ROUSCH 412
10- SABA 134
11- JAPAN POWER 135
12- CHASHNUPP 325
13- UCH 586
14- JAGRAN HYDEL 30
15- ALTERN 11
16- LIBERTY POWER 235
500kV STATIONS
1- Peshawar
2- Tarbela
3- Ghazi Brotha
4- Rewat New
5- Lahore
6- Gatti
ROUSCH (IPP)
7- Yousafwala
8- Multan
9- Muzaffar Garh
10- Guddu
11- Dadu New
12- Jamshoro
HUBCO (IPP)
CHINA
GILGIT AGENCY
PESCO
JAMMU & KASHMIR
AFGHANISTAN
PESHAWAR
TARBELA
NEW REWAT
FESCO
MEPCO
MULTAN
GUDDU
KHUZDAR
IRAN
QESCO
ARABIAN SEA
KESC
HESCO
INDIA
LEGEND
NTDC PLANNING POWER
NATIONAL GRID
500 & 220kV SYSTEM

India-Pakistan Power Exchange

Three Options :

1 Bilateral power trade

2 Pool based exchange and

3 Wheeling Facility

1 Bilateral Options : Success Stories

- India - Bhutan Energy Exchange:

India- Bangladesh : Three Far reaching Projects underway

i) 250 MW exports from India likely to start in mid 2013

ii) A grid inter-connection between Bheramara in Bangladesh and Bahrampur (West Bengal) in India is likely to be completed by mid 2013. ADB loan critical role

iii) 1320 MW coal based unit at Rampal (350 kms S-South West of Dhaka by Bangladesh-India Friendship Power Company consisting of BPDB and NTPC costing $1.5 billion by 2017

These three projects are going to be landmark starting projects as they for the first time break a long journey between potential, negotiations and implementations.

Could lead to several such exchanges

4-Borders pre-feasibility study
Bangladesh-Bhutan-India-Nepal Interconnection

These are path breaking projects because :

Shows a new and more realistic and matured relations between India and Bangladesh

New trend of harmonized and coordinated approach among various ministries within a country.

Indicates a generational shift in the bureaucracy of both these countries. Sidelining of unnecessary national prejudices.

Strong commercial and professional elements in the exchanges.

Issues of orthodox variety of national security are for the first time overwhelmed by more serious concerns about non-traditional security threats such as energy insecurity and human insecurity.

Leaders have discarded their traditional positions and showed unprecedented “political will”.

Borders are used as opportunities rather than sources of threats

Could lead to several such exchanges

2 Pool based approach : Sub-regional power Pool

-The pool based approach : agent based integrated simulation can possibly provide support to develop a competitive long run market equilibrium in sub-regional power trade.

Involves working together of a set of agents (manufactures), a monitoring, advisory and channelising regional body in close harmony.

Establishing a Sub-Regional Power Trading Corporation (SRPTC) would be highly beneficial to launch this type of market mechanism in India-Pakistan sub-region also.

Some Successful Power Pools based examples of energy exchange

Regional Arrangement	Member Countries
Union for the Coordination of Transmission of Electricity (UCTE)	Spain, Portugal, France, Belgium, Italy, Netherlands, Luxemburg, Austria, Germany, Switzerland and now extended to Poland, Czech Republic, Slovak Republic, Hungary, Slovenia and Croatia.
Nord Pool	Norway, Sweden, Finland & Denmark
North American Electric Reliability Council (NERC)	United States and Canada.
Southern African Power Pool (SAPP),	South Africa, Lesotho, Mozambique, Namibia, Malawi, Zimbabwe, Zambia, Botswana, Angola, Swaziland & Tanzania
The Commission of Regional Power Integration (CIER)	Jordan, Bahrain, Tunisia, Algeria, Saudi Arabia, Syria, Libya, Egypt, Morocco, Mauritania, Yemen, Iraq, Lebanon, Palestine, Dubai and Qatar
South America, power trading	Argentina, Paraguay & Uruguay. Central America

3 Wheeling Facility

- Distinct advantages for Pakistan to import power from Bhutan and Nepal both because of the lower tariff and supply reliability.

Bhutan : like to diversify the markets
from India's monopsony situation to Regional Market

Other major supplier : Number of hydro plants are under construction in the North East region

Bhutan : Huge Generation Surplus by 2020 & 2030

Existing Installed Capacity (IC)	Capacity addition by 2020	**I.C. by 2020**	Capacity addition by 2030?	I.C. by 2030?
1,480	11,864	**13,344**	14,653	**27,997**
5 HEPs	13 HEPs	60 HEPS	78 HEPs	

In addition, the countries neighboring SAARC region have abundant natural resources

- Central Asia (hydropower, gas, coal, oil)
- Iran (gas, oil)

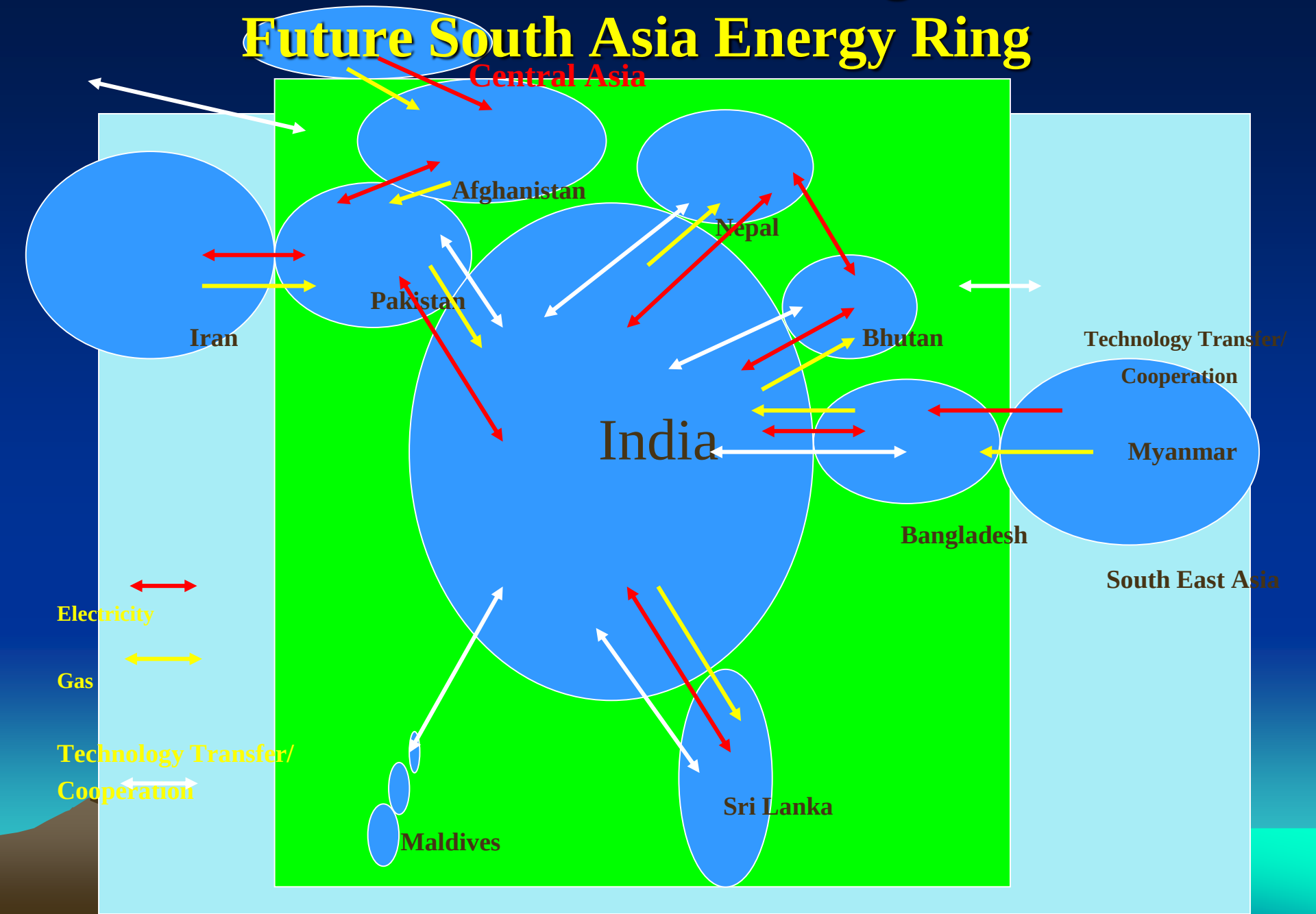
Opportunity exists for Pakistan to import electricity from Central Asia/Iran etc. and provide transit to India and other SAARC countries.

Example CASA :

The governments of Afghanistan, Kyrgyz Republic, Pakistan and Tajikistan have entered into MoU for overall development of Central Asia-South Asia Regional Energy Markets (CASAREM)

•

India and Pakistan could be integrated in the Future South Asia Energy Ring



India and Pakistan
Several Bilateral Options

HUGE potentials between India and Pakistan

India's North East regions are now harnessing the hydel power potentials in a massive way
For Example : Sikkim – 2000 MW by 2015
Domestic Demand is hardly 200 MW

Options : to export power to Pakistan
Bangladesh, Myanmar and China

Hydro Power Potential in North East India

States	Potential (MW)	Capacity developed (MW)	% of the capacity developed
Arunachal Pradesh	50328	423.5	0.84
Assam	680	375.0	55.15
Manipur	1784	105	5.89
Meghalaya	2394	185	7.74
Mizoram	2196	0	0.00
Nagaland	1574	99	6.29
Tripura	15	15	100
Total NE	58971	1202.7	2.04
All India	148701	33222.5	22.34

India's proposed Power Import from Pakistan

1998 Pakistan's offer to India to sale surplus power

Discussions : Power Grid Corporation of India Limited (PGCIL) and WAPDA led various independent power producers (IPPs) in Pakistan

Feasibility of export of 300-1000 MW power to India was studied

Delivery points were identified and number of options were explored

System studies were also carried out under various loading conditions

- Technical and commercial aspects were also considered

- 2nd Draft of the Interconnection and Operating Agreement was discussed on 1 February 1999

  - Tariff : major stumbling block
  - WAPDA offered : US 7.2 cents/KWH
  - While Indian side offered : US 2.25 cents
  - Negotiations broke off

Transmission Arrangement : Easy Access

Pre-Partition plans/arrangements also available

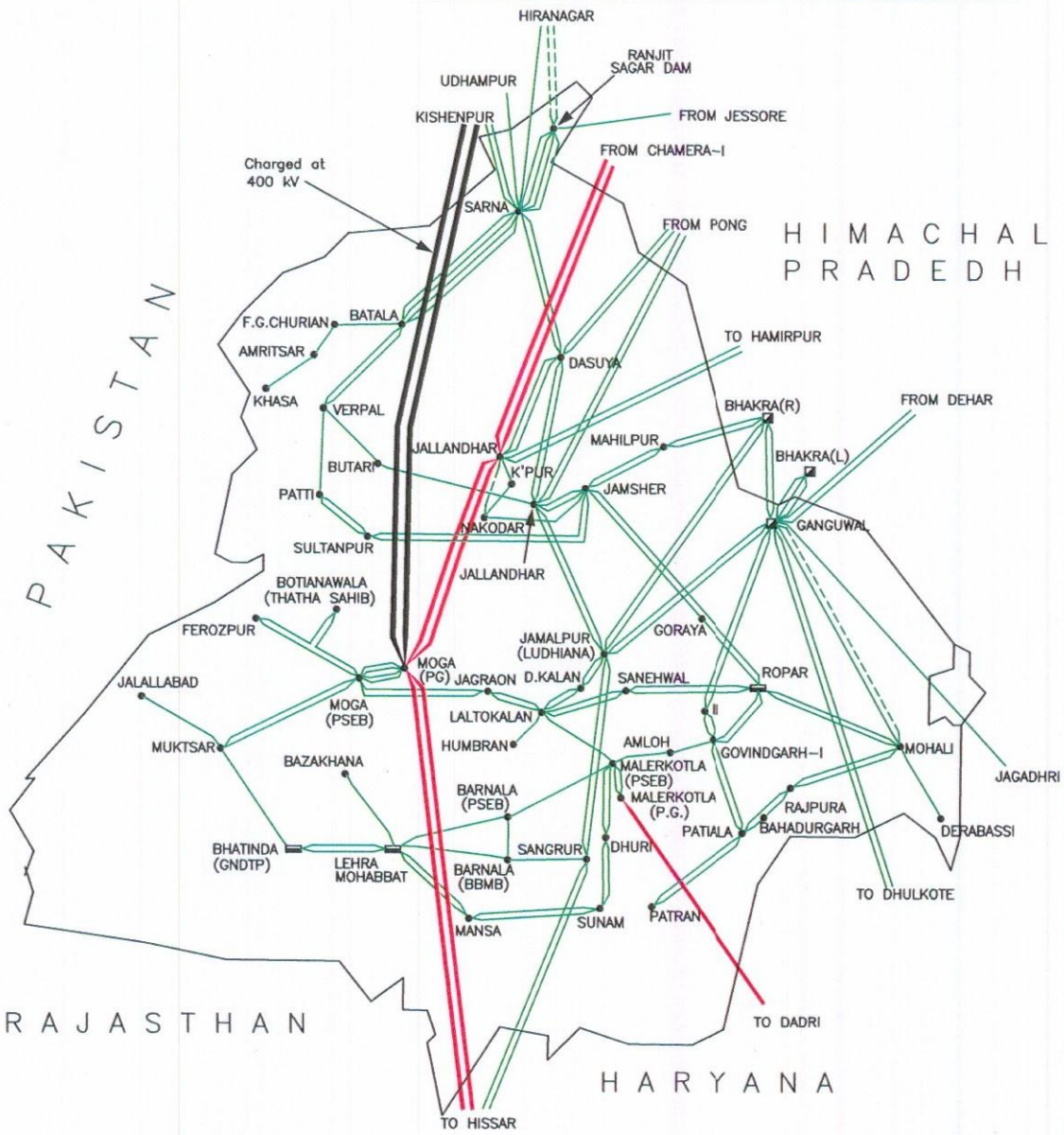
Pakistan - 500 KV primary transmission system Extending from Jamshoro in the south to Tarbela and Peshawar in the north.

Lines run very much near to the adjoining borders of India

May not require complex transmission extensions :

Designated substations
Dinanath (Lahore) in Pakistan and
Patti (Punjab) in India.

POWER MAP OF PUNJAB



LEGEND:—

	EXISTING	PROPOSED
HYDRO POWER STATIONS	◪	◪
THERMAL POWER STATIONS	▬	▬
SUB STATIONS	•	○
765 kV TRANSMISSION LINES	▬▬	▬ ▬
400 kV TRANSMISSION LINES	———	- - -
220 kV TRANSMISSION LINES	———	- - -

NRLDC/POWERGRID

POWER MAP OF PUNJAB

220 kV AND ABOVE

DRN. BY Ramjit | MARCH, 2004


500kV STATIONS
1-Peshawar
2-Tarbela
3-Ghazi Brotha
4-Rewat New
5-Lahore
6-Gatti
ROUSCH(IPP)
7-Multan
8-Muzaffar Garh
9-Guddu
10-Dadu New
11-Jamshoro
HUBCO (IPP)
117km
3478MW
TARBELA
SHAHIBAGH
MARDAN
PESHAWAR
WARSAK
240MW
BURHAN
10km
ISD.PESH.RD.
IESCO
ISD.UNIV.
N.IND.
72km
87km
1000MW
MANGLA
PESCO
GHAZI
BROTHA
1450MW
112km
REWAT
BANNU
DAUD KHEL
CHASNUPP
1&2
(2x325MW)
311km
GUJRANWALA
286km
118km
84km
GEPCO
GAKKHAR
SIALKOT
85km
70km
K.S.K
LESCO
LUDEWALA
LAHORE
RAVI
GHAZI
ROAD
FESCO
GATTI
85km
CIRCUIT(1)209km
CIRCUIT(2)222km
BUND
RD.
NEW KOT
LAKHPAT
412MW
ROUSCH
J.RD.
NISHATABAD
S.RD
316km
S.NAGAR
1638MW
KOTADDU
A.E.S
PAK.GEN.
727MW
130MW
MULTAN
A.E.S
LALPIR
YOUSAFWALA
QUETTA IND:
QESCO
D.G.KHAN
MUZAFFAR
GARH
1370MW
KASSOWAL
N.G.P.S
MULTAN
VEHARI
MEPCO
HCPC
140MW
SIBBI
316km
BAHAWALPUR
256+58km
586MW
UCH
1655MW
GUDDU
KHUZDAR
SHIKARPUR
285km
286km
HESCO
DADU
155km
152km
JAMSHORO
850MW
KESC
HALA RD.
1292MW
HUBCO
LINE(1)182km
LINE(2)181km
K.D.A-33
HYDERABAD
THAR COAL
LEGEND
EXISTING
PROPOSED
G/STN
T/L
G/STN
T/L
500kV
220kV
HYDEL P/STN
THERMAL P/STN
P/STN IPPs
NAME OF DISCO
DISCO
NTDC (WAPDA)
PLANNING POWER
DWN
SHAHID MAHMOOD
DD
M.WASEEM
CE
S.S.TANWEER
GM
KH.SHAFIQ AHMAD
GRID MAP
500 & 220kV SYSTEM
DRG NO. GM(PP)014
DATED
04-12-03

"There is a complete network on our side and of course on their (India) side as well. What we need are the connections, which would take only a couple of weeks“ - **Statement by the Power Minister of Pakistan Gohar Ayub Khan,**

New Negotiations

- Group of Experts on Energy have met thrice (Rounds of Secretary level talks on commercial and economic co-operation between India and Pakistan)

To negotiate on a cross-border interconnection between India and Pakistan to facilitate exchange and trade in electricity 500 MW power from Indian power market on commercial terms.

Three vital Steps

De-politicise

De-securitise

De-bureaucratise

at least the first project

Because it is a project at the ground level that is the test.

Otherwise like in the past 67 years we would continue to be most consistently inconsistent.


thank you