Opening Nepal Hydropower Investment

&

Accessing Indian Electricity Market

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Agenda for Presentation

- Nepal's present power scenario
- Nepal's hydropower potential
- Market for Nepal's hydropower
- Access to electricity market
- Nepal's legal & regulatory framework
- Why invest in Nepal's hydropower development
- Issues and challenges
- Vision for Nepal's power sector
- Conclusion

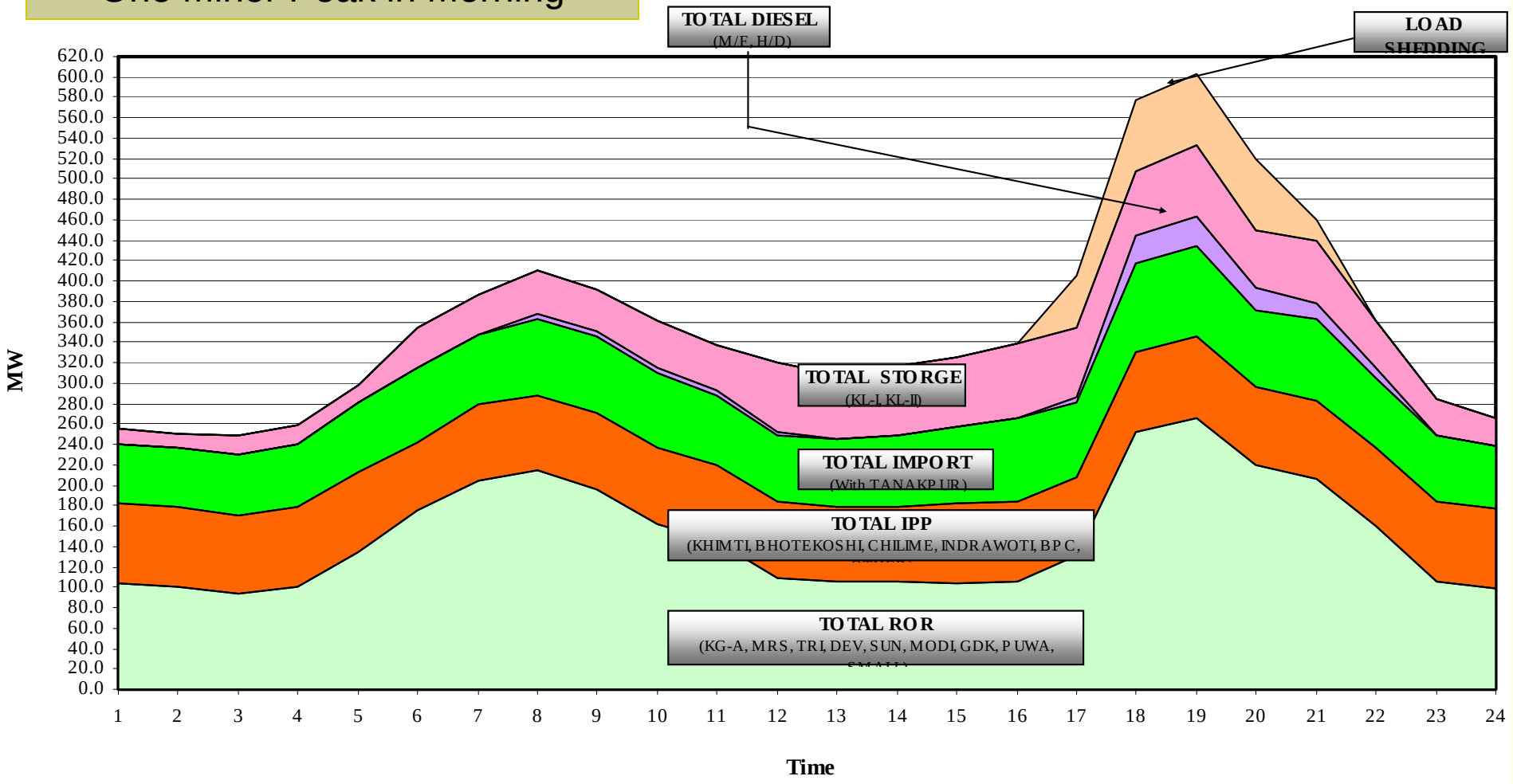
Nepal's Present Power Scenario

- Peak Load in current FY 2006/07, Dec. 643 MW
- Annul Energy Consumption in FY 2005/06 2777 GWH
- Total Number of Consumers 1.28 Mil
- Total System Loss 24.7 %
- Access to electricity 42 %
- Per capita energy consumption 70 KWH
- Average Annual Demand Capacity Growth 8.14 %
- Average Annual Demand Energy Growth 8.14 %
- Nepal Electricity Authority: A vertically integrated utility is key player

Typical Load Curve of Nepal Power System

One Major Peak in Evening

One Minor Peak in Morning



Present Power Generation

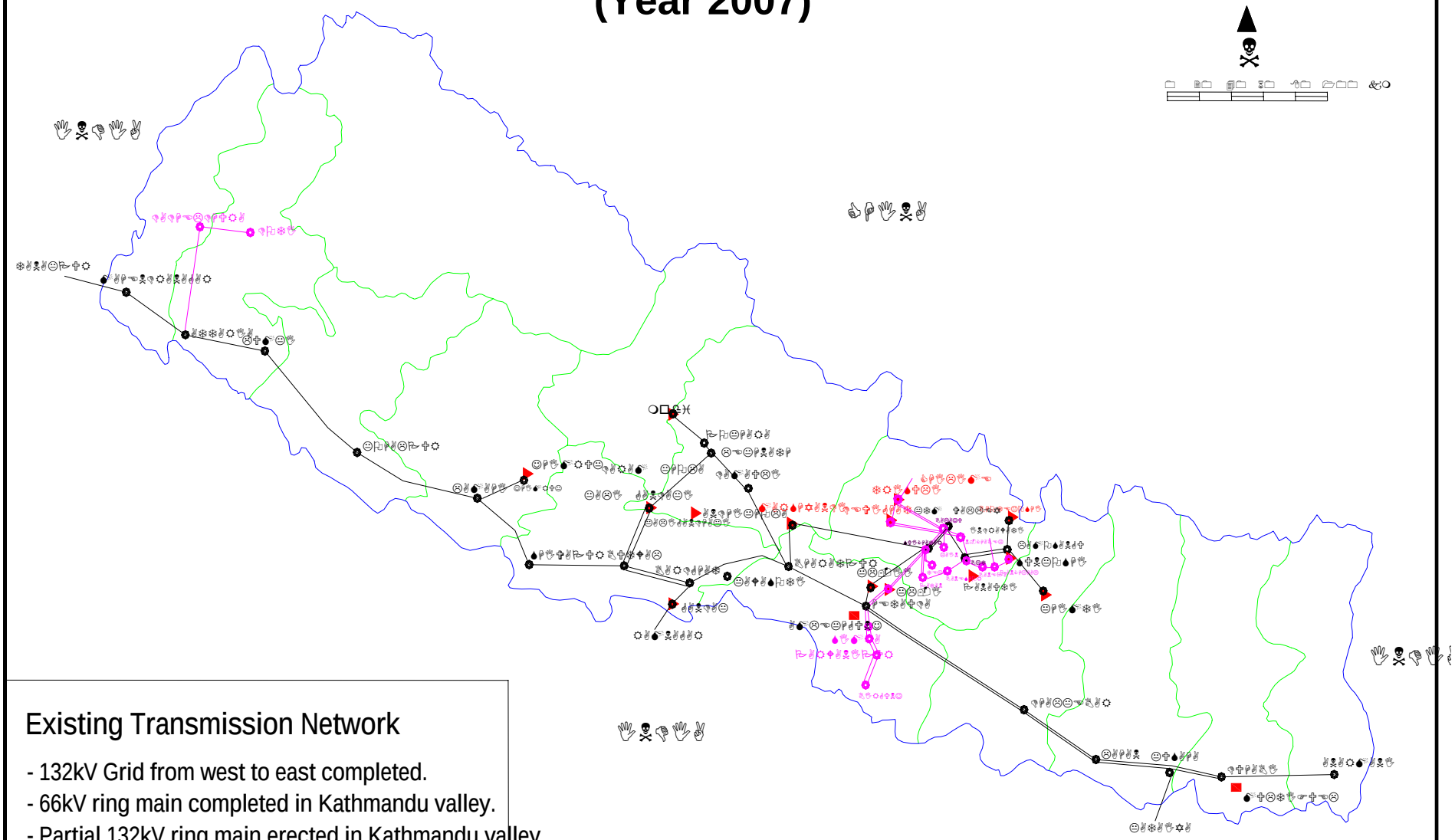
Main generating source	Hydropower
Total Installed Capacity	611 MW
Total Hydro	556 MW (91%)
NEA Capacity	408 MW (73 %)
IPP Capacity	148 MW(27 %)
Total thermal	55 MW (9.0 %)
Largest Hydropower Plant	144 MW
Import from India	65 MW

Present Transmission System of Nepal (Year 2007)

Backbone of Transmission System	132 kV
Secondary Transmission Voltage	66 kV
Total Length of 132 kV	2076 ckt-km
Total Length of 66 kV	593 ckt-km
Total Number of Grid Substations	33 no.
Total Capacity of Grid Substations	690 MVA

Present Transmission System

(Year 2007)



Existing Transmission Network

- 132kV Grid from west to east completed.
- 66kV ring main completed in Kathmandu valley.
- Partial 132kV ring main erected in Kathmandu valley.

Present Hydropower Projects Planned for/ Under Construction

Name of Projects	Capacity	Annual Energy (GWh)	Year of Commissioning
Middle Marsyandi	70 MW	398	2008
Kulekhani - III	14 MW	40	2010
Trishuli-3A	61 MW	480	2011
Chamelia	30 MW	185	2011
Raughat	27 MW	165	2011
Trishuli – 3B	40 MW	318	2012
Upper Tamakoshi	309 MW	1737	2013
Total	**555 MW**	3323	

Nepal's Hydropower Potential

- Three major river basins
- Theoretical potential 83,000 MW
- Economically viable potential 43,000 MW
- Viable potential could be much larger due to
  - Increase price of fuel
  - Greater energy market
- Present Installed Capacity < 1.0 %

Hydropower Projects in Karnali/Mahakali Basin

Total Potential: 35,250 MW **Number of Projects: 50**

Major projects identified & their status:

Project	Capacity (MW)	Level of Study	Remarks
Karnali Chisapani	10,800	FS	ST
Pancheswor	6480	DPR	ST
West Seti	750	FS	ST
Upper Karnali	300	FS	PROR
Lakharpata	289	Identification	
Karnali -1, 2	518	Identification	2 projects
Humla Karnali - 1,2,3,4,5	524	Identification	5 projects

Hydropower Projects in Gandaki Basin

Total Potential:5270 MW Number of Projects:66

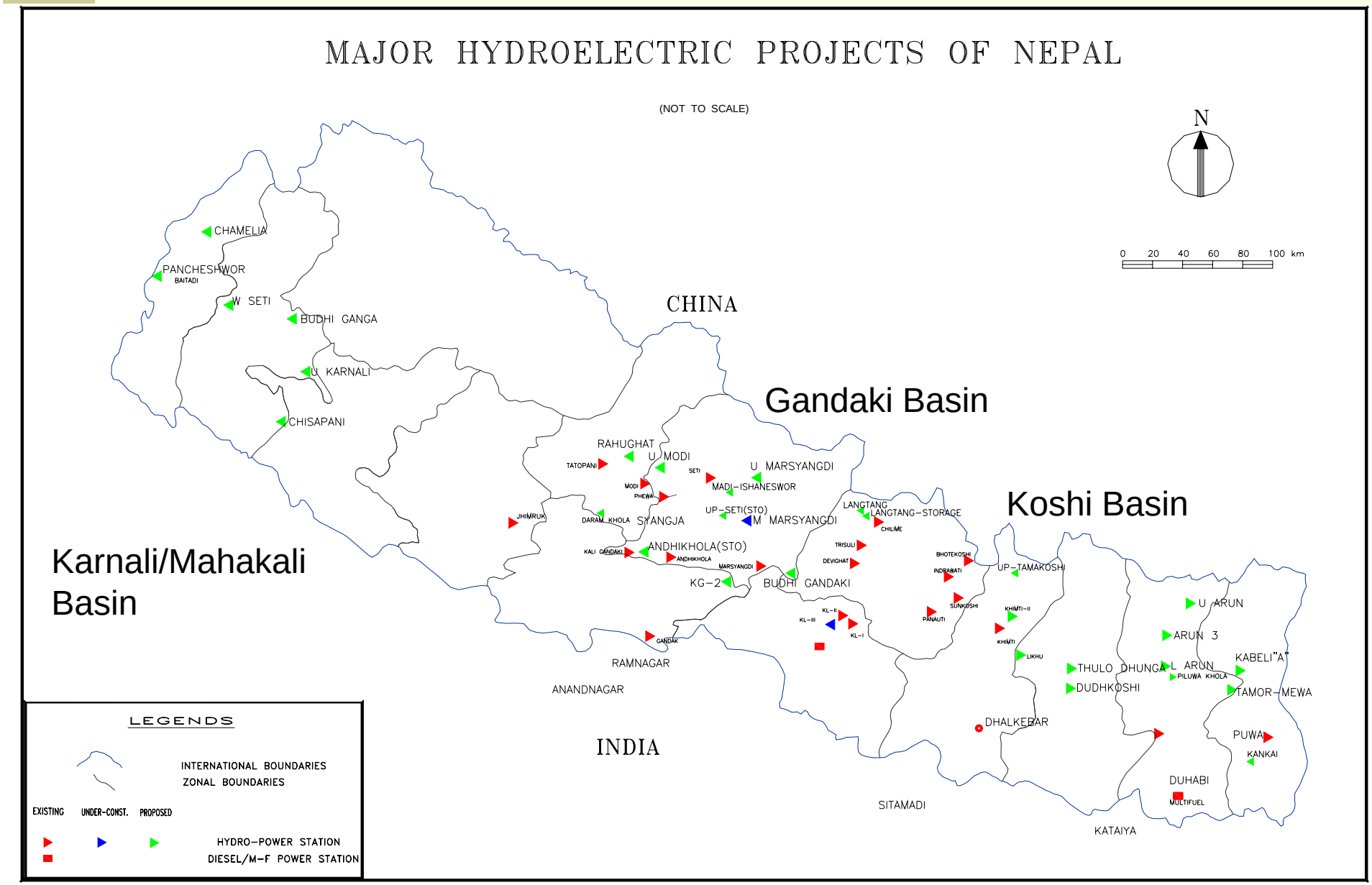
Project	Capacity (MW)	Level of Study	Remarks
Madi Ishaneswar	86	FS	ST
Upper Modi A	42	FS	PROR
Upper Marsyandi	50	FS	ROR
Kali Gandaki 2	660	Identification	
Kali Gandaki	407	Identification	
Sapta Gandaki	225	Identification	ST
Upper Budhigandaki	76	Identification	
Uttar Ganga	270	Identification	ST

Hydropower Projects in Kosi Basin

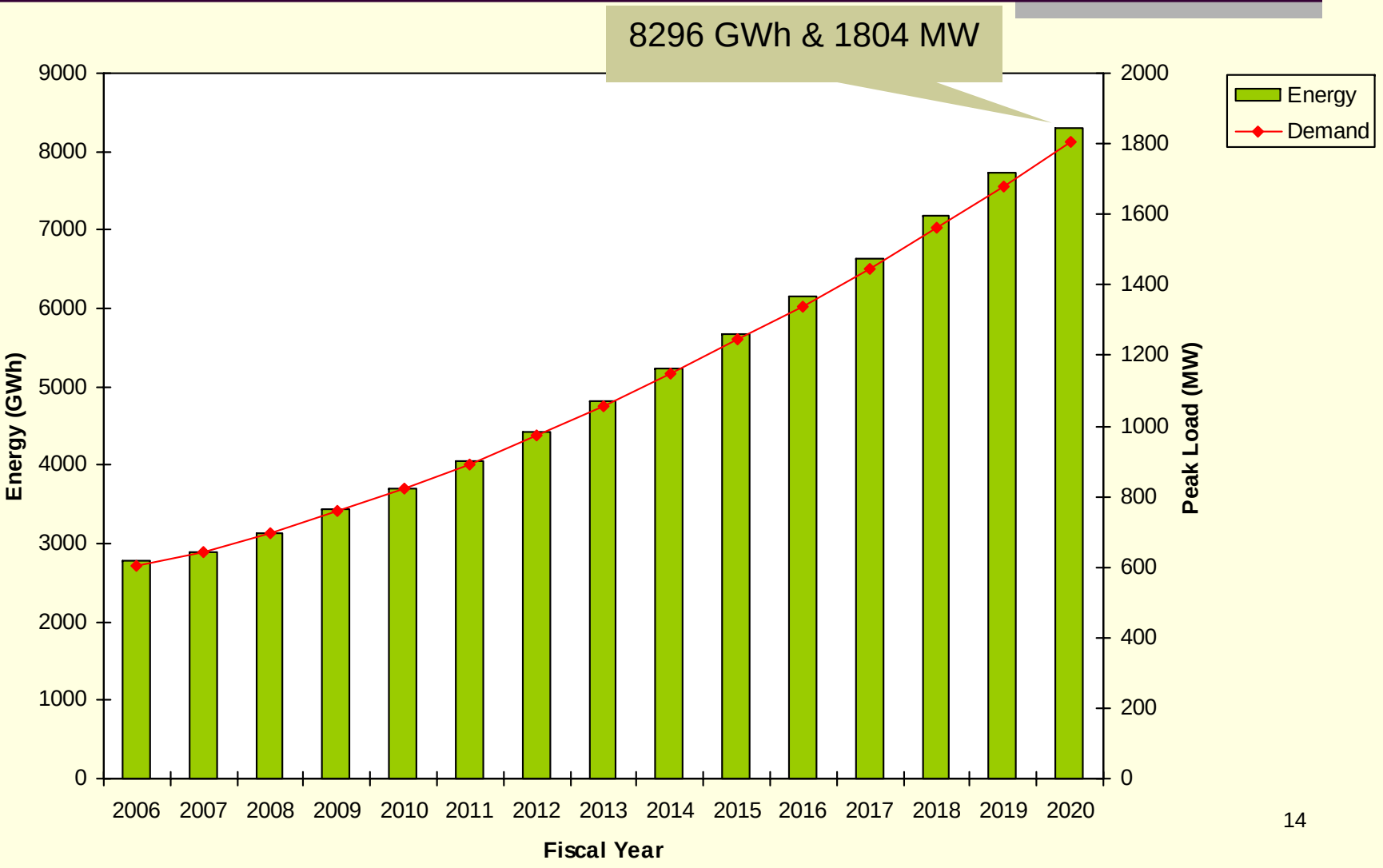
Total Potential: 10860 MW **Number of Projects: 93**

Major projects identified & their status:

Project	Capacity (MW)	Present Status	Remarks
Upper Tamakoshi	309	Detail Design	PROR
Saptakoshi	3000	DPR underway	ST
Arun-3	402	Detail Design	PROR
Upper Arun	335	FS	PROR
Lower Arun	308	FS	ROR
Tamur-Mewa	101	FS	ROR
Tamakoshi-2,3,4,5	547	Identification	4 projects
Dudh Koshi	300	FS	ST


MAJOR HYDROELECTRIC PROJECTS OF NEPAL
(NOT TO SCALE)
N
0 20 40 60 80 100 km
CHINA
INDIA
Karnali/Mahakali Basin
Gandaki Basin
Koshi Basin
CHAMELIA
PANCHESHWOR
BAITADI
W SETI
BUDHI GANGA
U KARNALI
CHISAPANI
RAHUGHAT
U MODI
TATOPANI
SETI
U MARSYANGDI
MODI
MADI-ISHANESWOR
PHEWA
UP-SETI(STO)
JHIMRUK
DARAM KHOLA
SYANGJA
M MARSYANGDI
LANGTANG
LANGTANG-STORAGE
CHILIME
KALI GANDAKI
ANDHIKHOLA(STO)
ANDHIKHOLA
MARSYANGDI
TRISULI
DEVGHAT
KG-2
BUDHI GANDAKI
BHOTEKOSHI
INDRAWATI
UP-TAMAKOSHI
SUNKOSHI
PANAUTI
KL-II
KL-III
KL-I
KHIMTI-II
KHIMTI
LIKHU
GANDAK
RAMNAGAR
ANANDNAGAR
U ARUN
ARUN 3
KABELI"A"
THULO DHUNGA
L ARUN
PILUWA KHOLA
DUDHKOSHI
TAMOR-MEWA
DHALKEBAR
PUWA
KANKAI
DUHABI
MULTIFUEL
SITAMADI
KATAIYA
LEGENDS
INTERNATIONAL BOUNDARIES
ZONAL BOUNDARIES
EXISTING
UNDER-CONST.
PROPOSED
HYDRO-POWER STATION
DIESEL/M-F POWER STATION

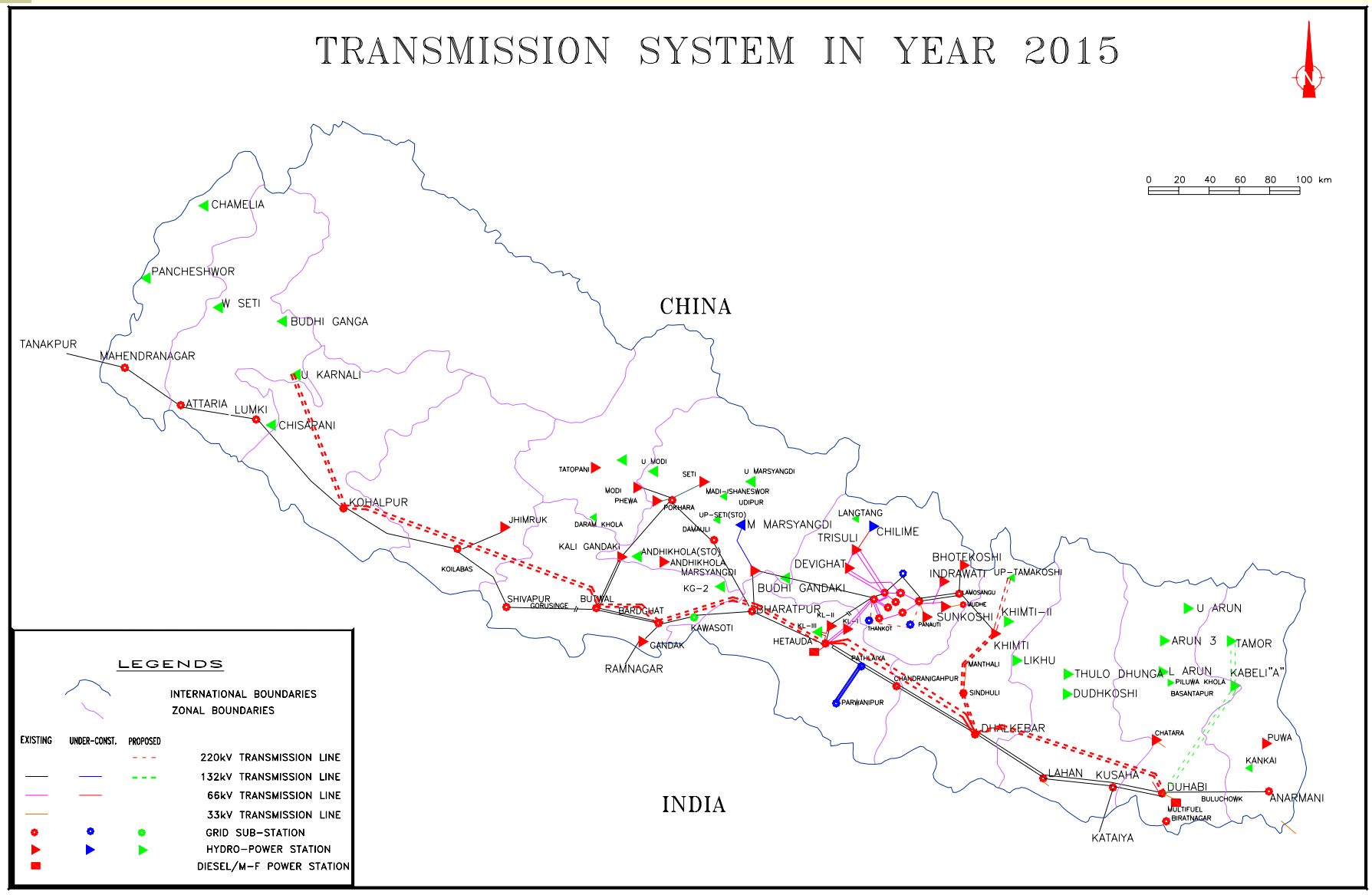
Market for Nepal's Hydropower: Domestic Market



Market for Nepal's Hydropower: Export Market

- Northern India requires additional 10,000 MW, with total shortfall increasing to 34,000 MW by year 2012
- India as a country will need additional 100,000 MW by 2017
- Shortfall of 1,000 MW in Bangladesh is expected in 2007
- Market could embrace Sri Lanka, Pakistan and even beyond
- Hydro power is being increasingly competitive due to rising fuel prices
- "Unlimited Market" in the region

Access to Electricity Market: Domestic Market

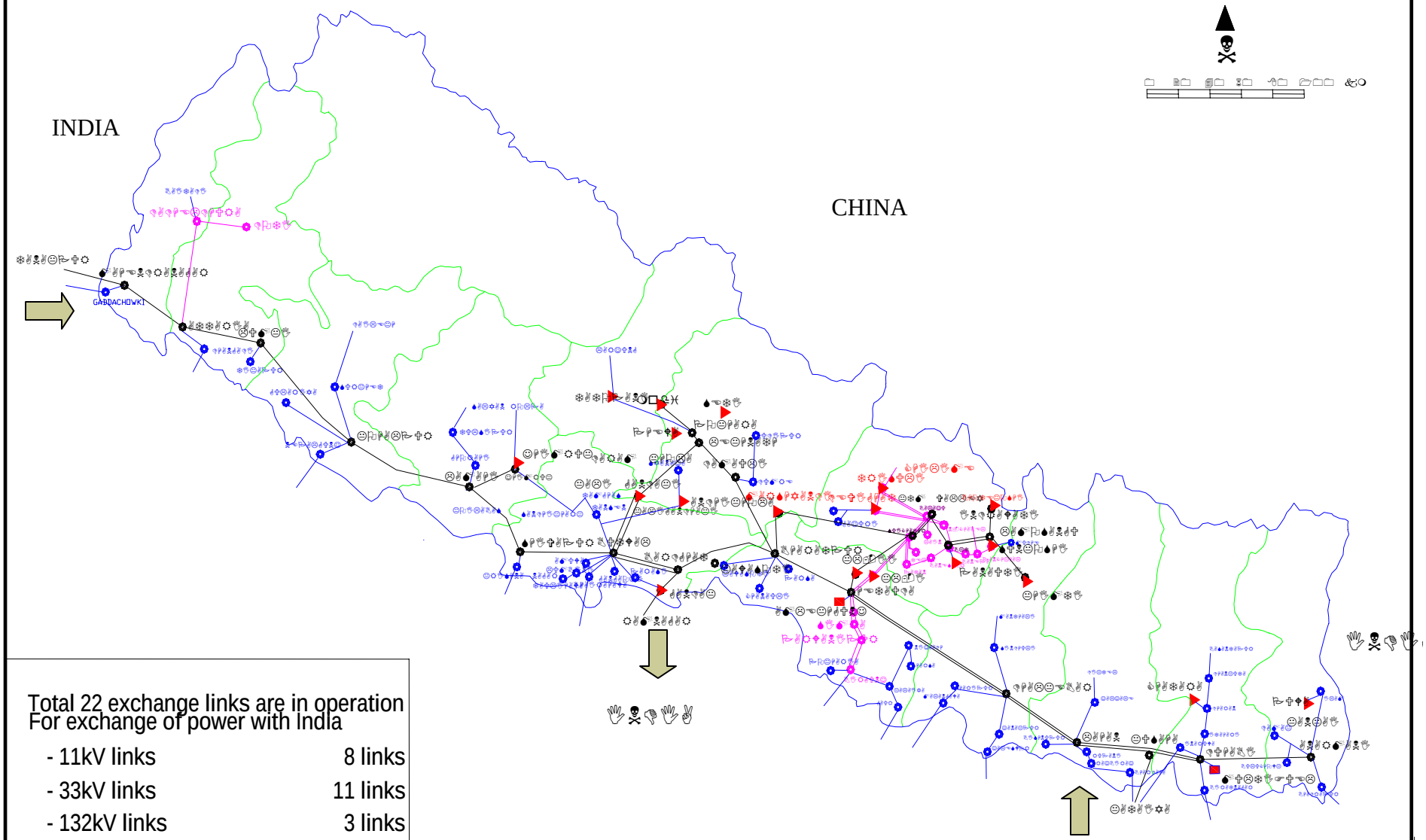


Access to Electricity Market: Indian Market

Salient Features:

- Commenced in year 1971
- Objective was to supply power to off-grid small load centers along border
- Presently, 22 points for power exchange
- Supply Voltages at 11 kV, 33 kV and 132 kV
- Exchange limit augmented from 50 MW to 150 MW
- Power exchange committee- recommendatory body oversees the exchange

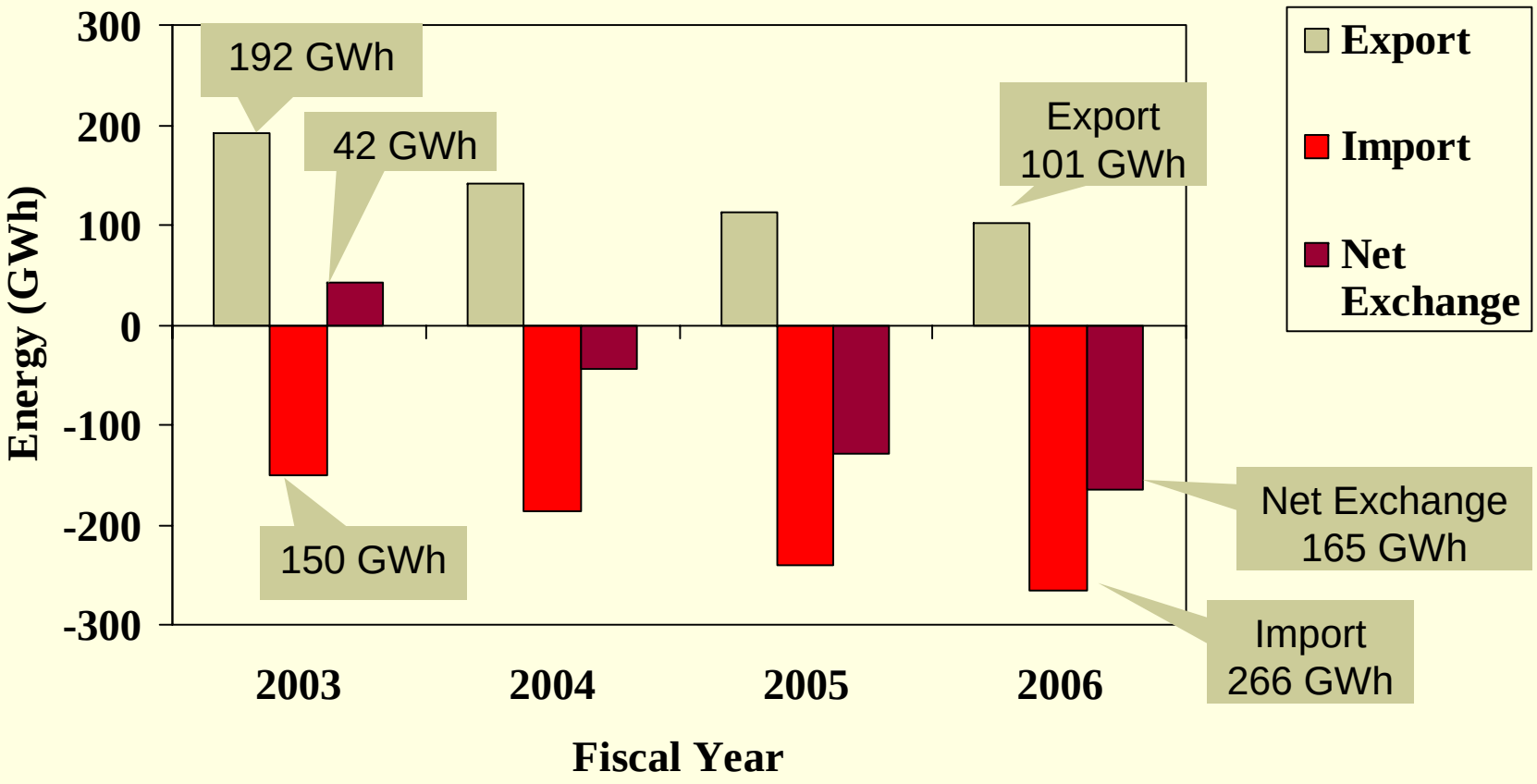
PRESENT POWER EXCHANGE LINKS



Total 22 exchange links are in operation
For exchange of power with India

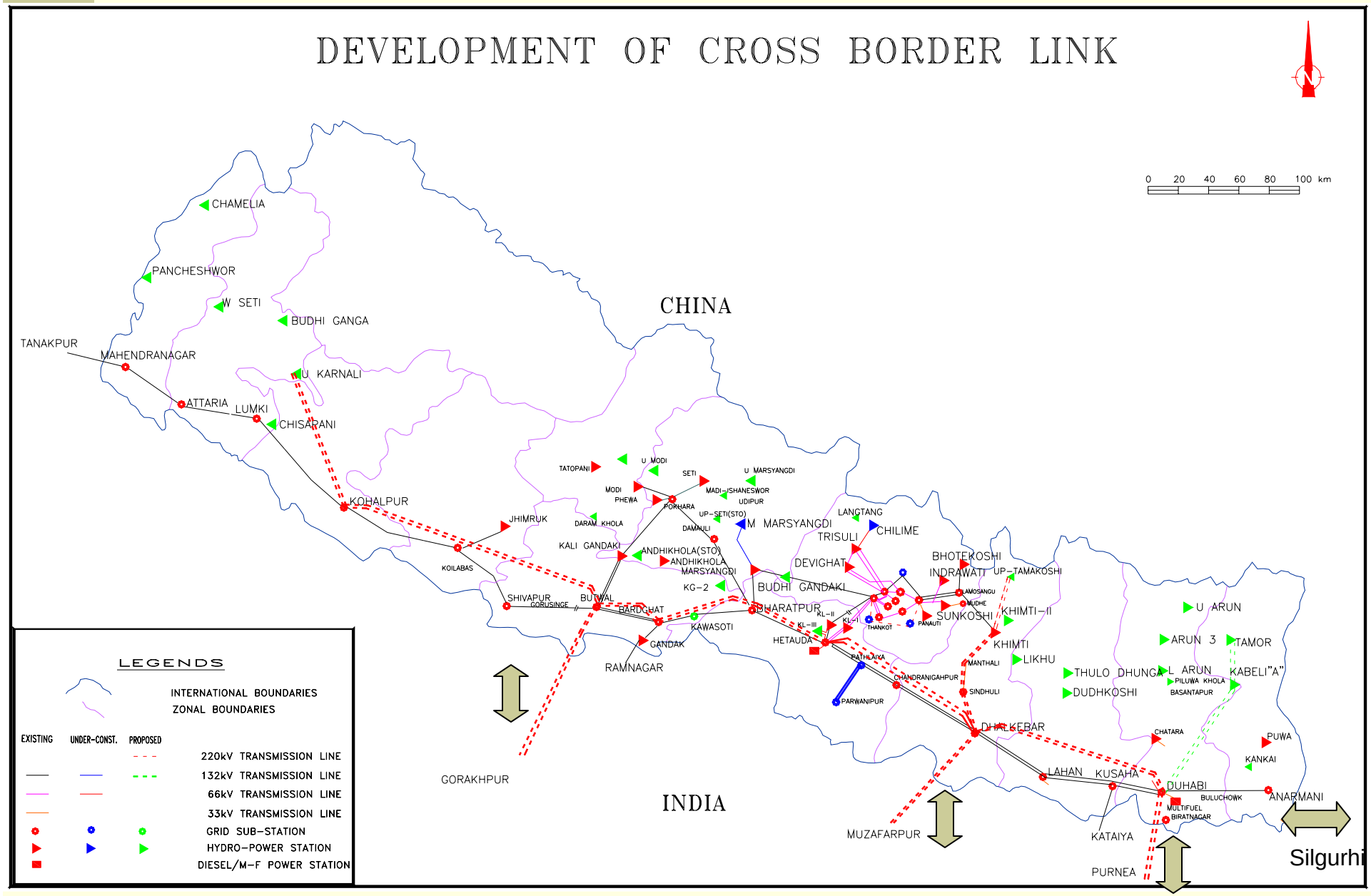
- 11kV links	8 links
- 33kV links	11 links
- 132kV links	3 links

Quantum of Power Exchange



Limitations of Present Power Exchange Arrangement

- Supply at low voltage - low transfer capacity
- Supply “as and when available basis” – no firm supply
- Isolated mode of operation - no operational flexibility
- Energy tariff not based on present facts; requires rationalization
- May have outlived its objectives


DEVELOPMENT OF CROSS BORDER LINK
0 20 40 60 80 100 km
CHINA
INDIA
CHAMELIA
PANCHESHWOR
W SETI
BUDHI GANGA
TANAKPUR
MAHENDRANAGAR
U KARNALI
ATTARIA
LUMKI
CHISAPANI
KOHALPUR
KOILABAS
JHIMRUK
TATOPANI
U MODI
SETI
U MARSYANGDI
MODI
PHEWA
MADI-ISHANESWOR
UDIPUR
POKHARA
UP-SETI(STO)
DARAM KHOLA
DAMAULI
M MARSYANGDI
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UP-TAMAKOSHI
KG-2
BUDHI GANDAKI
LAMOSANGU
MUDHE
SHIVAPUR
GORUSINGE
BUTWAL
BARDGHAT
BHARATPUR
KL-II
KL-I
THANKOT
PANAUTI
SUNKOSHI
KHIMTI-II
KAWASOTI
HETAUDA
KHIMTI
GANDAK
RAMNAGAR
PATHLAIYA
MANTHALI
LIKHU
CHANDRANIGAHPUR
SINDHULI
PARWANIPUR
U ARUN
ARUN 3
TAMOR
THULO DHUNGA
L ARUN
KABELI"A"
PILUWA KHOLA
BASANTAPUR
DUDHKOSHI
DHALKEBAR
CHATARA
PUWA
KANKAI
LAHAN
KUSAHA
DUHABI
BULUCHOWK
MULTIFUEL
BIRATNAGAR
ANARMANI
GORAKHPUR
MUZAFARPUR
KATAIYA
PURNEA
Silgurhi
LEGENDS
INTERNATIONAL BOUNDARIES
ZONAL BOUNDARIES
EXISTING
UNDER-CONST.
PROPOSED
220kV TRANSMISSION LINE
132kV TRANSMISSION LINE
66kV TRANSMISSION LINE
33kV TRANSMISSION LINE
GRID SUB-STATION
HYDRO-POWER STATION
DIESEL/M-F POWER STATION

Development of Cross Border Links: Special Features

- Development through Special Purpose Vehicle (SPV)
- Formation of joint venture company in Nepal between NEA and Indian firm, ILFS
- Provision for equity participation of local & international private sectors
- Present scope of works: development, operation and maintenance of Nepalese side of cross border links
- Option for NEA to participate in equity in Indian firm's company set up in India for development of corresponding cross border links in India

Benefits of Regional Grid

- Cost saving through reduced capital investment & operational efficiency
  - Diversity in demand between countries- differ capital investment
  - Reduction in spinning reserve in the systems
  - Improvement in reliability
  - Support during emergencies
  - Support ancillary services
  - Improvement in optimal generation mix

Benefits of Regional Grid (contd..)

- Long term energy security
- Foreign exchange earning
- Environment gains: According to a report 300 MW Upper Karnali would reduce carbon emission by 2.58 MT per year estimated reduction of SO_X by 15 MT and NO_X by 7 MT

Investment Friendly Legal and Regulatory Framework

- Up to 100 % FDI
- One window system for environmental clearance and licensing
- Establishment of Nepal Electricity Regulatory Commission to regulate the system and create level playing field for all
- Open access to transmission system
- Legal provision w.r.t. acquisition of land for construction
- Fiscal incentives
  - Repatriation of profit and investment
  - Guarantee for non-nationalization of property
  - Concession in import duties

Investment Friendly Legal and Regulatory Framework (contd..)

- Rebate on government royalty amount

  For ROR Projects

  - NRs. 400 per kW per annum for the first 15 years of generation and NRs. 1800 thereafter
  - Amount equivalent to 7.5% of energy price per kWh for the first 15 years of generation and 10% thereafter

  For Storage Projects

  - NRs. 500 per kW per annum for the first 15 years of generation and NRs. 2000 thereafter
  - Amount equivalent to 10% of energy price per kWh for the first 15 years of generation and 15% thereafter

Why Invest in Nepal's Hydropower Development?

- Tremendous untapped hydropower potential & access to ever burgeoning demand in domestic and export market
- Geographic proximity of hydropower sites with major load centers in India- minimizes transmission cost for power evacuation
- National grid running parallel to Border; facilitates connectivity to Indian National Grid- reduces transmission loss

Why Invest in Nepal's Hydropower Development? (contd..)

- Offers clean energy- reduces green house gas emission
- Contributes to thermal-hydro mix generation (60:40) – enhances operational efficiency; presently this ratio is around 74:26 in India
- Provides long term energy security, unlike non renewable fuels
- Country provides investment friendly climate

Issues & Challenges

- **Political commitment for energy trading:** The concept of SAARC Grid for regional energy trading was mooted several years back. Little progress so far.
- **Timely establishment of cross border transmission links:** NEA has set the target for commissioning at least two cross border 220 kV transmission lines within two years with another two lines to follow in the next years
- **Capital requirement:** Requires relatively huge capital investment. Only foreign investment can meet this requirement, as local capital market is limited.

Issues & Challenges (contd..)

- **Favorable investment climate:** Necessary legal and regulatory framework are being devised
- **Trading mechanism and market rules:** Along with infrastructures it is necessary to formulate market rules and operational and commercial mechanisms for energy trading as in any other business
- **Harmonization of regulation:** Each country has its own regulatory framework. Differences must be harmonized for cross border trading.

Vision for Nepal's Power Sector

- Development of 1000 MW in coming five years for domestic market
- Development of 1000 MW in coming five years for export market
- Development of 5000 MW in coming ten years for export market
- Realization of regional grid
- Private sector is to play dominant role in future development with or without public sector partnership

Conclusions

- Nepal has an abundance of hydropower potentials, which remain to be harnessed. It has a portfolio of hydropower projects with capacity ranging from few Megawatts to thousands of Megawatts. There are purely run-of-river types with or without peaking pondage and storage types. Many of these projects already have bankable documents.

- There is a huge market for Nepal's hydropower for domestic and export market and necessary transmissions line infrastructures are being erected for access to these markets.

Conclusions (contd..)

- Nepal also has a legal framework, which is friendly for investment in hydropower development.

- Against this backdrop, the opportunities for private investment in Nepal's hydropower development is immense and I invite investors from India and abroad to join hands with us in this venture, which will bring economic upliftment of the entire region.