



PTC INDIA LTD.

Energy Co-operation: Cross Border Power Trade

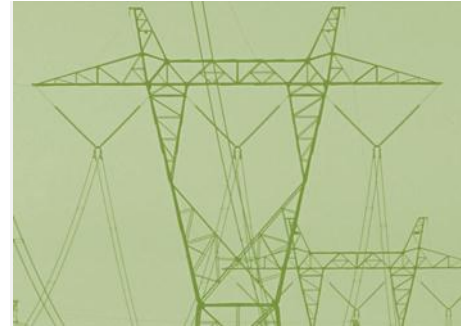


OVERVIEW: POWER SECTOR - INDIA

5th largest generation capacity (~255 GW)

A fair mix of Central, State and Private capacity

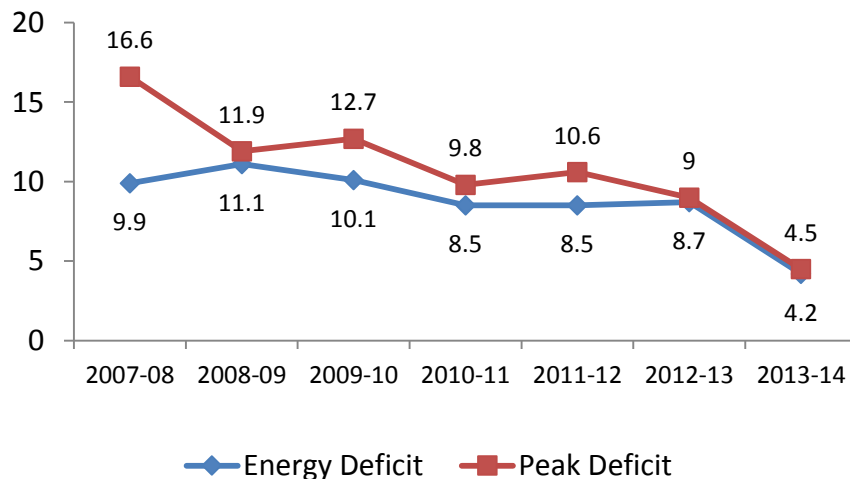
Target to establish **65,500 MW** of inter-regional power transfer capacity by end of 12th plan - 2017 (current - 31,850 MW)



Trading volumes are also expected to multiply with growth of transmission capacity

Private sector's share in installed generation capacity about **34%**; total **82.7 GW** from **15%**; **22.2 GW** in **Dec-08**

Energy and peak deficit reduced to 4.2% and 4.5% respectively in FY14 from 13% and 10% respectively in FY10



Installed Capacity in India (MW) (as on 30.11.2014)

Sector	Thermal	Nuclear	Hydro	RES (MNRE)	Total
Govt.	117422	4780	38105	3804	164110
Private	60321	0	2694	27888	90903
Total	177743	4780	40799	31692	255013

PTC: GENESIS & OBJECTIVES



- **PTC India Ltd. (“PTC”)**, was established in the year 1999 by **Govt. of India**; with primary focus on
 - promoting power trading to optimally utilize existing resources
 - attract viable investments in the power sector on the strength of multi-buyer model
 - creating a Power Market in India and the neighboring countries
- Promoted by public sector majors in the industry namely **NTPC, POWERGRID, PFC** and **NHPC**
- Stock listed on BSE and NSE since 2004; widely held by institutions
- Board with eminent persons from Government and Power Sector

- Nodal agency for Nepal and Bhutan
- Agreement signed with NEA(Nepal) to supply 150 MW power on long term basis (expected commencement by Dec 2015) and also supplying up to 30 MW on short term basis
- Successfully managing import of entire surplus power of Bhutan since year 2002
 - Total 1400 MW from Tala (1020 MW), Kurichhu (60 MW), Chukha (336 MW)
 - Signed Long Term Agreement for purchase of power from 118 MW Nikachhu HEP in Bhutan. Project expected to commission in 2019
- Supplying 250 MW power to Bangladesh on Medium Term Basis

CURRENT COLLABORATION EFFORTS IN SOUTH ASIA



Nepal-India	<ul style="list-style-type: none">▪ PTC facilitates power sourcing for Nepal in winters on commercial terms▪ Power Exchange between Nepal & Bihar as per the formula of Indo-Nepal Power Exchange Committee▪ Several transmission interconnections exists between India & Nepal on Radial Mode▪ 400 kV Muzaffarpur-Dhalkebar line once implemented will have carrying capacity of 1000 MW
Bhutan-India	<ul style="list-style-type: none">▪ Currently India imports about 1400 MW from Bhutan▪ Another 10000 MW likely to be added by 2026
Bangladesh-India	<ul style="list-style-type: none">▪ 500 MW power is being supplied from India via 400 kV HVDC Behrampur - Bheramara line
Sri Lanka-India	<ul style="list-style-type: none">▪ Proposed HVDC interconnection between Madurai (India) and Anuradhapura (Sri Lanka) through the Palk Strait▪ The carrying capacity of the line will be 1000 MW
Pakistan-India	<ul style="list-style-type: none">▪ Proposed interconnection between India and Pakistan with carrying capacity of 500 MW under discussion

The above are small but crucial steps towards formation of a SAARC Power Market. But there are many more barriers required to be removed to create a vibrant South Asian Power Market place

Installed Capacity

- 23,600 MW, expected to increase to 34,200 MW in next 5 years (80% coming through private sector)
- 62% is Thermal (~15000 MW), 32 % is Hydro (~7500 MW), 5% is Nuclear (~1000 MW), Iran import (0.3%) and mixed (1%)
 - Thermal is mainly Residual Fuel Oil based (34%) and Gas based (26%); diesel based is 2% and coal based only 0.1%

Major Power Producers	Installed Capacity (MW)
Water and Power Development Authority (WAPDA)	~12000 MW
Karachi Electric Supply Corporation (KESC)	~2000 MW
Pakistan Atomic Energy Commission (PAEC)	~7000 MW
IPPs	~900 MW

Capacity shortage due to difficulty of public budget to meet high investment requirements of Power Sector

Natural Gas Reserves > 800 Billion cubic meter

Power Supply Position

- 55% of population estimated to have access to electricity
- Deficit of ~4500 MW (18-19 %), Peak deficit of ~5600 MW (~27%) (Peak Demand – 21-22000 MW)
- Demand growing at 9%, supply growing at 7%
- T&D losses – 25-26%
- 4-12 hours of load-shedding in both urban and rural areas

Average Cost and Tariff

- Average cost of producing electricity is 14 Pak rupees/kWh (INR 8.28) but it is sold at an average price of 9 Pak rupees/kWh (INR 5.32)

Expected price of new hydro-electric electricity – PAK Rs. 5.43 per unit (INR 3.21) for first 12 years, then PAK Rs. 2.47 per unit (INR 1.46) once the debt is paid off

Natural gas based electricity is expected to be the cheapest at around PAK Rs. 4.24 per kWh (INR 2.5 /kWh)



INDIA-PAKISTAN ENERGY CO-OPERATION POSSIBILITIES



- Transfer of 1000 MW power (500 MW in 1st Phase and total 1000 MW in 2nd Phase) from India to Pakistan under discussion
- MoU was proposed between the MoP, GoI and Govt of Pakistan for power supply in March 2014
- Also proposal for formation of Joint Technical Committee having agencies from India and Pakistan for feasibility study of transmission line for power transfer
- Committee would make feasibility study for HVDC line (for transfer of 500 MW) between Amritsar and Lahore (around 40 KMs), which will take around 3 years and Rs 400 Cr investment
- World Bank and USAID are supporting the transmission line project
- Renewable projects can be installed with technical /funding support from India. Existing hydro capacity may work as balancing mechanism for renewable power

With signing of SAARC Framework Agreement for Energy Co-operation (Electricity), SAARC Countries have agreed for trade of electricity among them for greater regional connectivity



BENEFITS OF ENERGY CO-OPERATION

- Initiating energy trading between India and Pakistan can help bridge power deficit in Pakistan
- Power supply from India to Pakistan can be on Short /Medium/Long Term basis as per requirements
- Short Term Power Supply may cater to managing seasonal variations in demand and supply
- With import of power, Pakistan can reduce high investment requirements for new capacity addition
- Pakistan, Afghanistan, Iran and India now have greater opportunity to tackle energy shortages by co-operating with one another and pressing on with projects like TAPI (Turkmenistan, Afghanistan, Pakistan and India) and IP (Iran-Pakistan) gas pipelines
- Energy Co-operation to help growth of the economies of both India and Pakistan



BENEFITS OF ENERGY CO-OPERATION: CASE STUDY

Expected Annual savings to Pakistan from import of 500 MW power from India

Approx. prevailing rate of power in Pakistan(in INR)	INR 7.00/ KWh
Approx. rate of power supply through Diesel	INR 18.00/ KWh
Approx. rate of supply of power from India to Pakistan	INR 5.50/ KWh
Savings to Pakistan compared to prevailing supply rate	INR 1.50/ KWh
Net Savings (500 MW*85%PLF*1 year* 1.50)	INR 558 crores/year
Savings to Pakistan compared to supply through Diesel	INR 12.50/ KWh
Net Savings (500 MW*85%PLF*1 year* 12.50)	INR 4653 crores/year



TRANSMISSION ARRANGEMENTS

- Installation of transmission links depending on investments required, cost sharing, EPC and O&M
- As a first step, 100-150 MW power transfer may take place in Radial Mode, which can then be updated to HVDC link for 500 MW or above power transfer
- Possible alternatives are Lahore-Amritsar and Mundra-Karachi
- Implementation of transmission link on PPP model like Indo-Nepal transmission link maybe explored
- Nodal Agency will be required in Pakistan for last mile connectivity to Pakistan Grid
- Direct connection may be explored between Projects in India supplying power to Pakistan grid
- Power could be exported through pool of generators and an agency be nominated from India for undertaking the transaction and assurance of supply to Pakistan





COMMERCIAL ARRANGEMENTS

- The buying arrangement should be structured between both the governments for securing commercial risks in transactions
 - An agency each may be nominated from Pakistan and India for structuring of transactions between the two countries and addressing issues related to off take of power and payment security
 - The Government of Pakistan may take partial ownership in the project, or may use commercial models like tolling (paying for fuel price) in order to secure the complete transaction
 - The risks associated in the project may be appropriately evaluated and divided among all the stakeholders involved in the transaction.





CONCLUDING REMARKS

Exchange of Power between the Countries to commence on Bilateral basis as a confidence building measure which may subsequently lead to formation of SAARC Grid which should be the ultimate goal



THANK YOU.

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