

Indian Transmission Sector - At a glance

July 2007

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Agenda

- Sector Overview
- Legislative Framework
- Power Market Development

Section 1

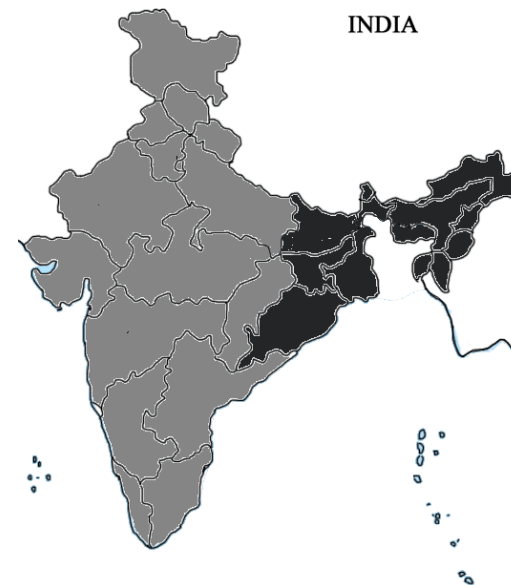


Sector Overview

Indian Power Sector: Overview

- 5th largest electricity sector with 128 GW of installed capacity, 150 million consumers
- Per capita consumption is 612 kWh against the world average of 2429 kWh
- 85% of the villages are electrified, 57% households have access to electricity
- Target: Power for all by 2012
- Shortage in generation
 - Energy shortage 9.9%
 - Peak shortage 13.5%

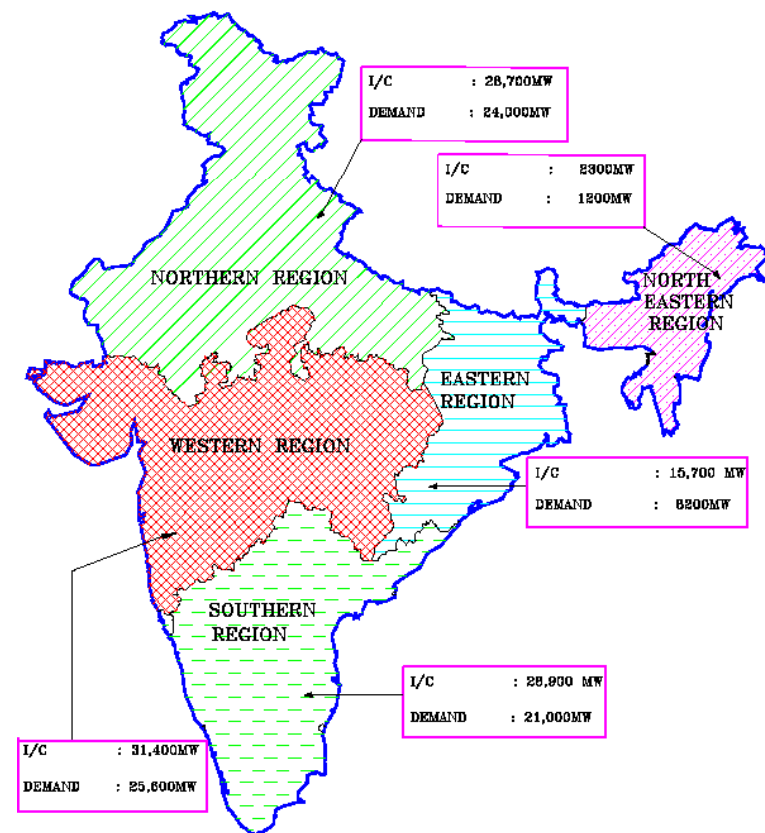
- Uneven distribution of generation resources
- Eastern region and North-eastern region (black color) are in surplus during most of the months in a year



Transmission Sector: Overview

- India is demarcated into 5 regions
 - WR-ER-NER-NR connected through synchronous links
 - SR connected to WR and ER through asynchronous links
- Inter-regional capacity
 - In 2007: 11,500MW
 - In 2012: 37,150MW
- Sufficient transmission capacity in regional transmission system to meet the current demands

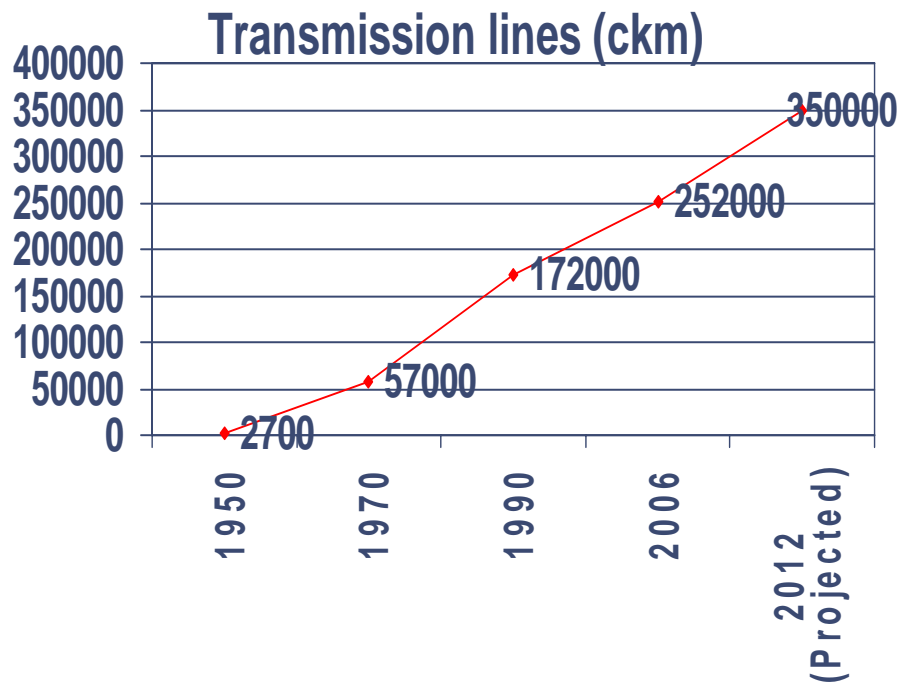
REGIONAL GRIDS



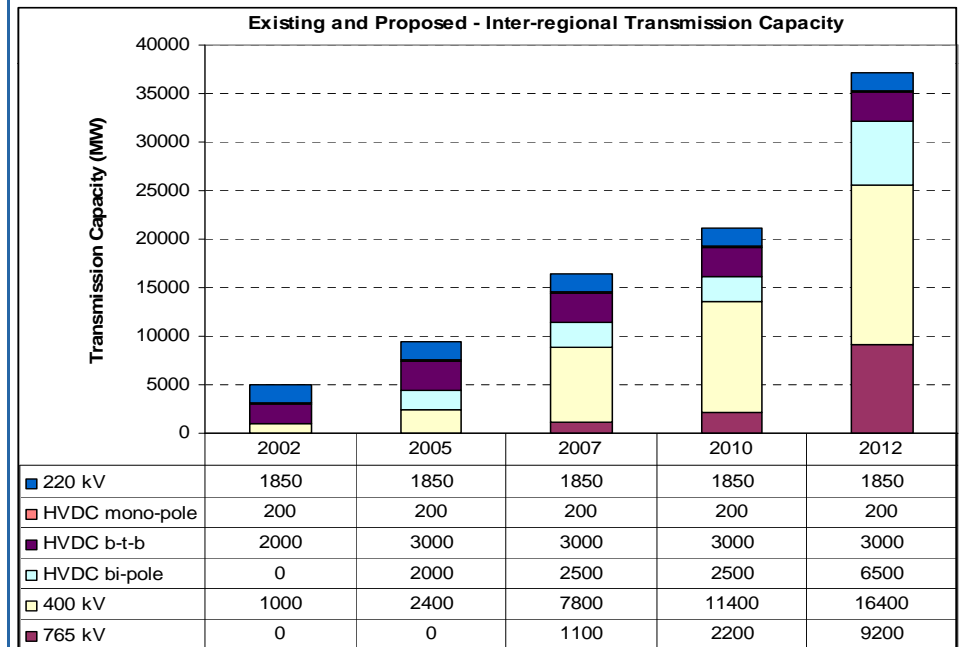
Source: PGCIL

Transmission Sector: Overview

- Substantial growth in total transmission line length over last decade



- Substantial growth in inter-regional transmission capacity planned



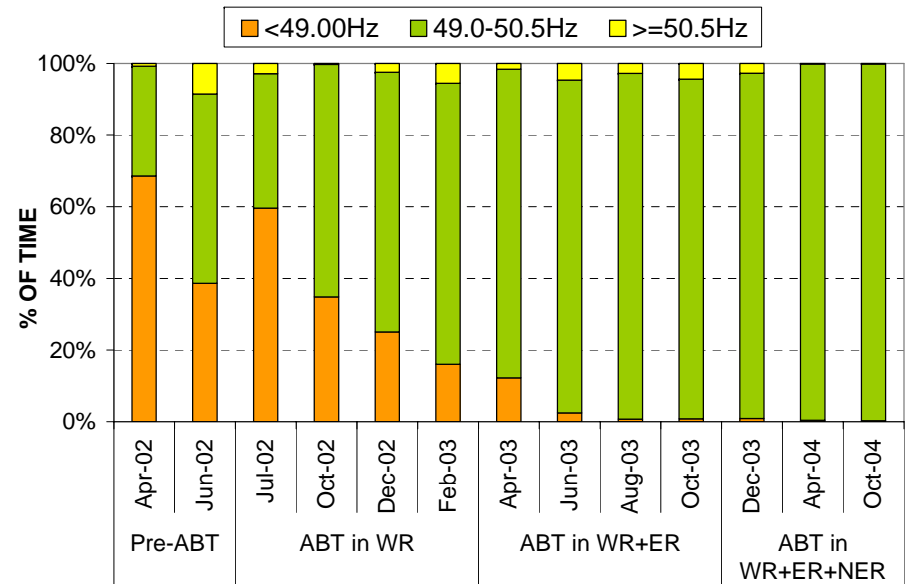
Transmission Sector: Industry Structure

- Central Transmission Utility (CTU)
 - PGCIL is designated as “CTU” by Govt. of India
 - Plans and operates National Grid / Regional Grids
 - Undertakes the functions of Transmission Operator as well as System Operator
 - Responsible to co-ordinate with other inter-state transmission licensees
- State Transmission Utility (STU)
 - Each State has one STU designated by State Govt.
 - Plans and operates State grid in respective state
 - Undertakes the functions of Transmission Operator as well as System Operator
 - Responsible to co-ordinate with other intra-state transmission licensees

Transmission Sector: System operation aspects

- Innovative Availability Based Tariff (ABT) introduced at regional level (in 2002)
- Objective was to bring responsibility and accountability in power generation and consumption through a scheme of incentives / disincentives
- ABT has provided robust and credible mechanism for settlement of deviations by grid users
- Similar mechanism proposed to be replicated at State level

- ABT has helped:
 - maintaining grid frequency and voltages within statutory limits
 - ensuring grid stability, integrity
 - narrowing demand-supply gap



Source: RLDC Reports

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Transmission Sector: Investment requirement

- Strengthening of transmission system to handle 2,00,000MW by 2012 from 1,28,000 MW presently
- CEA has developed draft National Electricity Plan (NEP) for XIth plan
 - Inter-regional capacity to enhance from 11,500 MW (in 2007) to 37,150 MW (in 2012)
 - Evacuation projects (UMPPs, ISGSs, MPPs, IPPs etc.)
 - System strengthening projects
- Investment required for transmission (XIth plan):
 - Regional level: USD 17.5 Billion
 - PGCIL: USD 10.3 Billion
 - PSP*: USD 7.2 Billion (through IPTC / JV)
 - State level: USD 32.5 Billion
 - No identified projects for PSP yet
 - Only couple of steps have initiated process

Transmission Sector: Key issues

Challenges for STUs to achieve their investment targets:

- Institutional capability
- Shortage of skilled workforce
- Capability to arrange funds
- Limited know-how of new technologies (e.g. 765kV AC)
- Right of Way Issues
- Delay in statutory clearances
- Limited suppliers for materials and equipment
- Limited agencies for erection and construction

- Possible options to achieve investment targets:
 - Augment skilled workforce
 - Private sector participation (JV / IPTC)
- Support required from respective Governments:
 - Statutory clearances
 - Providing counter-guarantee to donors against loans
 - Budgetary support
 - Policies for encouraging equipment manufacturing

Section 3



Legislative Framework

Transmission Sector: Regulatory framework

CTU (PGCIL)

- CERC approves annual transmission charges based on “Terms and Conditions of Tariff”
- Currently, Multi Year Tariff (FY’04 to FY’09) is in force

STUs

- Respective SERC approves annual transmission charges based on “Terms and Conditions of Tariff”
- Some states have moved to MYT (3 years)

- Revenue components (cost-plus approach):
 - O&M expenses
 - Depreciation (straight line method, up to 90% of cost)
 - Advance Against Depreciation
 - Interest on loan capital
 - Return on Equity (14% post tax)
 - Interest on working capital
 - Income tax
- Full recovery of ARR at target availability (98%) else pro-rata

Transmission Sector: Regulatory framework for PSP

- CEA has to prepare National Electricity Plan
 - Private investor proposes to construct a transmission line, not being a dedicated transmission line and not included in the Network Plan, the required load flow study and other relevant studies have to be undertaken by the CTU/ STU
 - The result of such studies indicating either inclusion or exclusion of the proposed transmission line
 - The line can then be constructed by CTU/STU or through PSP
- Ministry of Power has come out with guidelines for encouraging competition in development of transmission projects
 - Envisage formation of Empowered Committee whose primary role is to:-
 - To identify projects to be developed under PSP
 - To invite bids and to select a developer
 - Similar framework is envisaged at state level, however the framework is not operational

Transmission Sector: Business models for PSP in India

- Joint Venture (JV) route:
 - CTU/STU owns 26% equity
 - Balance by the Joint Venture Partner (JVP)
 - JVP selected through competitive bidding process
 - Example: Powerlinks Tx Ltd.
 - To evacuate power from Tala HEP (Bhutan) and surplus power in ER/NER
 - Tata: 51%, PGCIL: 49%
 - Approved cost: Rs.1,600 Cr.
 - RETL+PGCIL JV for Parbati-II and Koldam HEP evacuation
- Independent Private Transmission Company (IPTC) route:
 - 100% equity owned by private entity
 - IPTC selected through competitive bidding process
 - Example: Western Region System Strengthening Scheme - II (package B&C)
 - Reliance selected out of eight bidders
 - Cost: Rs. 2,000 Cr. (25% lower than the cost-plus tariff)

Transmission Sector: Sharing of Transmission Charges

Concept paper by CERC on equitable sharing of transmission charges:

- To introduce capacity allocation to beneficiaries for inter-regional links
- To rationalize transmission charge for using inter-regional links
- No pooling of transmission charges for the new system
- No pooling of transmission charges for the new system
- Transmission charges for the new system to be levied on identified beneficiaries
- Implementation of distance & direction sensitive loss allocation at National level

Section 4



Power Market Development

Transmission Sector: Promoting power trading

As per the Electricity Act 2003

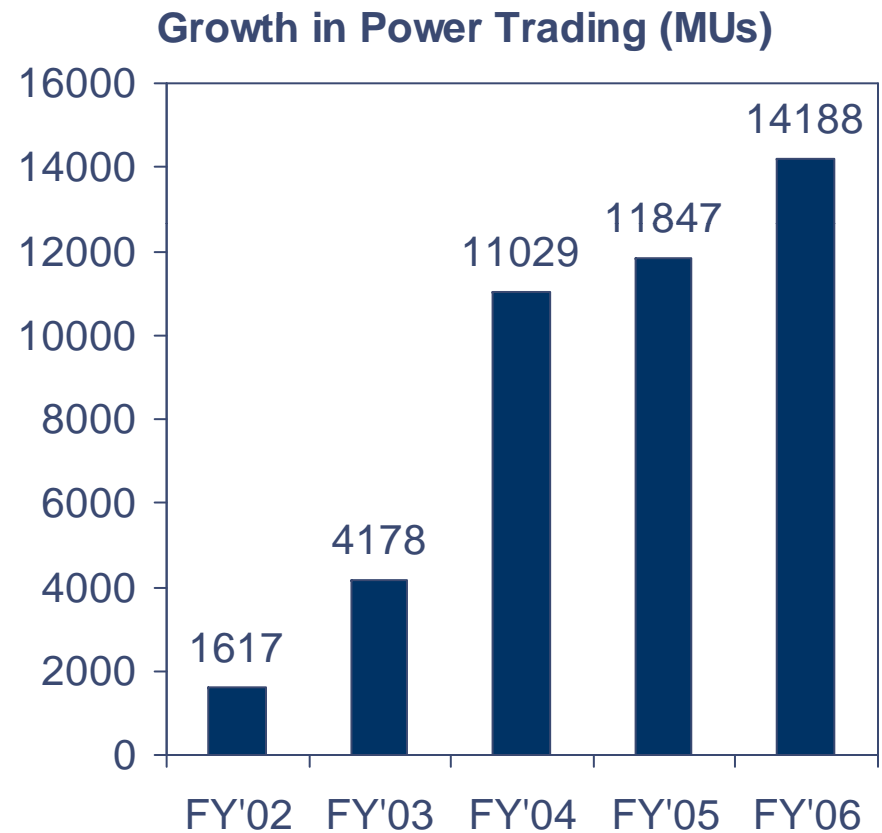
- Delicensed generation (except hydro)
- Non-discriminatory open access:
 - Mandatory in transmission
 - Phased introduction in distribution
- Electricity trading identified as a distinct licensed activity
- Development of markets (including trading) by CERCs / SERCs

Other measures to promote electricity trading

- Setting up of a power exchange(s)
- 15% of new generating capacity may be sold outside long term PPA as per National Electricity Policy
- Merchant Power Plants (MPPs)
 - MPPs compete for consumers and absorb full market risks
 - Ministry of Coal has identified 15 coal blocks (3.6 billion tonnes) for allotment

Transmission Sector: Current scenario of power trading

- Energy traded in FY'06 was 14,188MU (2.2% of total generation availability)
- Power traded in FY'06 was around 1000-1500MW (0.8-1.2% of generation availability)
- Significant growth in traded volume in last four years (CAGR ~ 72%)
- Inter-regional trade increased manifold through ER-NR, ER-WR, ER-SR links



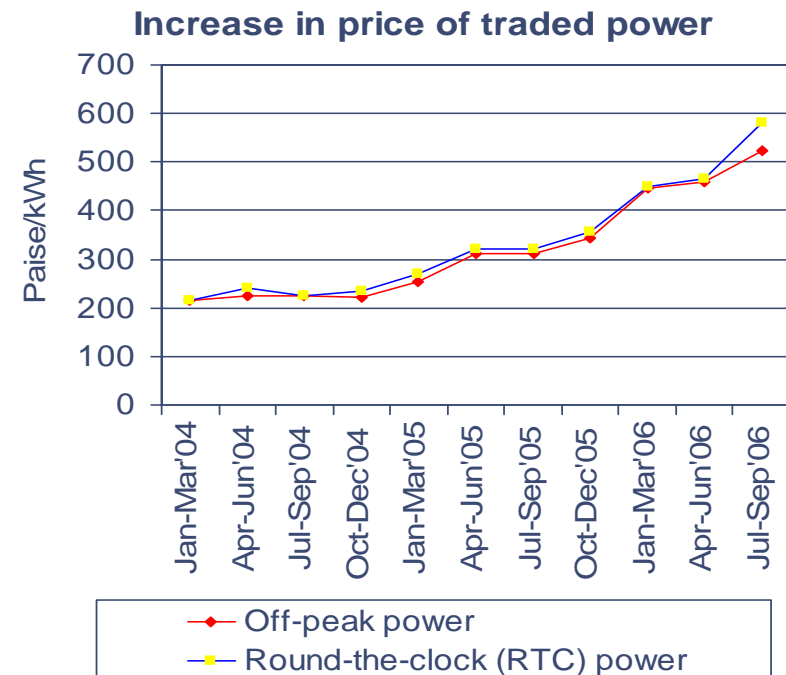
Source: CERC Power exchange paper

Transmission Sector: Current scenario of power trading

- Consistent rise (~40% per annum) in prices of traded power
- Prices of off-peak power and RTC power almost same as most of the thermal stations are operating on base load
- Indian power market needs peaking power plants to meet peak shortage

Sl. No.	Category of the Trading Licence	Volume of Electricity proposed to be traded (in kWh)	No. of Traders
1	A	Upto 100 million	10
2	B	100 to 200 million	1
3	C	200 to 500 million	3
4	D	500 to 700 million	0
5	E	700 to 1000 million	0
6	F	Above 1000 million	5
			19

- Trading margin fixed by CERC at 0.1 cent/kWh
- Trader-Trader transactions not allowed



Source: CERC Power exchange paper

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Transmission Sector: Promoting energy trading through PX

[CERC guidelines for setting up a Power Exchange (PX)]

Broad guidelines for the PX

- Voluntary participation
- De-mutualized form of organization
- Reliable, efficient and impartial management
- Ring fencing between ownership, management and participation
- Investment support from the investors including institutional investors
- Transparency in operation and decision-making
- Computerized trading and clearing system
- Efficient financial settlement and payment security mechanism
- Effective system for dissemination of trading information

Transmission Sector: Promoting energy trading through PX

[CERC guidelines for setting up a Power Exchange (PX)]

Role of CERC

- Commission to stay away from governance of the Power Exchange
- Scrutiny of rules and bye-laws
- Assignment of transmission capacity to Power Exchange
- Apportionment of transmission charges
- Procedures for handling congestion
- Monitoring of PX for gaming
- Adjudication of dispute between PX and Members

PX proposed by MCX

- National Power Exchange
- Day ahead markets
- Congestion management through merit order of bids & offers / pro-rata allocation
- Deviation in delivery to be settled under ABT/UI mechanism
- Uniform market clearing price

Transmission Sector: Promoting Merchant Power Plants

Transmission System for MPPs

- MPP have to seek open access from CTU up to prospective customers
- MPP required to bear the cost of dedicated system required for interconnection with the nearest grid point

Issues related to MPP

- Whether MPPs can sell part of capacity under long term PPA
- Can MPP enter into long term PPA after setting up the plant as MPP?

- MPP are given advantage in coal block allocation, hence should they be allowed to bid for long term procurement by distribution licensee
- Transmission system requirement
 - System strengthening
 - Transmission charges
- Sale of power
 - Short term
 - Spot
 - Seasonal
 - ToD

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