

# Transmission Sector

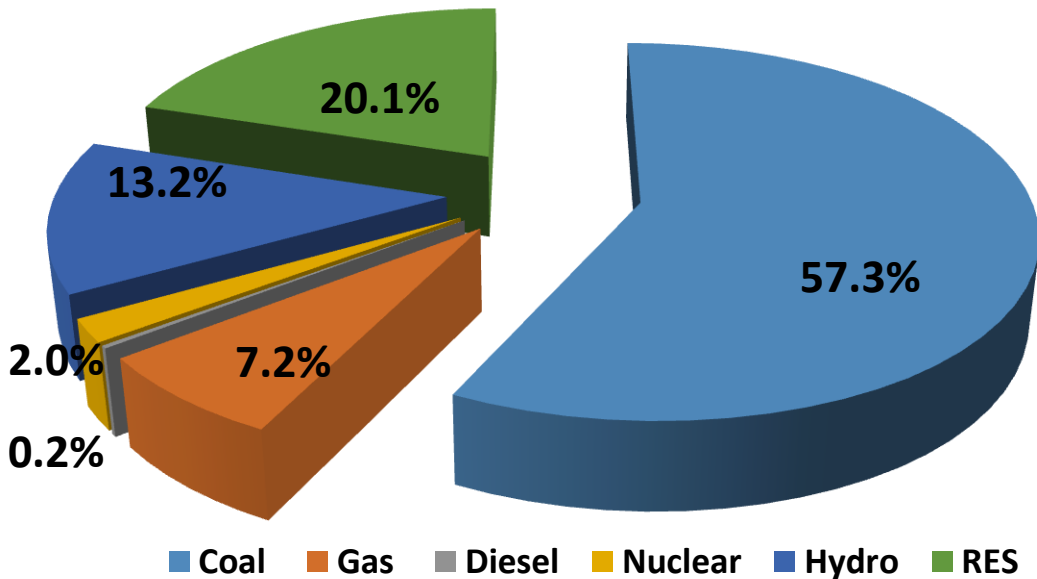
Presentation at ERPC  
CERC Consultation Paper

# Installed Generation Capacity

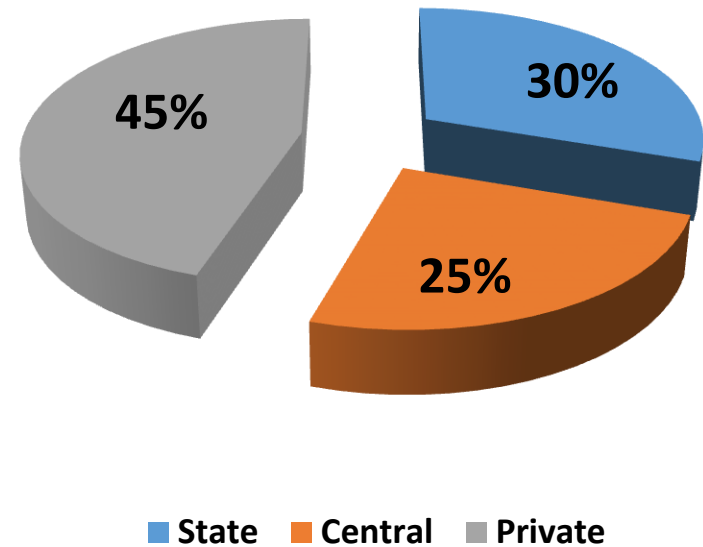


	Thermal (MW)				Other			Grand Total
	Coal (MW)	Gas (MW)	Diesel (MW)	Total (MW)	Nuclear (MW)	Hydro (MW)	RES (MW)	
2006-07	71121	13692	1202	86015	3900	34654	7760	132329
2017-18	197172	24897	838	222907	6780	45293	69022	344002
% Increase	177%	82%	-30%	159%	74%	31%	789%	160%

**Installed Electricity Generation Capacity in India as on 31.03.2018**



**Sector-Wise Generation**



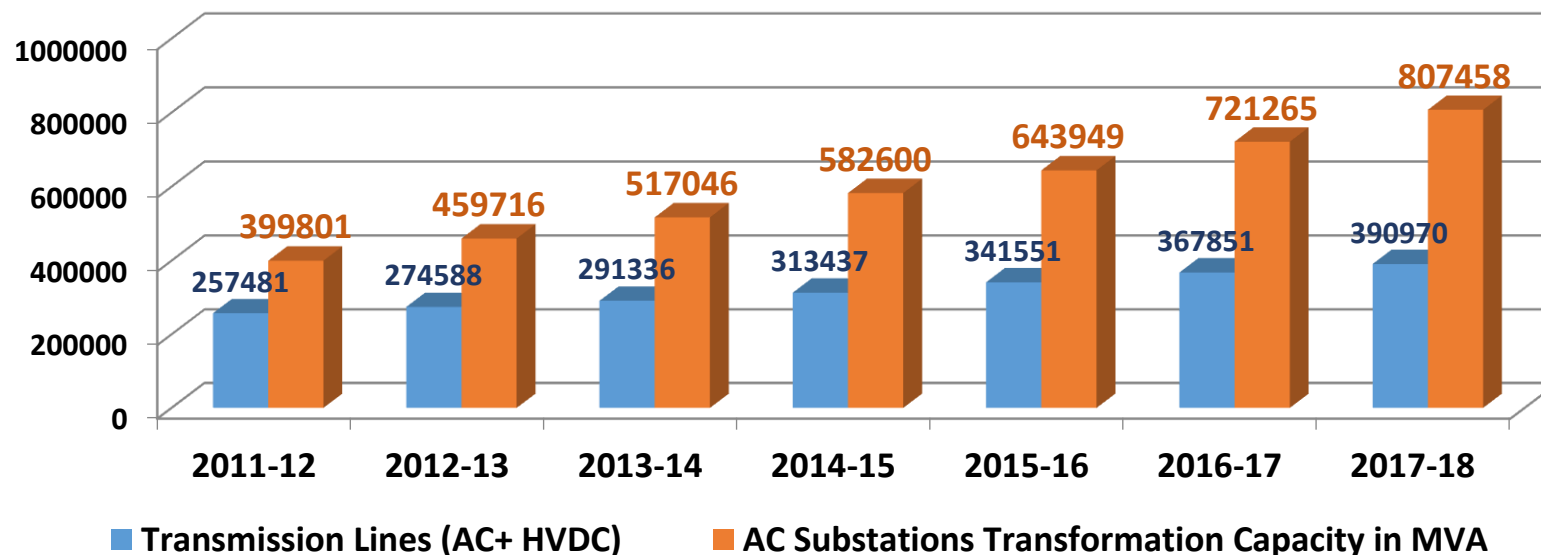
Source: Central Electricity Authority

**POWERGRID**

# Growth of Transmission Sector in India, 2011-12 to 2017-18



Year	Transmission Lines 220kV & above (AC+ HVDC) (Ckt Kms)	Growth (YoY)	AC Substations Transformation Capacity in MVA , 220 kV & above	Growth (YoY)
2011-12	257481		399801	
2012-13	274588	6.6%	459716	15.0%
2013-14	291336	6.1%	517046	12.5%
2014-15	313437	7.6%	582600	12.7%
2015-16	341551	9.0%	643949	10.5%
2016-17	367851	7.7%	721265	12.0%
2017-18	390970	6.28%	807458	11.95%



# Policy Framework for Tr. Development



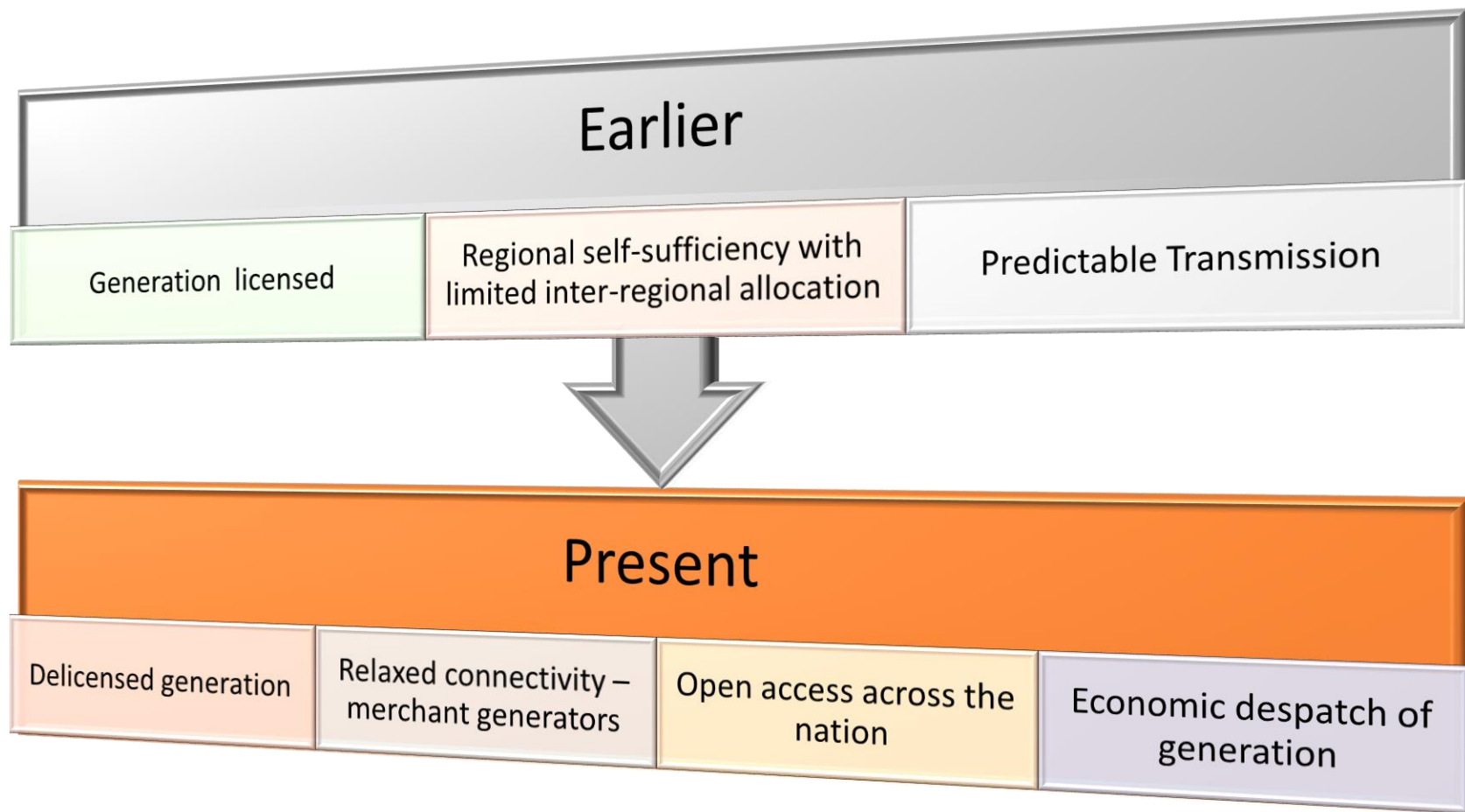
- ❖ Objectives as per Tariff Policy 2016 ;
  - Ensuring optimal development of the transmission network ahead of generation with adequate margin for reliability and to promote efficient utilization of generation and transmission assets in the country;
  - Attracting the required investments in the transmission sector and providing adequate returns.
- ❖ Suggestion: Sub group on power transmission constituted by MOP (2013)
  - Planning, funding and implementation of the National Grid to ensure that transmission is ahead of generation & load growth.
- ❖ CERC Staff Paper on Tr. Planning, LTA/MTOA & related issues(Sep 2014)
  - The cost of transmission system being significantly less than that of cost of generation.....ideally it must be ahead of generation both in time and capacity to avoid congestion or bottling up of power
- ❖ Sub-Committee of CAC on Congestion (Chairman- Sh. R V Shahi,) - June, 2015
  - (xiii) Long term strategy would include ..... the new transmission systems with higher capacities to take care of ROW issues.

- ❖ Planning carried out based on long term power transfer requirement under worst scenario to different States in line with security and reliability criteria as stipulated in the Transmission Planning criteria of CEA as well as ensuring optimal utilisation of Right-of-Way, land availability for substation
  - Peak power flow requirement: Peak demand varies according to seasons. The transmission capacity has to be sufficient to cater to these requirements.
  - Grid security and reliability : N-1 criterion is followed to increase reliability (In contrast USA has more liberal N-2 criterion)
  - Interconnection between various areas: Inter Regional links are planned to enable flow of cheaper power from one region to another

- Long term perspective: At some places e.g. North-east where there is estimated potential of 50,000 MW of generation and the evacuation system has to pass through chicken-neck area, it becomes imperative to plan a high capacity system which would cater to this huge potential in future.. Similar is the case with renewable energy projects.
- Right of way : ROW must be optimised so that even the future requirements are met and there is least environmental impact. High capacity lines are planned keeping in view these socio-economic considerations and future requirements.
- Transmission to lead Generation : it is imperative that there should be a robust grid to be able to cater to present as well as future load requirements. Thus Transmission should lead generation.



# Evolution of Power Sector



Supply of electricity is moving away from being considered as “Public Service” to an “Economic Activity”

# Transmission – An Enabler



Transmission is Infrastructure to the infrastructure sector (Power). Strategically important sector in one of the world's fastest growing economies

- Has reduced cost of power
- Brings in economy & efficiency, by replacing costly power by cheaper power
- Takes care of uncertainty in Generation
- Risk levelizer
- Lack of transmission results in loss of generation of much higher magnitude

For example, in 2013-14, volume of electricity in exchange that could not be cleared due to congestion – 5591 MU. Considering cost of un-cleared units @ Rs 3.59 /- the loss is about Rs 2000 Crs while transmission charges were only about 25-30 paise per unit.

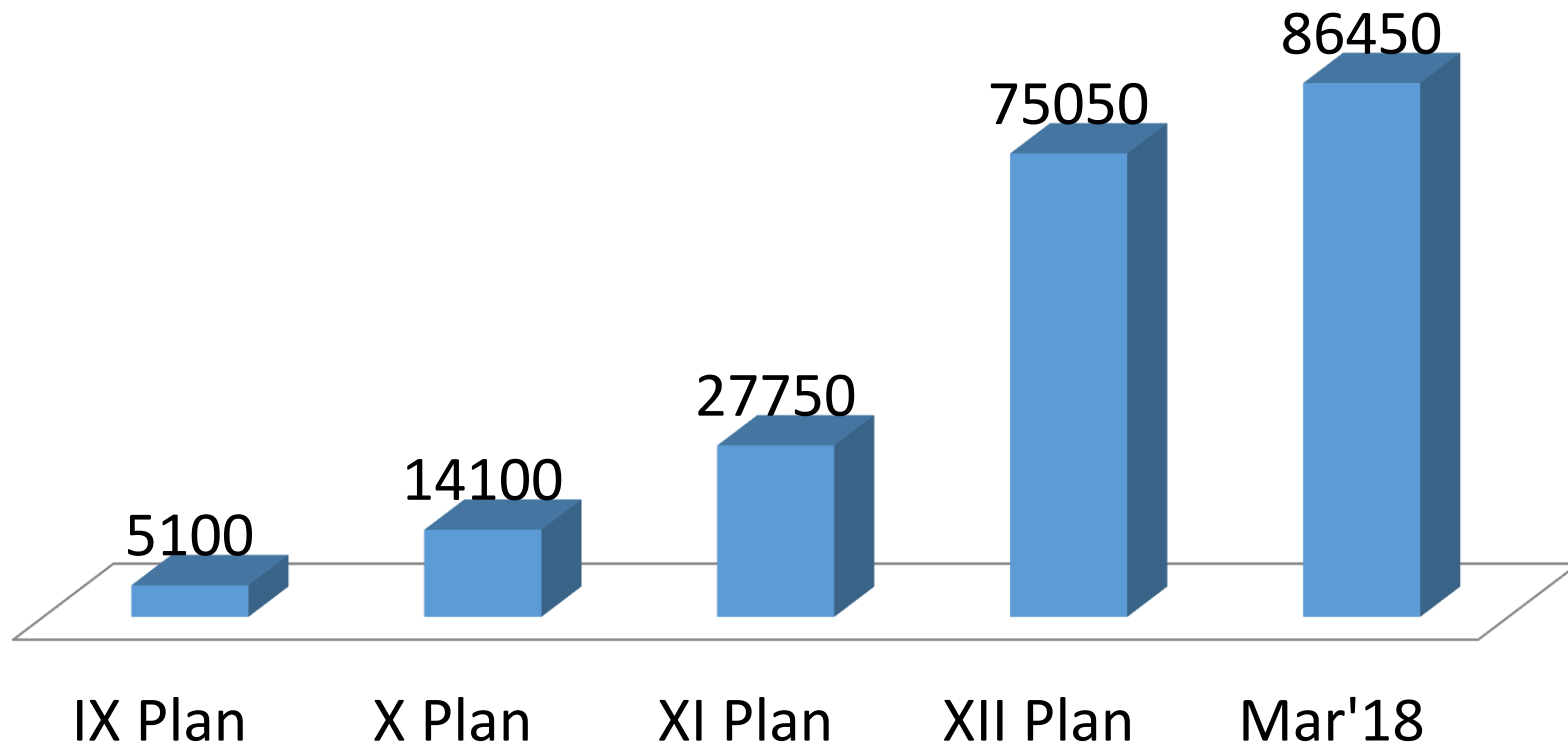
Thus, strong transmission network should be present to optimize the resources. In fact, Transmission should lead Generation



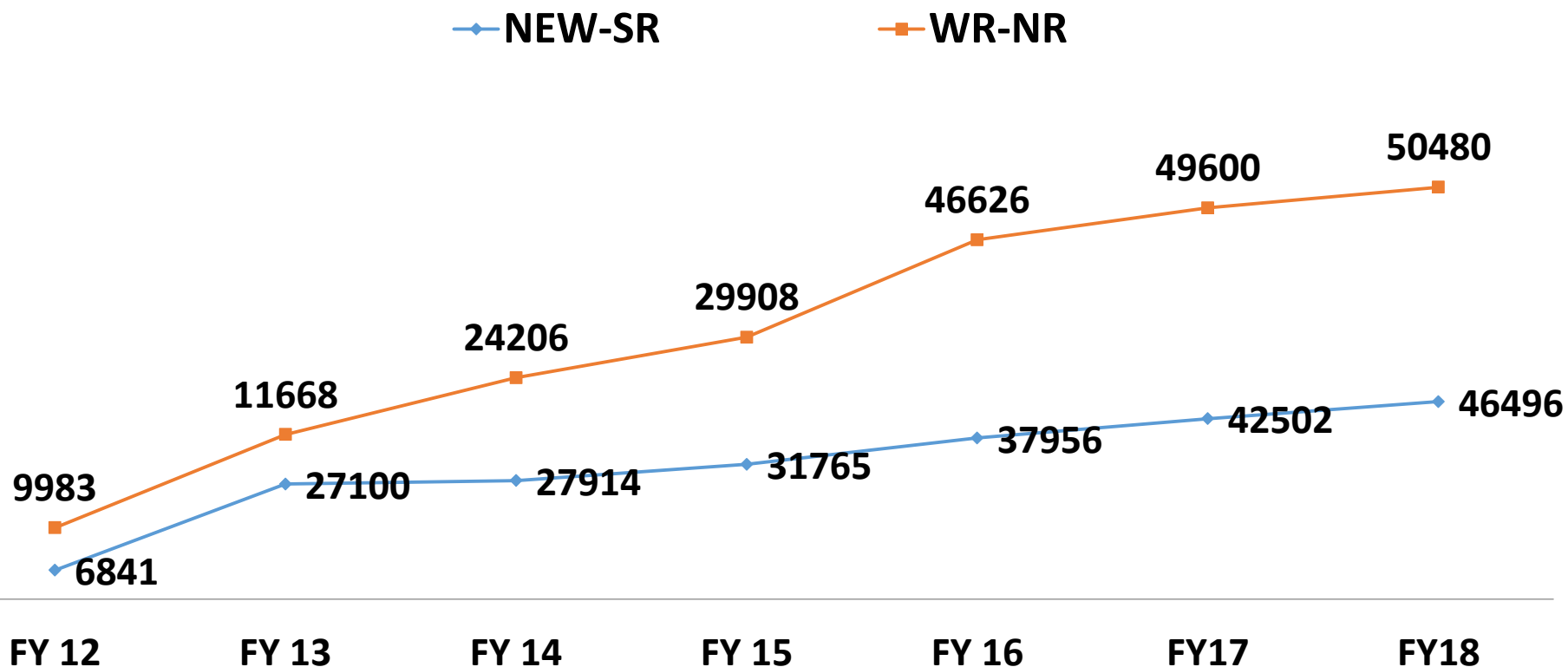
# Growth in Inter-regional capacity



## Inter-Regional Capacity (MW, as at the end of)



## IR-R Power flow from WR to NR & NEW to SR (Mus)



Increase WR-NR approx 5X  
NEW-SR approx 6.8X

# Power Supply Position in India



Year	Energy (MU)		
	Requirement	Availability	Deficit (%)
2009-10	830594	746644	10.1%
2010-11	861591	788355	8.5%
2011-12	937199	857886	8.5%
2012-13	995557	908652	8.7%
2013-14	1002257	959829	4.2%
2014-15	1068923	1030785	3.6%
2015-16	1114408	1090850	2.1%
2016-17	1142929	1135334	0.7%

*Source: Ministry of Power*

# Transmission – Benefits



❖ Flexibility in power transfer  
(Increase in short term transaction from 65 BU in 2009-10 to 119.23 BU in 2016-17)

Year	Volume of Short-term Transactions of Electricity (BU)
2009-10	65.90
2010-11	81.56
2011-12	94.51
2012-13	98.94
2013-14	104.64
2014-15	98.99
2015-16	115.23
2016-17	119.23

❖ STOA rate reduction  
(from about Rs. 7.5 in 2008 to Rs. 2.5 in 2016-17)

Year	Price of Electricity transacted through Traders (Rs/kWh)	Price of Electricity transacted through Power Exchanges (Rs/kWh)
2008-09	7.29	7.49
2009-10	5.26	4.96
2010-11	4.79	3.47
2011-12	4.18	3.57
2012-13	4.33	3.67
2013-14	4.29	2.90
2014-15	4.28	3.50
2015-16	4.11	2.72
2016-17	3.53	2.50

Before One Nation One Grid, MTOA and STOA reached upto ₹ 10/unit in SR. Presently, the prices in open markets have come down by 70% to around ₹ 3/unit

# Transmission – Benefits



❖ Reduction in congestion (from 17% in 2012-13 to 4% in 2016-17), facilitated merit order despatch and development of one nation one grid.

<b>Year</b>	<b>Unconstrained Cleared Volume* (BU)</b>	<b>Actual Cleared Volume and hence scheduled (BU)</b>	<b>Volume of electricity that could not be cleared due to congestion (BU)</b>	<b>Volume of electricity that could not be cleared as % to Unconstrained Cleared Volume</b>
2012-13	27.67	23.02	4.65	17%
2013-14	35.62	30.03	5.59	16%
2014-15	31.61	28.46	3.14	10%
2015-16	36.36	34.20	2.16	6%
2016-17	41.60	40.08	1.52	4%

# Cost of Transmission



- ❖ Today, every distribution utility has the flexibility of sourcing cheapest power available anywhere in the country & thereby reducing their power purchase costs.
- ❖ As per CERC consultation paper, components of electricity are as below;

Various components of cost of electricity in India Year	Figure in Rs per KWH	
	2009-10	2016-17
Basic price (ROM)	0.42	0.56
Taxes and duties	0.13	0.4
Coal Transportation	0.33	0.51
Taxes and duties on transportation	0.03	0.12
	0.91	1.59
Generation plant (Fixed cost)	2.01	1.66
Transmission cost (Inter)	0.23	0.39
Transmission cost (Intra)	0.12	0.14
Transmission losses	0.29	0.33
	2.65	2.52
Distribution Cost	0.48	1.39
Distribution Losses	1.03	1.17
Cost of Supply	5.07	6.67
% of Transmission in overall cost of supply	4.5%	5.8%

Transmission costs constitute only ~5.84% of the total costs of supply .The benefits far outweigh the cost associated with such investments in transmission sector.



- ❖ Central Transmission Utility and functions, Section 38. :.... the Central Transmission Utility shall not engage in the business of generation of electricity or trading in electricity
- ❖ Section 41. (Other business of transmission licensee):...a proportion of the revenues derived from such business shall, as may be specified by the Appropriate Commission, be utilised for reducing its charges for transmission and wheeling:

**Unlike other regulated entities in power sector the avenues for generating additional revenue is minimal in case of transmission.**

# Transmission : Facts



- ❖ Transmission unlike Generation is a regulated business and any new asset is added to the system only after due approvals from different forum. Investment not driven solely by market requirement.
- ❖ ISTS is not an independent system but part of an interlinked power system where its utilization depends completely on its upstream and downstream network. The flow in a particular line depends upon a number of variables and conditionality.
- ❖ Transmission licensee has no control over power flow or utilization of the asset; it is completely dependent on the load-generation scenario at that moment and operational decisions by Grid operators.
- ❖ Further, the whole system works as one single unit /one Grid, thus individuality of a transmission line or asset is lost in it.

- ❖ Prior to the year 2011, almost all of the ISTS projects were implemented under cost plus methodology under norms governed by CERC.
  - After 2011, projects are being awarded under Global tariff based competitive bidding. As a matter of fact in the last 3 years, all the major transmission projects have been awarded only through TBCB route.
  - The number of bidders are dwindling with each bid. From the initial robust more than 20 numbers of bidders per project, the numbers have reduced down to 4-5 bidders in each project
- ❖ Risk in transmission has increased significantly.
  - Issues like RoW, Generation atonement and Mismatch makes project execution risky and uncertain

*“1.3 It is therefore essential to attract adequate investments in the power sector by providing appropriate return on investment as budgetary resources of the Central and State Governments are incapable of providing the requisite funds. It is equally necessary to ensure availability of electricity to different categories of consumers at reasonable rates for achieving the objectives of rapid economic development of the country .....*

*1.4 Balancing the requirement of attracting adequate investments to the sector and that of ensuring reasonability of user charges for the consumers is the critical challenge for the regulatory process. ....*

*5.2 All future requirement of power should continue to be procured competitively by distribution licensees except.....*

*5.11 a) Return on Investment*

*Balance needs to be maintained between the interests of consumers and the need for investments while laying down rate of return. Return should attract investments at par with, if not in preference to, other sectors so that the electricity sector is able to create adequate capacity. The rate of return should be such that it allows generation of reasonable surplus for growth of the sector.*

