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## ELECTRICITY SECTOR IN INDIA: ISSUES AND CHALLENGES

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### ABSTRACT

In this era of development, power sector has become important and indispensable partially in every sphere of activities. The production status of energy in India has not been a match to the power requirements of various categories of consumers. Energy is one of the major inputs for economic development of any country. Over the last six decades, India has taken rapid development of the electricity sector both in terms of power generation and distribution. Power generation is the most important for economic growth and industrial development of any country. India has a very large verity of renewable and non renewable energy resources still it suffers lack of generation, transmission, and distribution of electricity due to its poor policies and weak planning strategy. The article analyzed the importance of power sector. This paper discusses issues, challenges and also suggests suitable measures to be taken by the government for the development of the power sector.

**KEYWORDS:** Energy Sector, Per Capita Consumption, Distribution, Generation Capacity and Transmission.

## **INTRODUCTION**

Electricity generation is one of eight core infrastructure of India. The power sector has significant progress after independence, where India has become independent in 1947. The economic development of any country irrespective of its size mainly depends upon the development of power sector, which is in fact is a key indicator of the Nation's overall economic development as well. In fact it is the fuel of economic progress in all sectors, not only agricultural and industrial but all allied areas. The country had power generating capacity of 1,362 MW. Hydro and coal base has the main sources of power generating electricity. Now electricity sector in India had an installed capacity of 263.66 G.W. and generated around 703.1 B.U. as on march 2015. Power is one of the most critical components of infrastructure crucial for the economic growth and welfare of nations. India's power sector is one of the most diversified in the world. Source of power generating range from conventional sources such as coal, lignite, natural gas, oil, hydro and nuclear power to viable non-conventional sources such as wind, solar, and agriculture and domestic waste. Electricity demand in the country has increased rapidly and is expected to rise further in years to come. The Indian power sector has made remarkable progress since independence. The total installed capacity has gone up from 1,362 M.W. in 1947 to 263.66 G.W. in 2015. The demand of electricity has always been overstepping the supply. India comes forward as the third larger producer of electricity in the year 2013. This paper is an attempt to highlight the gaps between electricity demand and supply and attempts to understand the problem. Some solution framework to overcome from the various issues and challenges in this sector.

## **OBJECTIVES OF THE STUDY**

1. To analyses the current scenario of Indian Power Sector.
2. To understand various challenges of Indian power sector.
3. To suggest solution and recommendation to change the future outlook of Indian Power Sector.

## **RESEARCH METHODOLOGY AND DATA COLLECTION**

This study is analytical in nature. In the present study, secondary data has been used. The required secondary data has been collected from various sites like India stat and reports of ministry of power.

## **PRESENT SCENARIO OF ELECTRICITY SECTOR IN INDIA**

### **GENERATION**

The power generation has been done mainly in hydrothermal and nuclear. There is no private partnership for nuclear power generation and it is completely held by central government. India's electricity generation has been increasing continuously to meet the rapidly growing in

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economic activity of the country. Total installed capacity of the electricity generation at the end of the nov.2015 as given in the table

**INSTALLED CAPACITY OF ELECTRICITY GENERATION SECTOR-WISE**

**TABLE No. I: Total Installed Capacity**

Sector	M.W.	%
state sector	96,963.20	36.23
central sector	7252116	27.1
private sector	98152.99	36.67
total installed capacity	267,637.35	100

Source: ministry of power

**TABLE II: Total Thermal**

Fuel	M.W.	% age
Coal	164635.88	61.51
Gas	23,062.15	8.61
Oil	1,99.75	0.44
Hydro (renewable)	41,267.43	9.81
Nuclear	5,780.00	2.16
RES**( MNRE)	31,692.14	11.84
Total	267,637.35	94.37

Source: central electricity

**PER CAPITA CONSUMPTION**

In March 2014 per capita total electricity consumption in India was 917.2 KWh. The per capita annual domestic electricity consumption in India 2009 was 96 KWH in urban areas. Electric energy consumption in agriculture sector is highest in 18% in India. The per capita electricity consumption is low compared to many countries.

**GROWTH OF ELECTRICITY CONSUMPTION IN INDIA**

year	Total in GWH	Domestic	Commercial	Industrial	Traction	Agriculture	Misc	per capita consumption
1947	4182	10.11%	4.26%	70.78%	6.62%	2.99%	5.24%	16.30%
1950	5610	9.36%	5.51%	72.32%	5.49%	2.89%	4.44%	18.20%
1956	10150	9.20%	5.38%	74.03%	3.99%	3.11%	4.29%	30.90%
1961	16804	8.88%	5.05%	74.67%	2.70%	4.96%	3.75%	45.90%
1966	30455	7.73%	5.42%	74.19%	3.47%	6.21%	2.97%	73.90%
1974	55557	8.36%	5.38%	68.82%	2.76%	11.36%	4.13%	126.20%
1979	84005	9.02%	5.15%	64.81%	2.60%	14.32%	4.10%	171.60%
1985	124569	12.45%	5.57%	59.02%	2.31%	16.83%	3.83%	228.70%
1990	195098	15.16%	4.89%	51.45%	2.09%	22.58%	4.01%	329.20%

1997	315294	17.53%	5.56%	44.17%	2.16%	26.65%	-5.75%	464.60%
2002	374670	21.27%	6.44%	42.57%	2.05%	21.80%	4.45%	671.90%
2007	525672	21.12%	7.65%	45.89%	2.00%	18.84%	5.00%	559.20%
2012	785194	22.00%	8.00%	45.00%	1.71%	18.00%	4.88%	883.60%
2013	824301	22.29%	8.83%	44.40%	1.75%	17.89%	4.88%	914.40%
2014	881562	22.95%	8.80%	43.17%	1.79%	18.19%	5.14%	914.40%
2015	938823	23.53%	8.77%	42.10%	1.79%	18.45%	5.37%	954.00%

**Source:** ministry of power

Growth of electricity consumption in India has been increasing in 1947 per capita consumption was 16.3 % that will increase 954.0% in 2015. But in India the generation capacity is very low.

**TRANSMISSION**

The current transmission is only 13 % of the total installed generation capacity over the next 5-10 years , the corresponding investments in the transmission sector is also expected.

**Existing transmission lines in (CKM)**

Capacity	Substation MVA	Transmission lines KKM	CKM/MVA ratio
500 KVHVDC	13,500	9,432	0.699
765 K.V.	88,500	12,367	0.14
400 K.V.	180,872	127,261	0.704
200 K.V.	258,444	145,561	0.563

**Source:** ministry of power

**DISTRIBUTION**

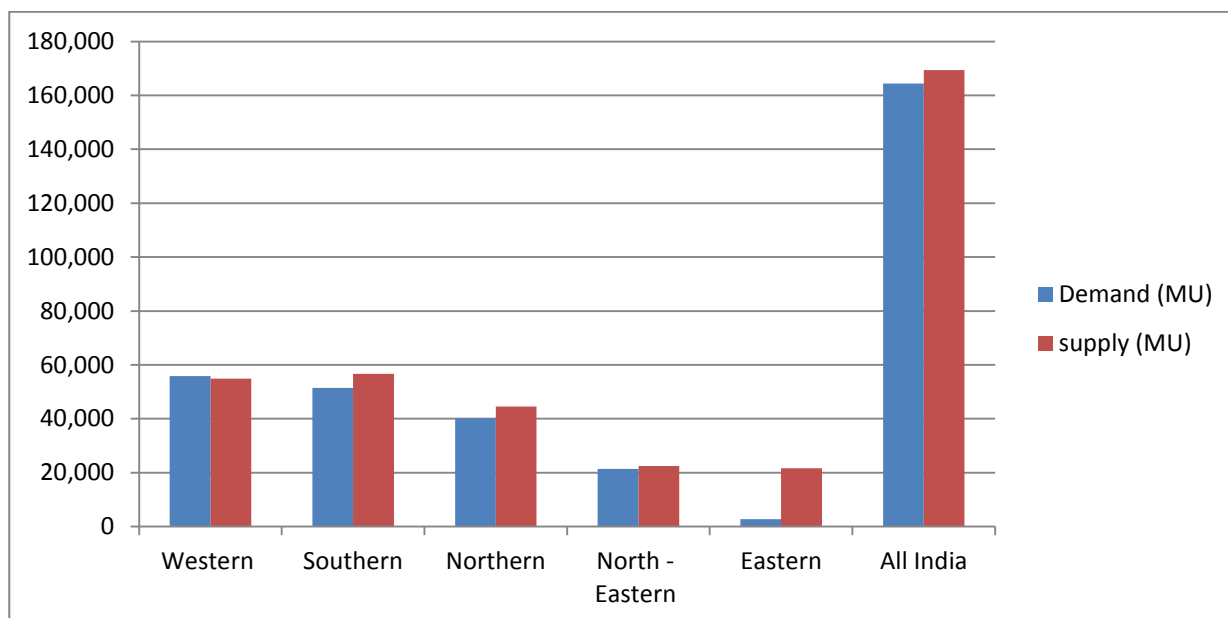
India’s distribution network starts at the 33 KV substation and ends at the customer’s doorstep. Each state has its own distribution network and the old vertically integrated SEB’s have been unbundled into smaller distribution companies in many states. In May 2014 reports, India’s central electricity authority anticipated for 2016-17 fiscal year, A base load energy deficit and peaking shortage to be 5.1 % and 2% respectively. India also expects all regions to face energy shortage up to a maximum of 17.4 % in northern eastern region.

**All India Power Supply Position in 2016-17**

Region	Requirement (MU)	Energy		Demand (MU)	Peak power	
		Availability (MU)	Surplus (+) deficit(-)		supply (MU)	Surplus (+) Deficit (-)
Western	357,459	351,009	-1.80%	55,800	54,900	-1.60%
Southern	379,087	405,370	6.90%	51,436	56,715	10.30%
Northern	310,564	320,944	3.39%	40,145	44,604	11.10%
North - Eastern	151,336	135,713	-10.30%	21,387	22,440	4.90%
Eastern	16,197	14,858	-8.30%	2,801	21,695	-3.80%
All India	1,214,642	1,227,895	1.10%	164,377	169,403	3.10%

Source : Ministry of power

**REGION WISE REQUIREMENT AND AVAILABILITY OF POWER SECTOR**



**ISSUES OF INDIAN POWER SECTOR**

Despite the increasing growth curve in the energy sector over the last few years, the Indian power sector has still not been able to induce and sustainable the required capacity addition matching the ever growing power of economy. There are some following challenges in the growth of Indian power sector:

**1. Limited fuel**

Limited fuel is the most crucial challenge for Indian power sector. India has limited source of energy. In the Indian power sector, primarily electricity production is from thermal power stations. The main fuel used is coal, coal fuels about 55% of India’s power generation, and if current projection is accurate, the proportion will from substantially in the next 20 years.

## **2. Generation Slippage**

For the 11<sup>th</sup> five year plan various reasons have been identified for slippage. The target of 78,700 mw capacity additions during 11<sup>th</sup> plan was revised to 62,374 mw as per the midterm of planning commission. The major reasons for slippage of power projects from the capacity addition target 78,700 mw are as follows:

### **MAJOR REASON OF SLIPPAGE**

Sr.no.	Reason of slippage	Amount of slippage
1	Delay in placement of order for main	6,660
2	Delay in placement of order for unit	1,860
3	Slow progress of civil works	900
4	Poor geology	4,432
5	Contractual dispute between project	4,760
6	Delay in land acquisition	810
7	Law and order problem /local issues	580
8	electrical and mechanical work critical	600
9	Difficult area and accessibility	100
10	Environmental concerns	1,100
	Total	21,802

**Source:** working group of power for 12 the plan

## **3. Shortage of Equipments**

Equipment shortages have been a significant reason for the India missing its capacity addition target for the 12<sup>th</sup> five year plan .while the shortage has been primarily in the core components of turbinies, boilers and generators ,these has been lack of adequate supply of balance of plant equipment as well .These includes coal –handling plants etc. TO evaluate supply shortage of equipment two measures are being adopted – enhancement of domestic equipment manufacturing capability by establishing between Indian and foreign suppliers and second measure is procuring equipment directly from international markets.

## **4. Transmission and Distribution losses**

High distribution losses are among the most serious problem in electricity sector. India’s aggregate technical and commercial losses average about 32 % of electricity which is very high as compared to developed countries .This is a matter for saving electricity which may reduce the demand supply gap. Reeducation in transmission and distribution losses by 1 % would result in saving in capacity by 800 MW.

## **5. Financial problems**

Rapid builds up to the generation capacity is being aided by setting up to ultra mega power projects each of which is 400 Mw. Ultra mega power project is a significant challenge as India has not witnessed on execution of such a large scale power project before.

### **6. Land acquisition and environment clearance**

Land acquisition is an increasingly significant challenge in the Indian power sector .power plants and utilities face major constraint and delay regarding the availability of land and obtaining the requisite environment and other clearness for the projects. The new bill related to land acquisition has continued to face political opposition .and in some cases owner were not handover their land or the project was not completed for several years due to other delays.

### **7. Aging power plants and transmission network**

Most of the power plants and transmission lines have been installed immediately after independence they have become old and inefficient. This is the main reason for the low growth and transmission rate in electricity generation and transmission during the recent year’s old and inefficient plants and lines needs to be replaced or modernized to achieve the electricity production and demand target.

### **8. Manpower shortage**

There is a general reason that shortage of talent in the construction sector is long term problem and is likely to continue to push up project costs and risk. The government, which is the biggest buyers of the capital projects, has also not done enough to address this challenge. The education system is always not delivering, the required number of specialist across project management engineering, estimating, surveying and contract management. The profile of manpower shortage at supervisory staff level in hydro power and thermal power sector is outlined below:

#### **Manpower requirement in hydro power and thermal power**

	Hydro Power sector		
Category	estimated requirement	Available	Augmentation required
Senior level executives	550	330	220
Middle level executives	2000	1200	800
Junior level executives	4300	2600	1700
Non executives	1700	1000	700
Total	8550	5130	3420
	Thermal Power		
Senior level executives	1014	660	354
Middle level executives	3702	2400	1302
Junior level executives	7308	5040	2268
non executives	12780	8280	4500
Total	24804	16380	8424

**Source:** the working group of power for 12<sup>th</sup> plan, planning commission

### **9. Sharp increase in demand**

India is one of the fastest growing countries. So the demand of electricity also increased with the development. Power sector is an essential input for all sectors of the economy. Although India has large installed capacity but still there is large demand and supply difference.

### **10. Inter-state disputes**

India is federal democracy, and because rivers cross state boundaries, constructing efficient and equitable mechanisms for allocating rivers flows has long been an important legal and constitutional issue. Due to this there is not availability of water all times to operate hydro power plants .interstate disputes also restrict the excess power exchange between the states.

### **11. Delay in Policy Implementation and construction of projects**

Policy paralysis is one of the major challenges of Indian power sector. The micro level policies governing the fuel cost pass-through, mega power policy, competition bidding guidelines are not in consonance with the macro frame-work like the Electricity Act 2003 and NEP (National Electricity Policy). And the power projects has been delayed for too long .The main reasons of behind this is the lack of financing long route money follow of department.

## **SUGGESTIONS**

There are some suggestions, which help to overcome the challenges of Indian power sector.

### **1. Development of National Grid**

In order to increase the transmission capability of power the important role plays by the national grid development. It is suggest to add new inter regional capacities of 20700 MW and above during the eleventh plan period. This would increase the total inter regional transmission capacity of national power grid at 220 KV and above from 14100 MW by the end of twelfth plan.

### **2. Theft of Power**

In Indian power sector there is a no. of electricity theft. Especially in villages a no. of person uses electricity without having meter. For reducing electricity theft privatization must be need.

### **3. Arriving at an Optimal Fuel Mix**

There is need to develop both conventional and non conventional forms of energy , wherein, three key factors must be kept in view for developing an energy mix:-

- (i) To understand the pattern of demand in the country
- (ii) Estimate the availability of fuel in the country
- (iii) Estimate the cost of fuel production and imports.

It would be effective to adopt coal thermal as a fundamental component of the fuel mix for the next 20-30 years, with solar occupying 5-8% of total mix.



#### **4. Adoption of PPP Plan**

To overcome the financial problems and inefficiency in the production, government can be adopting the PPP (Public Private Partnership) model. This model is doing great work in some states. Government should try to attract FDI in this sector.

#### **5. Modern techniques for electric power conservation**

DSW is the planning, implementation and monitoring of utility activities designed to customer used of electricity in ways that will produce the desired changes in the load, shape, of utility. An integrated approach to DSM and successful implementation of DSW schemes, results in capital expenditure, maintains, fuel saving and required system losses and improved plants life.

#### **6. Introducing the co-generation system**

India have a large number of sources for the electricity generation and the energy from the all available resources should be converted to electricity for better operation , utilization in order to meet growing electricity demand .The central and state grid networks are being contemplated for efficient supply of energy. But such complex network have large number problems to solve such problems ,the total energy system consists of generators for producing electricity and the waste heat from prime mover fuels is utilized for air conditioning etc.

#### **7. Regular Energy Audit**

There should be a board that should be involved in the auditing of electric power at intervals of time to ensure that the future of electricity **industry will not the growth of national economy.**

#### **8. Adoption of innovation business models**

The Indian power sector must adopt the innovation business models of developed countries .The private sector would also drive adoption of never business, operating modals.

#### **9. Re-Innovation and Modernization of Generation**

To improve the performance old power plants a renovation and modernization program need to be launched. There is need to increase the efficiency of thermal power plants. The fuel conversion efficiency of the existing population of thermal power stations is an average around 30 percent.

#### **10. Strengthened Role of Renewable in the Sector**

To boost investment in renewable energy, it is essential to introduce clear, stable and long run support policies. A number of policy measures at national level, to improve the framework for renewable energy in India .They must be carefully designed to ensure that they operate in harmfully with existing state level mechanisms.

## **CONCLUSION**

In this paper Indian power sector scenario is discussed. India's growing economy has forced the country to increase installed capacity to 200 GW this year, despite this growth in supply, the country is still facing major challenges in providing electricity access to all the household and also improving reliability and quality of power supply. Its power system is struggling to overcome power shortage. The major concepts to achieve the target in shortage of capital resources, shortages in power generation, distribution and end use system. There is immediate need to change in planning strategies, from the traditional approach to increasing generation to meet in disciplined consumption to need resource and conservation based approach for economic and environmental benefits. The Indian power sector is full of wrought with issues and challenges but at the same time, there are plenty of opportunities that indicate. The numerous policies announced by government as well as those being implemented have started yielding results towards energy rich India. Implementation of those policies helps Indian power sector to become more efficient. Policies regarding renewable energy are working efficiently. India has huge scope of solar energy. There is need to improve the cost efficiency of renewable energy.

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