



Emerging Issues and Challenges in Electricity Sector in India

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Abstract

In the last 60 years, India has made remarkable progress in the energy sector, both in terms of increasing power generation and distributing it geographically. To fulfil rising power demand and support the country's economic growth, considerable increases in installed generating capacity and accompanying transmission and distribution networks are required. Previously, the power sector was believed to be beset with basic faults, demanding reform. Despite several policy measures, the power sector has yet to be transformed. This report identifies and quantifies some of the issues. The article focuses on the industry's dangers, some notable challenges already conquered, and others still to be. He tried to give a framework to address the concerns and obstacles in this field.

Key Words:

Electricity Sector in India, Power Sector in India, Power Industry, Transmission and Distribution, Slippage etc.

1. Introduction

In November 2014, India's electrical sector generated roughly 703.1 BU from 255.012 GW of installed capacity. In 2013, India surpassed Japan and Russia as the world's third largest electricity producer, with a 4.8 percent worldwide share. Indian power generation has improved dramatically in the last 60 years, as has power distribution across vast geographical areas. The rise in power consumption has constantly outpaced the expansion of generation capacity over the last sixty years. Despite an increase in capacity of around 1, 81,500 MW over the last six decades, the country still faces peak and energy shortages.

This report identifies and quantifies some of the issues. The study focuses on the industry's dangers, certain notable hurdles that the power sector has already cleared, and others that diverse actors must clear. He tried to give a framework to address the concerns and obstacles in this field.



2. Objectives of the Study

- To investigate the current state of India's power sector.
- To recognize the difficulties and risks in the Power Sector
- To provide solutions and cures to various power sector issues in India

3. Methodology

Researcher used secondary data. Sources of secondary data included reports from the Ministry of Power and the Indian Finance Commission.

4. Electricity Sector in India: Current Scenario

4.1. Production: In November 2014, India's electrical sector generated roughly 703.1 BU from 255.012 GW of installed capacity. In 2013, India ranked third globally in terms of power production, generating 4.8% of global electricity. Besides Japan and Russia. Non-renewable power plants accounted up 71.57 percent of total installed capacity. In 2013–14, India generated roughly 967 TWh (967,150.32 GWh) of electricity (excluding renewable and captive power plants). In 2013, total power generation was 1102.9 TeraWatt-hours (TWh).

4.2. Per Capita Consumption: In March 2013, India's per capita electricity consumption was 917.2 kWh. In 2009, the average annual home energy usage in India was 96 kWh in rural regions and 288 kWh in urban areas, compared to 2,600 kWh globally and 6,200 kWh in the European Union. Agriculture uses the most electricity (18%) in India. Despite decreasing electricity costs, India's per capita usage is lower than many other countries.

4.3. Transmission and Distribution: The July 2012 blackout in the country's north was the greatest in terms of persons affected. The Availability Based Tariff (ABT) has greatly improved grid stability in India.

Table 1: Installed transmission (circuit km) and distribution capacity (MVA) up to June, 2014

Capacity	Substations (MVA)	Transmission lines (c.km)	c.km / MVA ratio*
± 500 kV HVDC	13,500	9,432	0.699
765 kV	88,500	12,367	0.140
400 KV	180,872	127,261	0.704
200 KV	258,444	145,561	0.563

*Progress of Substations capacity in the Country up to June, 2014". Central Electricity Authority, GoI, 2014.

* the ratio to be multiplied with transmission line capacity (MVA) to give average installed length of transmission line per one MVA of installed substation capacity at each voltage level.

The unified grid has a maximum peak load of 151,000 MW, which was met on 30/6/2014. At 200 KV, substations attain a demand factor of roughly 61.91 percent. Large capacity substations and a broad network



of low demand high voltage transmission lines can't fulfil peak electrical demand.

In 2013, India's network technical losses were 23.65%, compared to a global average of 15%. The government estimates national T&D losses at roughly 24% in 2011 and aims to reduce them to 17.1% in 2017 and 14.1 percent in 2022. Non-technical losses result from illegal line tapping and faulty electric metres. A case study in Kerala found that repairing malfunctioning metres reduced distribution losses by 34% to 29%.

4.4. Demand Trends: According to a May 2014 estimate, India's Central Electricity Authority expects a 5.1 percent base load and a 2% peaking energy deficit in 2014–15. India forecasts electricity shortages in all regions, up to 17.4% in the North East.

Table 2: All India (Anticipated) Power Supply Position in FY2014-15

Region	Energy			Peak Power		
	Requirement (MU)	Availability (MU)	Surplus (+) Deficit (-)	Demand (MU)	Supply (MU)	Surplus(+) Deficit (-)
Western	288,062	289,029	+0.3%	45,980	52,652	+14.5%
Southern	298,180	260,366	-12.7%	41,677	32,423	-22.2%
Northern	328,944	318,837	-3.1%	47,570	46,899	-1.4%
North-Eastern	14,823	12,248	-17.4%	2,543	2,215	-12.9%
Eastern	118,663	114,677	-3.4%	17,608	17,782	+1.0%
All India	1,048,672	995,157	-5.1%	147,815	144,788	-2.0%

#Load Generation Balance Report 2014-15", 30 May 2014. Retrieved 18 July 2014.

Despite a massive rural electrification initiative, 400 million Indians are still without power. While 80 percent of Indian communities have power, only 52.5% of rural families do. In 2008, 93.1% of urban residents had electricity. In India, 64.5 percent of the population has access to electricity, but 35.5 percent does not. By 2017, India would need to develop roughly 135 GW of energy producing capacity to fulfil demand. Power outages are prevalent in India, and the inability to meet demand has hampered economic growth.

5. Electricity Sector in India: Challenges and Risks

The Indian electricity sector faces major hurdles in growing generating and transmission capacity, which has resulted in past underperformance.

Under Performance: India has a long history of not meeting its power sector goals. Even though there are a lot of great opportunities in the future, the shortfall on both the generation and transmission sides is still hurting the power sector. The inter-regional transmission capacity is just approximately 20 GW, which isn't enough to transmit a lot of power (13 percent of the installed capacity). The different ideas for how to generate



and transmit power are currently in different stages of implementation. There are, however, a lot of problems in the Indian power sector that make it hard for them to meet their goals. If you look at the country's history, you can see that it's possible that the resolution measures won't be put into place. The best way to tell if someone has a bad track record is if they don't meet their goals for adding power generation capacity. In the past, deviation from the goal could have been as high as 50%. The table below shows the aims and actual additions:



Slippage in Generation: For the 11th five-year plan, there are a lot of reasons why things aren't going as planned. In the Mid-Term Appraisal (MTA), the Planning Commission changed its goal for the 11th Plan from 78,700 MW to 62,374 MW. The primary reasons why power plants didn't fulfil their 78,700 MW capacity aim are:

Table 3: Major Reasons of Slippage

Sr.	Reasons of Slippage	Amount of Slippage
1	Delay in placement of orders for Main	6,660
2	Delay in placement of orders for Civil	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	Environmental Concerns	1100
8	Law and Order Problem/Local Issues	580
9	Electrical & Mechanical work critical	600
10	Difficult area and accessibility	100
	Total	21,802

#Working Group on Power for 12th Plan, Page No.98 and 99

Poor geology, flash floods, local agitation and law and order issues are some of the primary reasons for power loss.



The following are some of the specific challenges:

A. Fuel Availability: While more KG Basin gas supply has helped reduce gas shortages, domestic coal supply constraints exist and are projected to worsen. As a result, public and private groups have begun importing coal to fill the gap. As a result, several Indian companies have purchased, developed, and operated coal mines abroad. While this should safeguard coal supplies, it has created new obstacles. For example, India's main international coal supplier is Indonesia, which has several political and legal concerns due to changes in foreign business restrictions. Similarly, in South Africa, restricted railway capacity and controlled port capacity make reliable coal evacuation difficult for new entrants⁹. Diversification of supplies, rigorous supplier verification, unambiguous contracts, and strict monitoring are all strategies to reduce supply interruption risk in this instance.

B. Problems of Coal Blocks: Because just 24 of 210 captive coal blocks have been operationalized, the electricity sector faces a serious difficulty. Experts think that land acquisition concerns, licence delays, and infrastructural issues led to the blocks' non-operation. Due to their lack of coalmine development knowledge, the captive block developers do not really speed up mining operations.

India's power generation relies on coal and will continue to do so. Increased power output will certainly necessitate higher coal transportation by Indian Railways and increased import coal unloading at Indian ports. In both circumstances, India is currently short-handed. For this reason, a project developer must account for and manage its logistical chain. In many circumstances, this requires the developer to build their own supply infrastructure, adding to the project's complexity. Some imported coal-fired power stations, for example, must construct a coal-unloading jetty. This must be done prior to the commissioning of a power plant, requiring a different set of project management abilities.

C. Equipment Shortage: In the tenth five-year plan, India's capacity expansion plans were not met due to equipment shortages. Boilers, turbines, and generators are among the most in short supply. But balance of plant (BOP) equipment is not far behind. Plants that handle coal, ash, etc. Besides this, there is a lack of building equipment. The 11th Plan Working Group on Power specified the standards for hydro and thermal power plant building equipment.

To address the scarcity of equipment, two approaches are being implemented: improving domestic manufacturing competence through joint ventures with foreign suppliers, and purchasing directly from overseas markets. Both instances require effective equipment sourcing throughout the procurement cycle. Beginners may struggle to find a reliable provider, monitor performance, and ensure supply quality. Also, the



timing for new domestic equipment supplies is unclear.

D. Land Acquisition and Environmental Clearance: Land purchase in India is getting more complicated. Land and environmental permissions for power plants and utilities projects are scarce and take time to get. The new land purchase bill has been met with political opposition. While it allows project developers to buy up to 70% of the land needed for a project, the rest must be bought by the state. Moreover, it has been stated that even when landowners were asked to sell and hand up their land in the "public interest", projects took years to finish, eroding both the sector and the government's confidence. As a result, the Project Affected Persons' expectations are vastly different (PAP). Concerned parties can unite to stop the project from being completed. In such instances, proactive environmental and stakeholder management is required.

E. Financial Problem: The establishment of 4000 MW Ultra Mega Power Projects (UMPPs) is helping to rapidly increase generation capacity. In India, however, no such large-scale power project has ever been executed before. For a developer, funding a UMPP is a major challenge because they cost over INR 16,000 crore. Given the high stakes involved in private investments, payment delays may further put pressure on developers and suppliers to succeed.

F. Manpower Shortage: The lack of skilled labour in the construction industry is a long-term issue that will certainly increase project prices and risks. Candidates seeking alternate – and often more lucrative – career paths have slowed the flow of talent into the construction and power sectors. The government, which buys the most capital projects, has also failed. Personnel shortages exist in project management and engineering as well as contract management. To attract more school leavers and graduates, the business needs genuine partnership between project owners, contractors, and governments. Companies must also adapt to evolving employee expectations. By increasing diversity in employment practises and allowing more flexibility in working hours, the sector may attract a wider potential audience. Investment in existing staff is also critical to improved career paths and higher wages.

The following summarises the supervisory staff shortages in the hydro and thermal power sectors:



Table 4: Manpower Requirement in Hydro Power and Thermal Power Sector

Category	Estimated requirement	Available	Augmentation required
Hydro Power Sector			
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 Sector			
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 on Power for 11th Plan, Planning Commission

G.Schedule Dependency on Transmission Lines: To reach the 11th plan aim of extra transmission, significant increases in building activity are likely. This improvement will likely be concentrated on Sikkim and Bhutan's north-eastern regions, where severe terrain limits project execution. Extra transmission capacity is needed to move power from surplus to deficit areas and to facilitate electricity trading. This is required to achieve "power for everybody". Thus, establishing transmission projects is crucial. In this scenario, establishing solid project management principles can help assure timely project completion.

6. Remedies and Solutions

Clearly, the lack of power in India is a major hindrance to economic growth. In this setting, bridging the demand-supply gap has become crucial, and big projects are being conducted in the generating, transmission, and distribution segments. Because India hasn't had many projects implemented before, it's critical to look at and improve project execution abilities.

The table below covers important implementation issues, remedies and solutions for implementing power generation programmes successfully.



Key Challenges	Measures being adopted	Resulting issues	Solutions and Remedies
Addition of significant generation capacity	UMPP	Technical and financial capability to execute such large projects	Project execution Costs/Cash flow management
		Risks increase manifold	Risk Management strategy and planning
Ensuring fuel availability and quality	Purchase and development of coal mines abroad	Risks in operating in different geographies. Eg. - political risks	Risk management through effective contracting, supply diversification, etc.
		Uncertainties in logistics operations	Control over supply infrastructure
Plant equipment shortage	Procurement from abroad	Vendor reliability	Robust procurement management, vendor monitoring
	Setting up of new supply units	Execution timelines	Project scheduling
Land acquisition and environment clearances	Speeding up processes	Inadequate communication with stakeholders resulting in mismatch of expectations from project affected persons	Environment and stakeholder management
Manpower shortage	Enhance training		Resource planning and management

To solve the primary issues of the power sector projects and meet the anticipated targets, a complete project management system is required. This poor project management structure has caused problems and impediments in the past. As stated previously, this article focuses on the power sector's potential and obstacles, as well as project management solutions and cures.



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