

Power

MARKET & OPPORTUNITIES



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Overview

BRIEF HISTORY

The process of electrification commenced in India almost concurrently with the developed world, in the 1880s, with the establishment of a small hydroelectric power station in Darjeeling. However, commercial production and distribution started in 1889, in Calcutta (now Kolkata). When, India became independent in 1947, the country had a power generating capacity of 1,362 MW. Power was available only in a few urban centres. After independence, all new power generation, transmission and distribution in the rural, as well as in the urban centres (which were not served by private utilities), came under the purview of State and Central Government agencies. State Electricity Boards (SEBs), were formed in all the states.

Under the Electricity (Supply) Act, 1948, the Central Electricity Authority (CEA) was constituted, for power planning at the national level. The Act, also allowed private licensees to distribute and/or generate electricity in the specified areas designated by the concerned State Government/SEB.

From the 5th five-year plan onwards, between 1974-79, the Government of India (GoI) involved itself in a big way in the generation and bulk transmission of power and took upon itself the responsibility of setting up large power projects in order to develop the coal and hydroelectric resources in the country. The National Thermal Power Corporation (NTPC) and National Hydro-electric Power Corporation (NHPC) were set up for this purpose in 1975.

In 1995, the policy for mega power projects with a capacity of 1,000 MW or more and supplying power to more than one state, was introduced. These mega projects, are set up in the regions, having coal and hydel potential or in the coastal regions, based on imported fuel. The GOI promulgated Electricity Regulatory Commission Act, 1998 for setting up of Independent Regulatory Bodies, viz. the

Central Electricity Regulatory Commission (CERC) and the State Electricity Regulatory Commissions (SERCs), at the Central and the State levels, respectively.

The main function of the CERC is to regulate the tariff of generating companies, owned or controlled by the Central Government as well as, of those generating companies which enter into or otherwise have a composite scheme for generation and sale of electricity in more than one state. It also, regulates the inter-state transmission of energy, including tariff of the transmission utilities and inter-state bulk sale of power.

The main functions of the SERC are to determine the tariff for electricity, wholesale, bulk, grid or retail, to determine the tariff payable for use by the transmission facilities and to regulate power purchase and procurement process of transmission utilities and distribution utilities.

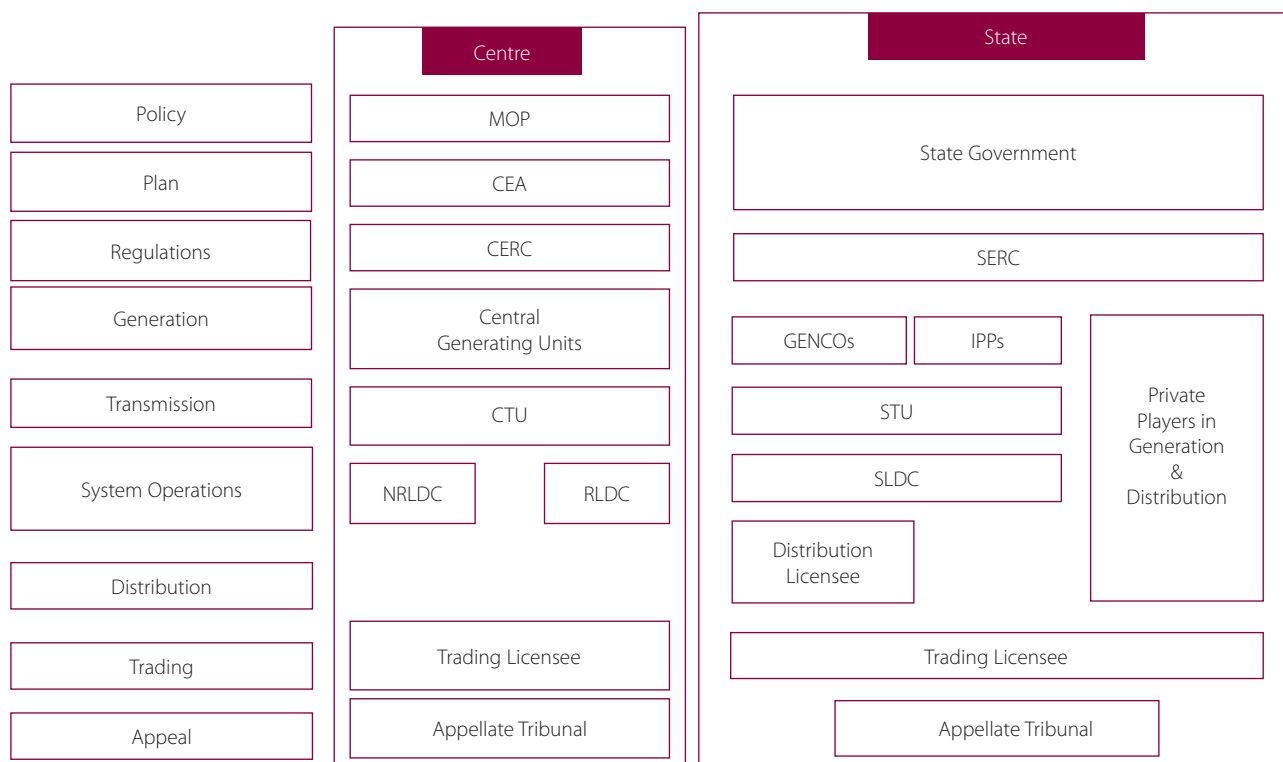
The policy of liberalisation of the GOI announced in 1991 and consequent amendments in Electricity (Supply) Act, have opened new vistas to involve private efforts and investments in the electricity industry. Installed capacity of 1,362 MW in 1947, increased to 97,000 MW as of March 2000 and has since, crossed the 100,000 MW mark. India has become the sixth largest producer and consumer of electricity in the world, equalling the capacities of UK and France, combined. The number of consumers connected to the Indian power grid exceeds 75 million.

INSTITUTIONAL STRUCTURE

The institutional structure of the power sector in India is given in Figure 1 overleaf:

The primary agency responsible for the power sector in India, is the Ministry of Power, which started functioning with effect from 2nd July, 1992 (it was earlier known as the Ministry of Energy, comprising the Departments of Power,

Figure 1: Institutional Structure of the Power Sector in India



Coal, and Non-Conventional Energy Sources). The Ministry, is responsible for the administration of the Electricity Act, 2003, the Energy Conservation Act, 2001 and to undertake such amendments to these Acts, as may be necessary from time to time.

ORGANISATIONS UNDER THE MINISTRY OF POWER

In all technical and economic matters, the Ministry of Power is assisted by the Central Electricity Authority (CEA), constituted under the Electricity (Supply) Act, 1948. The Badarpur Management Contract Cell (BMCC), a subordinate office of the Ministry, is responsible for administering the Badarpur Thermal Power Station (BTPS) Management Contract between the Government of India and NTPC. The construction and operation of generation and transmission projects in the Central Sector are entrusted to Central Sector Power Corporations, viz. NTPC, NHPC, the North Eastern Electric Power Corporation (NEEPCO) and the Power Grid Corporation of India Limited. The Power Grid, is responsible for all the existing and future transmission projects in the Central Sector and also for the formation of the National Power Grid.

Two joint venture power corporations, namely, Nathpa Jhakri Power Corporation (NJPC) and Tehri Hydro Development Corporation (THDC), are responsible for the execution of the Nathpa Jhakri Power Project, in Himachal Pradesh and projects of the Tehri Hydro Power Complex, in Uttarakhand, respectively. Two statutory bodies, i.e., the Damodar Valley Corporation (DVC) and the Bhakra Beas Management Board (BBMB), are also under the administrative control of the Ministry of Power. Programmes of rural electrification are provided financial assistance by the Rural Electrification Corporation (REC), under the Ministry of Power. The Power Finance Corporation (PFC), provides term-finance to projects in the power sector.

Further, the autonomous bodies (societies) i.e. Central Power Research Institute (CPRI), the National Power Training Institute (NPTI) and the Bureau of Energy Efficiency (BEE), are also under the administrative control of the Ministry of Power. A Power Trading Corporation (PTC), has also been set up in April, 1999, to catalyse development of mega power projects and to promote exchange of power with neighbouring countries.

Organisations under the Ministry of Power

Organisation	Established	Core Expertise
Damodar Valley Corporation (DVC)	1948	Generation, transmission and distribution in specified region.
Bhakra Beas Management Board (BBMB)	1967	Administration, operation and maintenance of projects under Board.
Rural Electrification Corporation (REC)	1969	Financing and implementing rural electrification schemes.
National Thermal Power Corporation (NTPC)	1975	Thermal plants: concept to commissioning and operations.
National Hydro Electric Power Corporation (NHPC)	1975	Hydro plants: concept to commissioning and operations.
North Eastern Electric Power Corporation (NEEPCO)	1976	Developing power projects in North Eastern region of the country.
Power Finance Corporation (PFC)	1986	Financing of power development schemes.
Tehri Hydro Development Corporation (THDC)	1988	Development of hydro potential in specific river/valley.
Satluj Jal Vidyut Nigam (SJVN)	1988	Development of hydro potential in specific basin.
Power Grid Corporation (PGC)	1989	Transmission system for evacuation of central sector power and establishment/operation of inter-regional grids, load despatch centres.
Power Trading Corporation (PTC)	2001	Trading of power
Bureau of Energy Efficiency (BEE)	2002	Responsible for spearheading the improvement of energy efficiency of economy through regulatory and promotional instruments

Generation

GROWTH AND MIX

The overall generation in the country had increased, from 264.3 billion units (BU) during 1990-91 to 551.7 BUs during 2006-07 (up to Jan 2007). The overall generation (Thermal + Nuclear + Hydro) in the country over the years has been:

Overall Power Generation (in billion units) in India

Year	Generation (billion units)
1990-91	264.3
1995-96	380.1
2000-01	499.5
2001-02	515.3
2002-03	531.4
2003-04	558.3
2004-05	587.4
2005-06	617.5
2006-07 (upto Jan 2007)	551.7

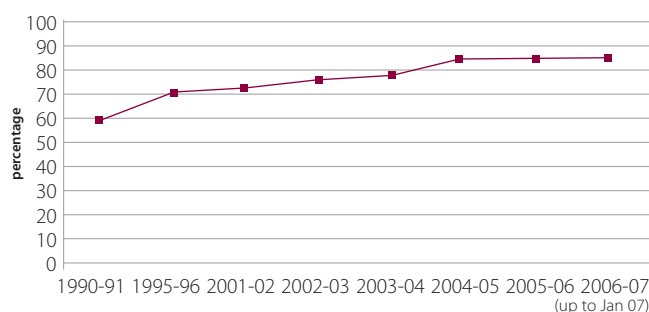
Source: Annual Report 2006-07, Ministry of Power

Of the total installed capacity, 52 per cent is in the state sector, 34 per cent in the central sector, and only about 14 per cent is in the private sector.

A significant portion of the current generation comes from thermal plants (64 per cent), followed by hydro (26 per cent), renewable (7 per cent) and nuclear (3 per cent) plants.

PLANT LOAD FACTOR (PLF)

The PLF of generating plants has improved consistently, over the past few years. The all India average PLF in January 2007 stood at 75.6 per cent, compared to 53.8 per cent in 1990-91. The PLF of central plants in 2006-07 stood at 83.3 per cent, while the average PLF of the state sector units in 2006-07 was 69.5 per cent. The average PLF of the private sector during 2006-07 stood at 87.2 per cent. The comparative sector-wise PLF in percentage over the years is as under:



Source: Ministry of Power

THE DEMAND-SUPPLY SITUATION

India's energy requirement during 2006-07 (up to January 2007) stood at 572,812 MU and energy availability during the same period was 519,656 MU, resulting in an energy shortage of 53,156 MU (9.3 per cent). Peak demand for energy in 2006-07 (up to January 2007) was recorded at 100,403 MW, whereas, peak demand met during the same period was 86,425 MW and hence, the peak shortage stood at 13,978 MW (13.9 per cent). The power supply position of the country over the years has been as follows:

Power Supply Position in India

Year	Energy Requirement (MU)	Energy Availability (MU)	Energy Shortage(MU)	Energy Shortage
2000-01	507,216	467,400	39,816	7.8%
2001-02	522,537	483,350	39,187	7.5%
2002-03	545,983	497,890	48,093	8.8%
2003-04	559,264	519,398	39,866	7.1%
2004-05	591,373	548,115	43,258	7.3%
2005-06	631,554	578,819	52,735	8.4%
2006- 07 (up to Jan 07)	572,812	519,656	53,156	9.3%

Source: Ministry of Power

Peak Demand Situation in India

Year	Peak Demand (MW)	Peak Met (MW)	Peak Shortage (MW)	Peaks Shortage
2000-01	78,037	67,880	10,157	13.0%
2001-02	78,441	69,189	9,252	11.8%
2002-03	81,492	71,547	9,945	12.2%
2003-04	84,574	75,066	9,508	11.2%
2004-05	87,906	77,652	10,254	11.7%
2005-06	93,255	81,792	11,463	12.3%
2006- 07 (up to Jan 07)	100,403	86,425	13,978	13.9%

Source: Ministry of Power

GENERATION CAPACITY EXPANSION/FUTURE PLANS

Significant capacity additions to electricity generation are being planned under the 11th five-year plan.

Recognising, the fact that economies of scale leading to cheaper power can be secured through large size power projects, the Ministry of Power, CEA and PFC are working in tandem for the development of five projects, under

tariff based competitive bidding route. The Ultra Mega Power Projects, each having a capacity of 4,000 MW or more, will have scope for expansion in future as well. They will meet the power needs of a number of states through transmission of power on regional and national grids. Experience of this initiative would facilitate development of state specific projects in the range of 1000-2000 MW, through competition on similar lines.

Planned Capacity Additions (tentative) in Generation (MW) During the 11th Plan (2007-2012)

	Central	State	Private	Total
Hydro	11,289	2,637	3,263	17,189
Thermal	25,860	16,152	4,102	46,114
Nuclear	3160	0	0	3,160
Renewables*	NA	NA	NA	14,000
Total	40,309	18,789	7,365	66,463

Source: Central Electricity Authority

*For renewables, break-up as follows: wind – 10500 MW, small hydro – 1400 MW, bio-energy – 2100 MW

THE BACK-END OF GENERATION – FUELS SCENARIO AND OUTLOOK

Coal

India has vast reserves of coal and participation of the private sector in captive mining is an immediate opportunity for investment. According to the Ministry of Coal and Mines, 38 coal fields with mineable coal reserves in excess of 2,800 million tonnes have been identified and are in the process of being allocated, for captive mining. This, may imply a total capital requirement of around US\$ 1.5-2 billion. Investment activity in other parts of the coal value chain, such as, coal washeries has also been observed in recent times.

Oil

The Government's policy of allowing full private participation, in upstream exploration and production has already attracted a number of private investors. Six rounds of competitive bidding under the Government policy, named New Exploration Licensing Policy (NELP), have already been done. Around 185 blocks were awarded and reserves estimated at 700 MMT of oil and gas have been discovered. The sixth round of bidding (NELP-VI) for 65 blocks, was successfully completed in 2006. In addition, India presents a lot of potential in the refining sector due to the strategic advantages of low cost and location; and is already a net exporter of petroleum products. The downstream marketing sector is also now, open to private participation.

Gas

Discoveries of gas to the tune of 700 bcm² over the last decade clearly indicates that gas reserves hold considerable promise in India. The potential for Coal Bed Methane appears to be very promising. While, the potential for LNG may be limited in the near term, due to inability of key sectors, such as, power to absorb high international prices, however in the long run there will be place for LNG, as the share of Natural Gas in India's energy mix increases. The draft gas pipeline policy gives support to the development of a national gas grid, meant to create a common gas market across the country.

Nuclear

The envisaged growth of nuclear power in India is possible, provided robust technologies are developed for both the front-end and the back-end of the fuel cycle. India has one of the largest reserves of the nuclear fuel - thorium. However, the nuclear energy programme will continue to be uranium based until, commercial production based on thorium becomes feasible. If the Indo-US nuclear deal goes through, it will boost nuclear energy and therefore, private participation in this sector will go up.

Hydro

According to the Ministry of Power, India is endowed with a hydroelectric potential of about 150,000 MW. However, only 17 per cent of the hydroelectric potential has been harnessed so far, with another 5 per cent under various stages of development. Private participation in the hydro sector will be important, to meet the target of an additional 45,000 MW of hydro capacity within the next ten years. Various policy measures are being contemplated to encourage private participation. The revised Hydro Policy is currently under discussion, with the Government of India.

Renewables

India has vast potential for renewable energy sources, especially in areas such as, solar power, biomass and wind power. According to the Ministry of New and Renewable Energy, the current installed capacity of renewable energy is around 9220 MW, constituting about 7.3 per cent of India's total installed generation capacity. India is already the fourth largest in the world in terms of wind energy installation. Technological breakthroughs for cost-effective photovoltaic technology will generate a quantum leap in the renewable energy sector since, India is well endowed with solar insolation (average of 6 kwh/ sq.mt./day).

Transmission

OVERVIEW OF TRANSMISSION

Transmission of electricity is defined as bulk transfer of power over a long distance at a high voltage, generally of 132 kV and above. In India, transmission lines have

grown from 3,708 ckm (circuit kilometres) in 1950 to more than 265,000 ckm at present. The entire country has been divided into five regions for transmission systems, namely, Northern Region, North Eastern Region, Eastern Region, Southern Region and Western Region.

Details of the Existing Transmission Network in India

S.No.	Region	Transmission Lines (Circuit Kms.)				Sub-stations (MVA)
		HVDC	400KV	220KV	132KV	
1	Northern Region					
	J&K	-	300	687	-	1260
	HP	-	572	192	-	-
	Delhi	-	397	-	-	1575
	Haryana	-	1789	66	-	2025
	Punjab	-	1170	401	-	1130
	Rajasthan	-	791	1032	-	-
	UP	817	2933	870	-	630
	Total NR	817	7952	3248	0	6620
2	Western Region					
	MP	-	5791	-	-	945
	Maharashtra	-	1127	-	-	NIL
	Gujarat	-	1195	852	-	630
	Total WR	-	8113	852	0	1575
3	Southern Region					
	AP	-	2762	-	-	3150
	Karnataka	-	965	-	-	NIL
	Kerala	-	260	156	-	630
	Tamil Nadu	-	1647	64	-	1575
	Total SR	-	5634	220	0	5355

S.No.	Region	Transmission Lines (Circuit Kms.)				Sub-stations	
		HVDC	400KV	220KV	132KV	(MVA)	
4	Eastern Region						
	Bihar	-	1057	82	-	1860	
	Orissa	-	1034	-	-	2520	
	West Bengal	-	1287	872	333	2025	
	DVC	-	344	-	-	630	
	Total ER	-	3722	952	333	7035	
5	N.E.Region						
	Assam	-	1978	171	79	1015	
	Meghalaya	-	-	-	67	-	
	Nagaland	-	-	320	189	100	
	Manipur	-	-	-	443	6.3	
	Mizoram	-	-	-	178	-	
	Tripura	-	-	-	147	5	
	Arunachal Pradesh	-	333	-	42	-	
		Total NER	-	2311	491	1145	1126
		Total All India	817	27732	5763	1478	21711

The GOI has an ambitious mission, 'POWER FOR ALL BY 2012'. This mission, requires that our installed generation capacity reaches at least 200,000 MW by 2012, from the present levels of 114,000 MW. To be able to reach this power to the entire country, expansion of the regional transmission networks and enhanced inter regional capacity to transmit power is essential, as resources are unevenly distributed in the country and power has to be carried to great distances, to areas where load centres exist.

The transmission system planning in the country, in the past, had traditionally been linked to generation projects as part of the evacuation system. The ability of the power system to safely withstand a contingency, without generation rescheduling or load-shedding was the main criteria for planning the transmission system. However, due to various reasons, such as, spatial development of load in the network, non-commissioning of load centre generating units originally planned and deficit in reactive compensation, certain pockets in the power system could not operate safely even under normal conditions. This had necessitated backing down of generation and operating at a lower load generation balance in the past. Transmission planning has, therefore, moved away from the earlier generation evacuation system planning to integrated system planning.

While, the predominant technology for electricity transmission and distribution has been Alternating Current (AC) technology, High Voltage Direct Current (HVDC) technology has also been used for interconnection of all regional grids across the country and for bulk transmission of power over long distances. Certain provisions in the Electricity Act, 2003 such as, open access to the transmission and distribution network, recognition of power trading as a distinct activity, the liberal definition of a captive generating plant and provision for supply in rural areas, are expected to introduce and encourage competition in the electricity sector. It is expected, that all the above measures on the generation, transmission and distribution front will result in the formation of a robust electricity grid in the country.

PERSPECTIVE PLAN

The country's transmission perspective plan for the 10th and 11th five-year plans focuses on the creation of a National Grid by adding over 60,000 ckm of transmission network by 2012. This will evacuate additional 100,000 MW by the year 2012 and carry 60 per cent of the power generated in the country. The existing inter-regional power transfer capacity is 9,000 MW, this is to be further enhanced to 30,000 MW

by 2012, through the creation of “Transmission Super Highways”. For the creation of such a grid, an investment of US\$ 17.78 billion is envisaged. Out of this, US\$ 12.5 billion is planned to be mobilised by POWERGRID and the remaining is envisaged through private sector participation.

Investment Plan for Transmission Augmentation

	X Plan	XI Plan	Total
POWERGRID's Outlay	21,370	28,258	49,628
Private Sector Participation	9,710	11,185	20,895
Total Central Sector	31,080	39,443	70,523

Source: Ministry of Power

Formation of such a National Power Grid has been envisaged in a phased manner, of which Phase 1 is already complete.

Phase-I: Considering the wide variation of electrical parameters in various regional grids, mostly HVDC interconnections were established between the regions. This phase was completed in the year 2002, achieving inter-regional transfer capacity of 5000 MW.

Phase-II: During this phase, inter-regional connectivity is planned to be strengthened by the hybrid system, consisting of high capacity AC (765 kV & 400 kV) and HVDC lines. Such a National Grid is envisaged to disperse power not only from mega generation projects, but to also enable the transfer of bulk power from one part of the country to another. The foundation of this phase has already been laid by POWERGRID, by commissioning of 2000 MW Talcher-II HVDC Bipole and 1000 MW, Raipur – Rourkela 400kV D/c AC transmission line. The inter-regional transfer capacity has been enhanced to 8,000 MW. During phase II the cumulative inter regional capacity is expected to be enhanced to about 23,000 MW, depending upon the commissioning of planned generation projects.

Phase-III: Further, strengthening of National Grid is envisaged through 765 kV AC lines/ HVDC lines to Southern region and linking North Eastern Region with the rest of the National Grid, through high capacity transmission system. This phase is planned to be implemented by 2012. This will enhance the cumulative inter-regional power transfer capacity to about 30,000 MW.

PRIVATE SECTOR PARTICIPATION IN TRANSMISSION

Out of the US\$ 20 billion required for doubling the power capacity to 2,00,000 MW by the year 2012, about US\$ 5 billion will be required for the associated transmission system, including creation of a National Grid. Considering the scale of investment, it is essential to attract large private investments in transmission. The GOI amended the Indian Electricity Act and Electricity Supply Act in 1998, to enable private sector participation in the transmission sector. In January 2000, the Ministry of Power, issued detailed guidelines for private sector participation in transmission. The guidelines envisage two routes for inviting private sector participation. One route, is through joint venture between POWERGRID and the private investor. The other route, called IPTC (Independent Power Transmission Corporation) will facilitate private investors, including investors coming through FDI to invest 100 per cent by themselves.

POWERGRID, has established the first public-private joint venture in Indian power sector with M/s Tata Power (POWERGRID's stake is 49 per cent and M/s Tata Power's stake is 51 per cent). The joint venture company named Powerlinks Transmission Limited was set up for the for implementation of major transmission system, associated with an investment of about US\$ 400 million. This joint venture company has received its transmission license from CERC, the first such license in the Indian power sector. Financial closure of the project was achieved in May 2004.

Transmission systems associated with Koldam and Parbati- II (estimated cost: US\$ 165 million), have been floated under the joint venture route. In addition, some transmission lines under the Western Region Strengthening Scheme, are envisaged to be implemented through 100 per cent private sector participation (IPTC). The Ministry of Power, is in the process of finalising policy guidelines for private investment in the transmission sector.

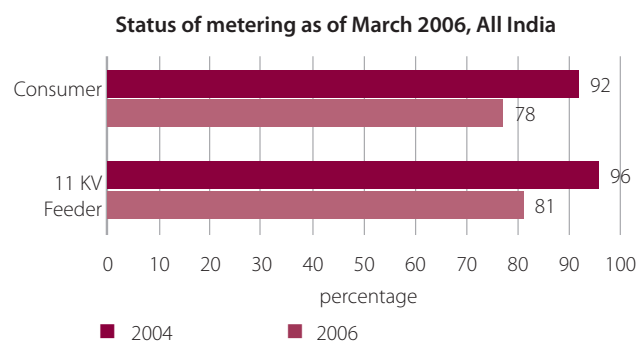
Distribution

Apart, from the vast transmission network in India, an extensive network of sub-transmission and distribution systems have been set up in India. However, due to lack of adequate investments on T & D works, the T & D losses have been on the higher side, in the country and are presently in the range of 18 per cent to 62 per cent in various states. Reduction of these losses by undertaking distribution system improvement works has not been possible, for want of adequate funds.

Inadequate investments over the years, for system improvement works has resulted in, unplanned extensions of the distribution lines, overloading of the system elements like transformers and conductors and lack of adequate reactive power support. By undertaking suitable system improvement schemes based on computer studies it is possible to bring down the technical losses in the distribution system to the level of 9 per cent. The commercial losses are mainly due to, low metering efficiency, theft and pilferages. This, may be eliminated by improving metering efficiency, proper energy accounting and auditing and improved billing and collection efficiency. Fixing of accountability of the personnel/feeder managers, will help considerably in the reduction of AT&C losses.

The Distribution Reform under the Accelerated Power development and Reform Programme (APDRP), was identified in 2000-01 as the key area, to improve the financial health of the power sector. All states have signed the Memorandum of Understandings with the Ministry to take various steps to undertake distribution reforms. Subsequently, 25 states have constituted SERCs and 20 have issued tariff orders, for rationalising the tariffs. States, are now better committed towards subsidy payment to the utilities. All the states have securitised their outstanding dues towards CPSUs. 14 states have unbundled/corporatised their SEBs and more are expected to unbundle/corporatise their SEBs, soon.

APDRP projects totalling approximately US\$ 4.79 billion have been sanctioned. Collection of technical and commercial data for the various scheme areas and the prevailing benchmarks has also been identified, in the detailed projects reports for the Circles and the urban areas. Schemes undertaken under APDRP, are for renovation and modernisation of sub-stations, transmission lines and distribution transformers, augmentation of feeders and transformers, feeder and consumer meters, high voltage distribution system (HVDS); consumer indexing, SCADA, computerised billing etc. These initiatives are beginning to give some results.



Power Sector Policy in India

The power sector has witnessed various phases of policy development. These policy and regulatory developments are discussed below, in terms of specific policy milestones.

PRIVATE POWER POLICY

In 1991, the GoI amended the Electricity Supply (Act), 1948 to allow the entry of private investors in power generation and distribution. A tariff notification issued in 1992, provided for a two-part tariff structure covering fixed and variable costs. It provided for a 16 per cent rate of return on equity at 68.5 per cent PLF for thermal plants and at 90 per cent availability for hydro power plants. Setting up of higher efficiency levels has translated into higher rate of return for investors.

MEGA POWER POLICY

In 1995, the government strengthened its policy for private investment in generation projects of over 1,000 MW capacity, for supplying electricity to more than one state, termed as mega power projects. The policy was intended to introduce competitive bidding for awarding projects. CEA, POWERGRID and NTPC, were to provide catalytic support to private investors by identifying potential sites, arranging the transmission of power and for preparing feasibility report respectively.

19 projects, 14 in the public sector and 5 in the private sector, were declared to be mega power projects. The Power Trading Corporation (PTC) was setup, to purchase power from the identified projects and to sell it to identified SEBs. This included, the adoption of a new package of security mechanism consisting of a Letter of Credit and recourse to state government's share of the Central Plan Allocations

Establishment of Regulatory Commissions and privatisation of distribution in cities with a population exceeding one million were included as pre-conditions in the policy. Import of capital equipment for such projects was exempted from customs duty. The projects were also granted income tax holiday for 10 years it could be claimed in any block of 10 years within the first 15 years of implementation. The policy was further liberalised and accorded mega project status to all inter-state thermal projects of 1,000 MW and above and to all inter-state hydro projects of 1,000 MW and above. These projects were now able to secure duty free import of capital goods.

Due to concerns over transparency associated with MOU-based projects, the government issued norms for tariff-based bidding for thermal power projects in 1997. Further, this role was handed over to respective regulatory commissions. These norms were to serve as guidelines, and the regulatory commissions were to issue terms and conditions for tariff and retain purview over the PPAs, for sale of power to the respective state utilities.

POLICY REFORMS FOR INVESTMENT IN TRANSMISSION

As a means to encourage private investment in transmission networks, the Electricity Laws (Amendment) Act, 1998, was enacted. This facilitated the infusion of private sector investment in transmission, through grant of transmission licenses. Guidelines for private sector participation in the transmission sector were introduced in January 2000. These guidelines envisage two routes for private sector participation, the Joint Venture route and the Independent Private Transmission Company (IPTC) route.

REGULATORY REFORMS

The government realised, that in order to attract much-needed private investment into the power sector, the separation of the distribution segment of the power sector should be carried out to improve its performance. Led by similar developments in a number of countries around the world a process of reform was introduced in the state of Orissa. Orissa became the first state to unbundle the electricity board into five corporatised entities one each for generation and transmission and one each for the three distribution zones in the state. An independent regulatory commission (Orissa Electricity Regulatory Commission) was also set up to oversee the functioning of the transmission and distribution companies. Orissa, later privatised its power companies. Subsequently, Haryana and Andhra Pradesh also followed the twin strategy of unbundling and regulatory reforms.

In order to alleviate consumer concerns regarding quality improvement, the SERCs have not only undertaken steps towards the formulation of complaint handling procedure by the utilities, but also a system for themselves so that consumers can bring their concerns before the commission. 24 states have set up regulatory commissions and 18 of these regulatory commissions have issued tariff orders. The smaller states in the North East have established a Joint Electricity Regulatory Commission. 13 states have unbundled and corporatised their previously integrated SEBs.

The regulatory environment has nevertheless reduced uncertainties associated with ad hoc behaviour by the electricity utilities, under political influence. The concerns regarding regulatory uncertainty and lack of incentives in the rate of return regulation, have been addressed through the adoption of a multi-year tariff (MYT) framework by the CERC. The Electricity Act of 2003, prescribed adoption of MYT principles by all regulatory institutions. Some of the SERCs have initiated a consultation process for introducing the same.

DISTRIBUTION REFORMS AND PRIVATISATION

The distribution segment has lagged, both in terms of operational efficiency as well as financial performance. This can be attributed to the severe cash flow problem, associated with the under-recovery of costs and poor

collection efficiency. Poor operational efficiency further aggravates the situation.

Recognising, the need to accelerate reforms in the distribution sector, the central government introduced the Accelerated Power Development Programme (APDP), in 2000–01, later rechristened as the Accelerated Power Development and Reforms Programme (APDRP) in 2002–03. The main objectives of the programme include, improving the financial viability of state utilities, reducing of aggregate technical and commercial (AT & C) losses, improving customer satisfaction, and increasing the reliability and quality of the power supply. The scheme also encourages, the establishment of SERCs, metering of 11 kV feeders and of all consumers, and energy audits at the 11 kV level.

A number of state utilities gained from the APDRP scheme, by reducing cash losses and securing equivalent grants from the central government. The reform linked investment component also motivated restructuring and initiation of regulatory reforms in various states.

MAJOR POLICY INITIATIVES TO STREAMLINE THE PROCESS OF PROJECT DEVELOPMENT IN THE POWER SECTOR

Captive Power Plants: Under the Electricity Act 2003 captive power plants including group captive, have been freely permitted. The Act provides, that any person may construct, maintain or operate a captive generating plant and dedicated transmission lines and shall have the right to open access for carrying electricity from his captive generating plant to the destination of his use, subject to the availability of transmission capacity.

Open Access to Transmission: Under the provisions of the Electricity Act 2003, open access in transmission has been introduced to promote competition amongst the generating companies, who can now sell to different distribution licensees across the country. Open access has been made available to captive generating plants, subject to availability of transmission capacity.

No Techno-Economic Clearance for Thermal Generation: Generation has been delicensed under the Electricity Act, 2003. The requirement of techno economic clearance of CEA for thermal power plants has also been done away with.

Setting up of Mega Power Projects: In order to facilitate setting up of large sized thermal power plants in the country and in order to derive the economies of scale, the Ministry of Power issued guidelines in November 1995, for setting up of mega power projects. Power projects having a capacity of 1,000 MW or above and supplying power to more than one state were defined as mega projects. The policy has been further liberalised and with effect from 1st March 2003, all inter-state projects with a capacity of 1,000 MW and above for thermal and 500 MW and above for hydel projects are being treated as mega power projects, subject to fulfilment of required conditions.

Automatic Approval for FDI: In order to facilitate FDI, automatic approval (RBI route) for 100 per cent foreign equity without any upper ceiling on the quantum of investment is permitted in all sectors of the power sector, i.e., generation, transmission and distribution of electricity.

Generating company permitted to distribute electricity in rural areas: The Electricity Act, 2003, allows any generator of electricity to distribute electricity in a rural area without the requirement of any license, subject to compliance with measures as may be specified by the CEA.

Investment Opportunities and Potential

OPPORTUNITIES IN VARIOUS SEGMENTS

According to CEA's sixteenth electric power survey, peak demand is expected to increase by a staggering 77 per cent to 157,107 MW by 2012. Similarly, the energy requirement is expected to increase by 274 per cent to 975,222 MU by 2012. It is estimated, that a capacity addition of over 100,000 MW units by 2012 is required to bridge the supply deficit and keep up with the increasing demand. The total investment required for capacity creation, along with necessary investments in transmission and distribution segments is estimated at US\$ 200 billion. Such a quantum of investment, calls for public-private partnerships.

Segment-wise opportunities are as follows:

Hydro Projects

- 68 per cent, i.e., 101,454 MW of potential capacity is still not developed.
- 77 schemes with a cumulative total of 33,000 MW have been identified.

Captive Power

- At present, captive power accounts only for 15 per cent, i.e. 22,100 MW of total combined capacity. Government plans to bring further 5000 MW into mainstream.
- "Open Access" and "Group Captive" allowed under recent policy initiatives.

Ultra Mega Power Projects

- Seven projects with an individual capacity of 4,000 MW, each requiring an investment of approximately US\$ 3.26 billion have been identified.

Nuclear Power

- In the post Indo-US agreement period, there is greater

scope for private-public partnership in this sector.

National Grid Program

- The program envisages addition of over 60,000 km of transmission network in a phased manner by 2012, with an estimated investment of about US\$ 15.18 billion. Of this about US\$ 4.33 billion is sought to be mobilised through private participation.

Distribution

- Various programmes under APDRP
- Rural Electrification
- Privatisation of Discoms
- Participation under Franchise Model

Trading

- "Power Pools" system has been established to facilitate trading opportunities for licences.

Renewables

- Existing untapped wind energy potential - 45,000 MW
- Untapped Bio-power potential - 52,000 MW
- Untapped bagasse based cogeneration potential - 5,000 MW

Policy Incentives

- 100 per cent foreign equity participation is allowed under the automatic approval route in all segments of the industry (except atomic energy).
- Generation and distribution power projects of any type and size are allowed
- The Electricity Act 2003 allows trading in power and provides for further deregulation.
- A renewable licence period of 30 years has been set.
- Return on equity up to 16 per cent is assured at 68.5 per cent PLF for thermal power plants. Similar

incentives are provided for hydroelectric power projects.

- Import duty at the concessional rate of 20 per cent has been set for import of equipment.
- The government allows a 5-year tax holiday for power generating projects with an additional five years, in which a deduction of 30 per cent taxable profits is allowed.

Status of Private and Foreign Investment in the Indian Power Sector

PRIVATE INVESTMENT

Growth in the power sector, since independence, has been primarily accompanied by public investment through economic planning. As a result of this, most assets in the electricity sector are owned by government-owned companies or the SEBs. Since the policy liberalisation in 1991, 39 private projects totalling 7,417 MW capacity had been commissioned till December 2005. This includes, 1,495 MW capacity installed by the existing private distribution licensees.

Most of the distribution network is owned by the state utilities. Select urban areas, some of which have been licensed to private companies for nearly a century and the distribution companies in Orissa and Delhi, are under majority private ownership. The transmission segment is dominated by public ownership, with the exception of the upcoming public-private joint venture for importing electricity from the Tata hydroelectric project in Bhutan. **Given, the limited fiscal space for increasing investment by the central as well as state governments and requirements for future investment, there is greater scope for private participation in the sector.**

The geographical distribution of private power projects

in the country, reveals a preference for the southern and western regions of the country. Investors' choice of a particular state is influenced, among others, by the relative investment climate in the state, the growth potential, the financial status of the buyer utility and the available risk mitigation options. The investment climate, is influenced by the policy and regulatory framework, including various incentives offered by the state government. The states often compete amongst themselves to offer better investment climate to investors. The relative dominance of states in the southern and western regions could be explained as follows. In terms of financial and operational performance and reform parameters, the power sectors in the states of Andhra Pradesh, Gujarat and Karnataka have been rated amongst the best in recent years. In terms of overall investment attractiveness the states of Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu and Gujarat have been rated the top five destinations by foreign investors.

The investors perceive relatively higher risk for investment in the distribution segment, which is characterised by inefficiency and is exposed to regulatory risk. More recently, a number of state distribution companies have shown signs of turnaround, as seen

Top 10 Rated State Utilities (2003-2006)

Rank	2003	2004	2005	2006
1	Andhra Pradesh	Delhi	Andhra Pradesh	Andhra Pradesh
2	Karnataka	Andhra Pradesh	Gujarat	Gujarat
3	Haryana	Goa	Delhi	Delhi
4	Rajasthan	Karnataka	Karnataka	Karnataka
5	Maharashtra	Gujarat	Tamil Nadu	West Bengal
6	Delhi	Haryana	Goa	Goa
7	Gujarat	Punjab	Himachal Pradesh	Himachal Pradesh
8	Himachal Pradesh	Himachal Pradesh	West Bengal	Uttar Pradesh
9	Tamil Nadu	Uttar Pradesh	Uttar Pradesh	Maharashtra
10	Punjab	Rajasthan	Chhattisgarh	Kerala

through improvements in various financial and technical benchmarks. This is a positive sign for prospective investors in greenfield generation assets and for future privatisation of distribution companies.

FOREIGN INVESTMENT

The policy framework for FDI in the power sector is designed to offer unhindered flow of capital from outside the country. It provides for 100 per cent FDI in the power sector through the automatic route. Roughly US\$ 1.1 billion of FDI inflow has been witnessed in the power sector since 1991, against approvals to the tune of US\$ 12.9 billion. This is largely reflective of the disappointment of investors frustrated by the cumbersome process of project development in India.

Conclusions

Electricity supply has been largely held under public ownership in India. As a result, the sector has not been able to catch up with the growing demand for electricity. Operational inefficiency and financial losses often lead to poor quality of supply and underinvestment. However, a wave of reforms has swept through the country, primarily aimed at improving the performance of state owned companies and establishing an environment conducive to private investment.

The erstwhile vertically integrated SEBs in India have been riddled with inefficiencies due to a lack of accountability and administrative bottlenecks. Reforms in the Indian power sector were initiated to restructure the SEBs and to set up independent regulatory institutions. The Electricity Act 2003, led to deepening of the reform process, by enabling competition in the wholesale electricity market and retail electricity supply in phases. 13 SEBs have so far unbundled

into separate generation, transmission and distribution companies. SERCs have been set up in all states. Some of the smaller states in the North East have established a Joint Electricity Regulatory Commission. The process of tariff determination has become more transparent and limited tariff rationalisation has been undertaken, despite political meddling and opposition from sections of consumers.

The regulatory challenge is to provide incentives for improvement in technical efficiency and financial performance. The unavailability of sovereign guarantees can be adequately addressed if state utilities become viable through greater commercialisation, if not privatisation. Given the objective of electrifying all villages by 2010 and to double the generating capacity in the country by 2012, the need to improve the policy environment and strengthen the regulatory framework cannot be ignored.

Exchange Rate Used

Year	Exchange Rate (INR/US\$)
2000	46.6
2001	48.3
2002	48.04
2003	45.6
2004	43.7
2005	45.2
2006	45
2007	42

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