



DR. AHINDRA CHAKRABARTI
 PROF. FINANCE AND ENERGY, GREAT LAKES
 INSTITUTE OF MANAGEMENT, GURGAON

Overview of Energy Sector in India

The demand for electricity in the country has been growing at a rapid rate and is expected to grow further in the years to come. The Indian power sector is one of the most diversified in the world, compared to many developing countries where crude oil and natural gas and renewables play a major role.

Electricity underpins modern civilization if we consider what would not work and would not happen without electric power. The demand for electricity in the country has been growing at a rapid rate and is expected to grow further in the years to come. The Indian power sector is one of the most diversified in the world, compared to many developing countries where crude oil and natural gas and renewables play a major role. Sources for power generation in India range from conventional sources like coal, lignite, natural gas, oil, hydro and nuclear power to other viable nonconventional sources like wind, solar and agriculture and domestic waste. Because of insufficient fuel supply and power generation and transmission capacity, the country has problems of electricity shortage.

As the growth of the economy in general and the manufacturing sector in particular is largely dependent on creation of suitable power/energy infrastructure, the policy focus in India has been on infrastructure and energy investment. Such investment has increased manifold over time with increased private-sector participation in the country. The Constitution of India determines the jurisdiction over infrastructure sectors in the country exclusively for Central (Union) Government (List –I), some sectors exclusively for State Governments (List –II), and some sectors for both Central and State Governments commonly known

as concurrent lists (List III). Electricity is under concurrent jurisdiction of the Union and the State.

Energy sector is managed at the Central Government level, by internal coordination among five ministries: Ministry of Power, Ministry of Coal, Ministry of Petroleum and Natural Gas, Ministry of Renewable Energy, Department of Atomic Energy. Each state has their own power ministers and related departments.

India's commercial energy consumption basket comprises of coal, oil, natural gas, nuclear power, hydro electricity and renewables. In terms of million tonne oil equivalent (MTOE) it has gone up from 320.8 in 2003-04 to 595.0 MTOE in 2012-13. Table -1 below shows over this period growth in the commercial energy basket has registered a CAGR of 6.37%; but highest growth has taken place in renewables followed by coal, hydro-electricity, nuclear, natural gas and oil. Coal retains largest share in the commercial energy consumption basket followed by oil. Coal and Oil taken together forms around 85% and 84% in 2003 and 2013 respectively, though over this period consumption of natural gas and hydro electricity has gone up substantially.

Installed Capacity and Generation of Power

India has followed five-year plan based economic growth model. As result of this Central Government in collaboration

with the states has pursued development of electricity in the country. In the first five year plan country's installed capacity were 2.3 thousand megawatt of which utilities would contribute 1.7 thousand megawatt and non-utilities contributed 0.6 thousand megawatt. This capacity has increased to 258701.46 megawatt at the end of January 2015. Of this thermal comprises of 180361.89 megawatt, hydro electric 40867.43 megawatt; nuclear 5780.00 megawatt and renewable sources 31692.14 megawatt. Thermal generation capacity constitutes 69.72%; hydro constitutes 15.80%; nuclear constitutes 2.23% and renewable constitute 12.25% of the total. Among the thermal capacity to produce power from coal is 60.37%; gas 8.88% and diesel 0.46 %.

Generation of power was 6.6 Billion Kilo-watt on 1950-51 increased to 1160.00 B kWh by 2013-14. Latest information as available show that at the end of November 2014 power generated was 846.4 B kWh for eight month period. In all likelihood the financial 2014-15 will generate 1269.6 Bkwh. India has constantly been plagued with a demand supply gap in the Power sector. Such a gap is a major hindrance to the growth of a developing economy like India, though of late data show that shortage is coming down with increase in generation of electricity.

Consumer profile of India's electricity is: Industry 45% followed by 22% domestic

TABLE- 1: INDIA'S COMMERCIAL ENERGY CONSUMPTION BASKET
 Consumption (MTOE)

	Coal	Oil	Natural Gas	Nuclear	Hydro Electricity	Renewables	Total
2003	156.8	116.5	26.6	4.1	15.7	1.2	320.8
2013	324.3	175.2	46.3	7.5	29.8	11.7	595

Source: BP- World Energy Statistics 2030



consumers and 18% consumed by agriculture sector. Rest of the Electricity is consumed by commercial sector, railways and others.

To fulfill the objectives of National Electricity Policy, a capacity addition of 78,700 MW had been proposed in the XI Five year Plan. During Midterm appraisal carried out by Planning Commission, the capacity ad-

dition target was revised to 62374 MW. In actual terms capacity addition during XI Five Year plan was 54964 MW.

In the 12th Five year plan (2012-17), country targeted to install 88537 megawatt of power capacity with proposed outlay of Rs.11,35,535 crores comprising Rs. 124771 crores from Government Budgetary Support and Rs. 10,10,764 crores

from Internal and Extra Budgetary Resources (IBER).

Ultra Mega Power Project: To accelerate power generation of power earlier the Government of India had launched an initiative for the development of coal-based Ultra Mega Power Projects (UMPPs), each with a capacity of 4,000 MW. The

TABLE-2: INSTALLED CAPACITY (IN MW) AS ON 31 JANUARY, 2015
Modewise Break Up

Ownership	Thermal							Renewable	Grand Total
	Coal	Gas	Diesel	Total	Nuclear	Hydro			
State	55890.5	6974.42	602.61	63467.53	0	27482	3803.67	94753.2	
Private	53525.38	8568	597.14	62690.52	0	2694	27888.47	93272.99	
Central	46775.01	7428.83	0	54203.84	5780	10691.43	0	70675.27	
Total	156190.89	22971.25	1199.75	180361.89	5780	40867.43	31692.14	258701.46	

Source: CEA Report

TABLE- 3: AVERAGE TARIFF AND AVERAGE COST

	Unit	2009-10	2010-11	2011-12	2012-13	2013-14
A.Average Tariff	Paise	327	367	387	439	480
B.Average Cost	Paise	471	506	570	593	593
C.Gap(A-B)	Paise	-56	-261	-183	-154	-113
D.Commercial Loss Without Subsidy	Rs. in Crores	63914.9	65997	93868	86906.2	71270.8

Source: Annual Report (2013-14) on the working of State Power Utilities & Electricity Departments ; (Power & Energy Division) Planning Commission, February 2014. Pg. no. 159.

TABLE -4 : TENTATIVE REGION-WISE BREAK-UP OF RENEWABLE POWER TARGET TO BE ACHIEVED BY THE YEAR 2022

	Solar Power (MW)	Wind (MW)	SHP (MW)	Biomass Power (MW)
Northern	31120	8600	2450	4149
Western	28410	22600	125	2875
Southern	26531	28200	1675	2612
Eastern	12237		135	244
North Eastern	1205		615	
Island	31	600		120
All India	99533	60000	5000	10000

objective behind the initiative was to ensure cheaper tariffs utilizing economies of scale, catering to the need of a number of States and to mitigate the risk relating to tie up of land, fuel, water and other statutory clearances etc.

Transmission Sector: Development of transmission sector did not get due importance earlier which has led to some imbalances. Investments in the transmission sector have been therefore been inadequate due to the heavy emphasis on generation capacity. In most states, the existing distribution network has been formed by expanding and interconnecting smaller and disjointed networks. Consequently, there are several deficiencies in the transmission system, such as high losses and low reliability. At the end of 31st December, 2014 total transformation capacity measured in MVA were 2,19,579.2 spread over different regions of the country.

Creation of National Grid: Developments in power sector emphasize the need for accelerated implementation of National Power Grid on priority to enable scheduled/unscheduled exchange of power as well as for providing open access to encourage competition in power market. In view of above, nationwide synchronous power grid, interconnecting all the five regional grids of the country, has been established on December 31, 2013. Powergrid Corporation, a central level undertaking is strengthening its transmission network to establish interstate and inter-regional links for enhancing the capacity of National Grid in a time bound manner to ensure optimal utilization of uneven distribution of energy resources. As on December 31, 2014, National Grid with inter-regional power transfer capacity of about 46,450 MW has been established. The inter-regional power transfer capacity is envisaged

to be augmented to about 72,250MW by the end of the XII Plan (2016-17).

Grid Code: The Indian Electricity Grid Code (IEGC), a regulation made by the Central Commission in exercise of powers conferred under the Electricity Act 2003, lays down the rules, guidelines and standards to be followed by various persons and participants in the system to plan, develop, maintain and operate the power system, in the most secure, reliable, economic and efficient manner, while facilitating healthy competition in the generation and supply of electricity.

Distribution Sector: Power being concurrent subject under Indian Constitution, the

responsibility for distribution and supply of power to rural and urban consumers rests with the states. The distribution arm of the power sector had been the domain of the SEBs for a very long time which faced financial problems due to lack of efficient pricing mechanism, its implementation and collection of revenues. Over and above distribution and supply losses also poses a threat. Consequently the SEB's financial and technical difficulties led to financial problems for generating companies also. To alleviate this situation, SEBs were unbundled known as DISCOMs ; in some cases were encouraged to be privatized. Along with this to reduce transmission and distribution losses, the Accelerated Power Development & Reform Programme



Application Segment	Target For Phase I (2010-13)	Achievements still March 2013
Grid Solar Power (large plants; roof top ; distribution grid plants)	1100 MW	1644.86 MW
Off Grid Solar Applications	200 MW	252.5 MW
Solar Thermal Collectors (Solar Cooking ; Solar Cooling ; SWHS; Industrial process heat applications)	7 million sq mtrs	7.01 million sq mtrs

(APDRP) was launched in 2001, for the strengthening of Sub Transmission and Distribution network and reduction in AT&C losses; which was relaunched after a period in the name of Restructured –APDRP.

Performance of the State Power Utilities: A cursory look at the Report by erst-while Planning Commission show that the average tariff over the past few years has undoubtedly increased (see Table-3 below), but the rise has not been commensurate with the increase in the cost of supply. As a result, the gap between the cost of supply and the average tariff has been widening over the years. The gap has increased from 56 paise/kWh in 2009-10 to 183 paise/kWh in 2011-12. It is expected to decline to 113 paise/kWh in 2013-14.

Commercial losses and Issue of Subsidy: State governments provide Subsidy on energy sales to the distribution companies, where some of the States direct electricity companies to provide electricity at subsidized rates to agriculture and domestic consumers. The gross subsidy on agriculture, domestic and inter-state is likely to increase from a level of Rs.70,012 crore in 2009-10 to Rs.1,19,621 crore in 2013-14 (AP). Distribution companies also make efforts to recover the shortfall of revenue due to the subsidized power supply, from the industrial and commercial consumers pay a tariff higher than the cost of supply.

Solar and renewable Energy: India is endowed with a very vast solar energy potential. Most parts of the country have about 300 sunny days. Hence solar energy has high potential, which can be utilized through solar photovoltaic technology which enables direct conversion of sunlight into energy and solar thermal technologies. Over the last three decades several solar energy based systems and devices have been developed and deployed in India which are successfully providing energy solutions for lighting, cooking, water heating, air heating, drawing and elec-

tricity generation. The research and development in this sector have also helped in better efficiency, affordability and quality of the products. As a result many solar energy systems and devices are commercially available with affordable cost in the market. Keeping this in view Jawaharlal Nehru National Solar Mission was launched on 11th January, 2010.

The Mission target included (i) deployment of 20,000 MW of grid connected solar power by 2022, (ii) 2,000 MW of off-grid solar applications including 20 million solar lights by 2022, (iii) 20 million sq. m. solar thermal collector area, (iv) to create favourable conditions for developing solar manufacturing capability in the country; and (v) support R&D and capacity building activities to achieve grid parity by 2022. The Mission was to be implemented in three phases. For the first phase of the Mission, the target was to achieve Grid Solar Power 1100 MW and achievement was 1644.86 MW till March 2013. In addition, a target for Off Grid Solar applications of 200 MW capacity equivalent where achievement were 252.5 MW and 7 million square meter Solar Thermal Collector area; the achievements were 7.01 million sq mtrs.

New Government's proactive stance:

With the new government assumed power in the centre, optimism grew all accross the sectors of the economy and power sector in particular. The new government's aim is to achieve energy security and generate enough power to keep the country's economic engine chugging and at affordable price that would make the country competitive in manufacturing arena. Current focus of the power ministry is to put national assets to good use to keep energy costs affordable and address peak shortages. The new government has taken a few steps : To bring cohesiveness power, coal and renewable ministry has been brought under one minister to take a comprehensive view about power sectors problem. To reduce aggregate technical and com-

mercial losses established IT-enabled energy accounting /auditing, and improve collective efficiency, a new scheme, which subsumes the R-APDRP and named, as Integrated Power Development Scheme (IPDS). To boost agricultural production and protect the interest of rural masses a new programme has been launched named Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) focuses on separating agricultural and non-agricultural feeders and strengthen rural electrification efforts in the country. Taking advantage of the Supreme Court decision to cancel 214 coal-mining licences granted between 1993 and 2010, the new government had introduced a new regime of auctioning of coal mines for power sector.

The new government marked a fundamental shift, a leap forward in the energy policy, to promote solar and renewable energy as the prime driver of energy security for the country. The government plans to achieve 1,75,000 MW of power by 2022, from current installed capacity of 31692.14 MW. Solar power will be around 56 % plus 99588 MW in the total. Below presented (see Table -4) regional distribution of different renewable energy sources the country wants to achieve.

Conclusion

Ever since Thomas Edison fired up his power station in Lower Manhattan, the world has become progressively more electrified. In the developed part of the world it is taken for granted and yet the world cannot operate without it. For developing countries, shortages of electricity take their toll on people's lives and on economic growth. India one of the world's biggest green house gas emitter after US and China, when emphasizes on solar and wind power is also expected to strengthen the country's standing at global climate change negotiations. Meeting future electricity needs means challenging and sometimes wrenching decisions about the choice of fuel required to keep the lights on and power flowing ◀