

# Electricity Management In Maharashtra: An Introductory Exposition

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## INTRODUCTION

Maharashtra is one of the most industrialized states in India. In Maharashtra since 2005, The Maharashtra State Electricity Distribution Company Limited (MSEDCL) has been unable to supply electricity as per demand. The state utility has been resorting to load shedding to bridge the gap between supply and demand. Several parts of the state have ten to twelve hours of load shedding. Load shedding results in disruption of lifestyle, huge loss of production in Industrial, Agricultural, services sectors and causes inconvenience to consumers. Besides, it creates social problems, law and order issues and adversely affects the different segments of the economy. Naturally, electricity load shedding is one of the major contentious and controversial issues.

**In Maharashtra, load shedding has persisted for the last four- five years and it is expected to continue for few more years. The Maharashtra State Electricity Distribution Company Limited estimates that the shortages will be continue till 2011- 12. Due the acute shortage of electricity, an appropriate use of available electricity and load shedding is the only alternative to overtake this problem. Electricity is one of the essential infrastructures in the process of economic and social development.**

India is the world's sixth largest energy consumer accounting for about 3.5% of the world's total annual energy consumption, but, per capita consumption of energy is very low at 631 kwh as compared to world consumption of 2873 kwh which needs to be increased to meet the goals of economic and social development. The conventional sources of energy such as Thermal, Hydro and Nuclear are the major sources of generation of electricity in India. Conventional sources of energy are valuable because their formation takes million of years whether it is oil or coal. The conventional sources of energy are exhaustible. Energy prices may rise in the long run to reflect the relative scarcity and high cost of exploration and extraction. Hence, all initiatives have to be taken to optimal use of the available resources so that they can continue for a long duration. Energy efficiency improvements not only reduce the energy consumed per unit products but also improves energy security of the country to ensure sustained availability of energy resources at an affordable price.

The National Electricity Policy (NEP) stipulates power for all and annual per capita consumption of electricity to rise to 1000 units by 2012. This entails provision of adequate reliable power, at affordable cost with access to all citizens. Electricity is in the Concurrent List in the Constitution and the primary responsibility of structuring its availability and distribution is that of the states. However, both the centre and states have to play a decisive and positive role. While shortages are presently being experienced by each region in India, it is much more acute in the case of Maharashtra.

## OBJECTIVES OF THE STUDY

- 1) To focus on the issues - the prevailing electricity load shedding in Maharashtra .
- 2) To examines the trends of government's expenditure on energy generation projects.
- 3) To study the sources of energy generation and consumption pattern.
- 4) To highlight the energy transmission and distribution losses in the system.
- 5) To suggest suitable strategies to resolve the prevailing crisis.

## INDIA'S ENERGY SCENARIO

**The electricity sector in India is predominantly controlled by the Government of India's Public Sector Undertakings (PSUs). The Ministry of Power is the apex body responsible for the development of electrical energy**

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in India. India has an excellent capability in the form of various sectoral PSUs. Major PSUs involved in the generation of electricity include National Thermal Power Corporation (NTPC), National Hydroelectric Power Corporation (NHPC) and Nuclear Power Corporation of India (NPCI), Power Grid Corporation, Rural Electrification, Oil and Natural Gas Commission. Besides PSUs, several state-level corporations, such as Maharashtra State Electricity Board (MSEB), Maharashtra State Energy Development Agency (MEDA) are also involved in the generation and intra-state distribution of electricity. The Power Grid Corporation of India is responsible for the inter-state transmission of electricity and the development of national grid.

India is world's 6th largest energy consumer, accounting for 3.5% of global energy consumption. Due to India's economic rise, the demand for energy has grown at an average of 3.6% per annum over the past 30 years. In March 2009, the installed power generation capacity of India stood at 147,000 MW, while the per capita power consumption stood at 612 KWH. The country's annual power production increased from about 190 billion KWH in 1986 to more than 680 billion KWH in 2006. The Indian government has set an ambitious target to add approximately 78,000 MW of installed generation capacity by 2012. The total demand for electricity in India is expected to cross 950,000 MW by 2030.

The all India installed power generation capacity as on 31-03-2009 was 147965 mw comprising of 93725 mw thermal, 36878 mw hydro, 4120 mw nuclear and 13242 mw renewable energy sources. The central sector's share in generation has gradually increased from 12% in 1979 to 33% as on 31-03-2009. On the other hand, the share of the state sector declined from 82.5% to 51%, while the share of private sector has gone up from 5.2% to 16% during the same period. About 75% of the electricity consumed in India is generated by thermal power plants, 21% by hydroelectric power plants and 4% by nuclear power plants. More than 50% of India's commercial energy demand is met through the country's vast coal reserves. The country has also invested heavily in renewable sources of energy such as wind energy in recent years. As of 2008, India's installed wind power generation capacity stood at 9,655 MW. Additionally, India has committed massive amount of funds for the construction of various nuclear reactors which would generate at least 30,000 MW. In July 2009, India unveiled a \$19 billion plan to produce 20,000 MW of solar power by 2020.

Energy losses in India during transmission and distribution are extremely high and vary between 30 to 45%. In 2004-05, electricity demand outstripped supply by 7 to 11%. Due to shortage of electricity, power cuts are common throughout India and this has adversely affected the country's economic growth. Theft of electricity, common in most parts of urban India, amounts to 1.5% of India's GDP. Despite ambitious rural electrification programs, some 400 million Indians lose electricity access during blackouts. While 80 percent of Indian villages have at least an electricity line, just 44 percent of rural households have access to electricity.

According to a sample of 97,882 households in 2002, electricity was the main source of lighting for 53% of rural households compared to 36% in 1993. The Multi Commodity Exchange Of India Limited (MCX) has sought permission to offer electricity future markets.

## **MAHARASHTRA'S ENERGY SITUATION**

Electricity in Maharashtra is supplied by various agencies. Maharashtra State Electricity Board (MSEB) plays the most crucial role in the generation and distribution of power in the state. Apart from the MSEB, there are (i) Independent power projects and (ii) Licensees like Tata and Reliance energy which distribute electricity in the permitted area (Mumbai and Sub-urban area).

Among the conventional sources of energy, Maharashtra has a project based on coal, gas as well as hydro - projects. The major share (approximately 80%) is contributed by coal based projects.

## **GOVERNMENT EXPENDITURE ON ENERGY SECTOR (PLAN-WISE)**

The growth of power sector in Maharashtra had been noteworthy till the V<sup>th</sup> Five Year Plan. The direct government expenditure on the power sector substantially declined from the V<sup>th</sup> Five year plan (34.2%) to X<sup>th</sup> five year plan (9.6%). Therefore, instead of relying on investments by the public sector, the private sector was encouraged to participate in the power sector. However, rapid increase in the demand for power in the recent year has created a wide gap between demand and supply of the electricity in the state, which is the cause of concern. The Government has

taken up a number of steps for capacity addition, modernization of existing infrastructure for transmission & distribution and to curb the unauthorized consumption of the electricity.

## ENERGY GENERATION

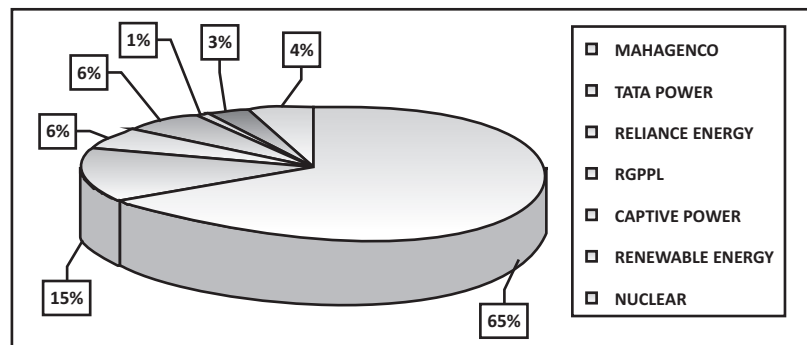
The state of Maharashtra is the largest producer of thermal power in the country. The aggregate generation of electricity (including renewable sources) in the state during 2007-08 was 79,721(mkwh), higher by 9.0% over the previous year. MAHAGENCO accounted for 66%, followed by Tata Power 15% and Reliance Energy 6%. During 2008-09, up to the end of November, the total generation of electricity in the state was 51,465mkwh, higher by 6.0% than that in the corresponding period of 2007-08. The details of the energy generated in the state by type of source are given in Table 1.

**Table 1: Energy Generation In Maharashtra**

Type of source	2006-07	2007-08	% Change
(A) In the State	73,129	79,721	9.0
(I) MAHAGENCO	50,940	52,294	2.6
Thermal	41,261	43,958	6.5
Hydro	5,651	4,606	(-)18.4
Natural Gas	4,028	3,730	(-)7.4
(ii) Tata Power	11,316	11,618	2.7
Thermal	7,840	8,664	10.5
Hydro	2,137	1,489	(-) 30.3
Natural Gas	1,339	1,337	(-)0.2
Renewable	-----	128	-----
(iii) Reliance Energy	4,458	4,450	0.1
(Thermal)			
(iv) RGPL (natural Gas)	1,640	4,740	189.0
(v) Captive Power	440	550	25.0
(vi) Renewable	1,893	2,584	36.5
(vii) Nuclear	2,442	3,475	42.3
<b>(B) Central allocation</b>	<b>22,168</b>	<b>22,383</b>	<b>1.0</b>
<b>TOTAL (A+B)</b>	<b>95,297</b>	<b>1,02,104</b>	<b>7.1</b>

Source: Economic Survey of Maharashtra, 2008-09

**Figure 1 : Electricity Generation In Maharashtra-2007-08**



## CONSUMPTION OF ELECTRICITY

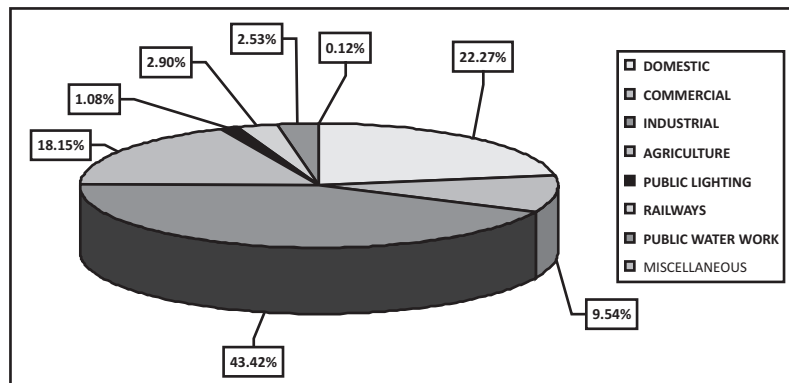
Electricity is the main driving force for development in today's industrial world. Per capita gross national product is

directly related to the per capita electricity production in the country. Analysis of statistics also indicates that per capita electricity consumption is directly related to life expectancy. The total consumption of electricity in the state during 2007-08 was 69,838 mkwh, higher by 12.5% as compared to 62,085 mkwh during 2006-07. The industrial sector (43.4%) was the largest consumer of the electricity in the state, followed by domestic (22.3%) and agriculture sector (18.2%). These three sectors together accounted for 83.9% of the total electricity consumption in the state. The details of consumption of electricity in the state are given in the Table 2.

**Table 2: Sector-Wise Electricity Consumption In Maharashtra (in MKWH)**

Sr. No.	Type	2005-06	2006-07	2007-08	% Change
1.	Domestic	13,572	14,224	15,553	8.95
2.	Commercial	4841	6940	6,661	(-) 4.0
3.	Industrial	25,962	26,535	30,323	14.3
4.	Agriculture	11,094	9,749	12,676	30.0
5.	Public Lighting	622	672	752	11.9
6.	Railways	1861	1,987	2,024	1.9
7.	Public Water Work	1526	1,600	1,768	10.5
8.	Miscellaneous	079	18	82	(-) 74.2
	<b>TOTAL</b>	<b>59,287</b>	<b>62,085</b>	<b>69,838</b>	<b>12.0</b>

**Figure 2 : Sector wise Electricity Consumption In Maharashtra (in MkwH)**



The per capita total, industrial and domestic consumption of electricity in the state was 578.5mkwh, 247.2wkh, 133.1kwh, as against 405.8kwh, 152.4kwh and 98.8 kwh for all India in the year 2006-07. For the year 2007-08, the corresponding in the state was 641.3kwh respectively.

## PEAK ENERGY DEMAND

Increasing Electricity demand, declining Government expenditure on electricity generation projects, financial and administrative inefficiencies of state electricity board, volatility in Crude Oil prices, India's entry in the global nuclear club and the energy ecology balance issues are the major responsible causes for electricity shortages.

The State Load Dispatch Centre (SLDC) at Kalwa (thane) is the main authority for implementing the load shedding plan in Maharashtra. During 2007-08, the peak demand of 17,489mw electricity was met on 18<sup>th</sup> December, 2007 with load shedding of 4,618mw. During 2008-09 up to October, the peak demand of 14,859 mw was met on 17<sup>th</sup> April, 2008 with load shedding of 4,772mw. The details of Variation in Monthly Electricity Shortage in the state from April 2005 to March 2007 are given in Table 3.

Till 1998-99, there was enough generation capacity to meet Maharashtra's peak demand for electricity. Since then, peak demand each has exceeded the available system capacity. During February 2007, the average shortage was 3,344 MW as against 1,883 MW in April 2005. Table 3 shows, the seasonal variation in restricted and unrestricted monthly peak demand from April 2005 to March 2007. In the months of July, August, and September, the peak shortage is relatively less as against the peak shortage is significant in January, February and March.

**Table 3: Variation In Monthly Energy Demand Shortage From April 2005 To March 2007**

For MSEDCL	Monthly Average of Unrestricted Demand (MW)	Monthly Average of Energy Supplied (MW)	Monthly Average of Load Shedding (MW)	Percentage of Load Shed
April 2005	10,668	8,785	1,883	17.7
May 2005	10,405	8,775	1,630	15.7
June 2005	10,047	8,359	1,688	16.8
July 2005	8,104	7,108	996	12.3
August 2005	7,616	7,182	434	5.7
September 2005	7,916	7,375	541	6.8
October 2005	9,442	8,060	1,382	14.6
November 2005	10,431	8,562	1,869	17.9
December 2005	11,357	8,637	2,720	23.9
January 2006	11,502	8,617	2,885	25.1
February 2006	11,705	8,798	2,907	24.8
March 2006	11,147	8,819	2,329	20.9
April 2006	11,804	9,101	2,704	22.9
May 2006	10,862	8,842	2,019	18.6
June 2006	8,937	7,948	989	11.1
July 2006	8,096	7,607	489	6.0
August 2006	7,724	7,589	135	1.7
September 2006	8,851	8,104	748	8.4
October 2006	9,864	8,499	1,365	13.8
November 2006	11,106	8,658	2,449	22.0
December 2006	11,395	8,697	2,699	23.7
January 2007	12,103	8,849	3,253	26.9
February 2007	12,489	9,145	3,344	26.8
March 2007*	12,024	9,179	2,845	23.7

Source: Economic and Political Weekly, September 29, 2007 (PP-3944)

## TRANSMISSION AND DISTRIBUTION LOSSESS

Electricity losses in India during transmission and distribution are extremely high and vary between 30 to 45%. High technical losses in the system are primarily due to inadequate investments over the years for system improvement works, which 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.

Theft of electricity, common in most parts of urban India, amounts to 1.5% of India's GDP. The commercial losses are mainly due to low metering efficiency, theft & pilferages. This may be eliminated by improving metering efficiency, proper energy accounting & auditing and improved billing & collection efficiency. Fixing of accountability of the personnel / feeder managers may help considerably in reduction of AT&C loss.

The Maharashtra State Electricity Transmission Company has initiated various measures to curb the transmission losses by modern techniques of extra high voltage sub-stations. As on 31<sup>st</sup> March, 2008, the company had 498 sub-stations having transformation capacity of 61,530 Million Volt Ampere and Extra High Voltage line length of 36,289 circuit kms. During XI th five year plan, an addition of 134 EHV sub-stations of 39,575 MVA transformation capacity and EHV line length of 20,142 circuit kms is expected. The transmission losses of MAHATRANSCO had decreased to 5.0% in 2007-08 from 5.5% in 2006-07.





The MAHADISCOM has limited measures like replacement of faulty meters, load reduction on overloaded HT & LT circuits by providing additional transformers, erection and commissioning of new stations and lines under various schemes. A massive drive has also been initiated against unauthorized use of energy. As a result, distribution losses had reduced to 24.1% in 2007-08 from 29.5% in 2006-07. Moreover, in order to detect and curb the unauthorized utilization of electricity, there were 36 Squads operative during 2007-08 at different places in the state. During 2007-08, these squads detected 12,802 irregular or unauthorized electric connections, of which 3,053 were theft cases and squad recovered from them ₹ 39.81 crores.

## **RURAL ELECTRIFICATION**

Additional electrification generation and distribution in the rural area will lead to a sharp increase in productivity and improving the quality of life. With increased availability of electricity, smaller towns and villages will have safe drinking water, better sewage treatment facilities and better primary health care and all these have a very beneficial impact on all health parameters, especially life expectancy.

As per the New Electrification Policy (2004) declared that-“ **A village would be declared as electrified if electricity is provided to public places like schools, panchayat office, health centre dispensaries, community centres etc. and the number of households electrified should be at least 10% of the total number of households in the village**”.

Accordingly, the number of villages electrified in the state as on 31<sup>st</sup> March, 2008 was 36,312 and 4,783 villages are not electrified yet. During 2007-08, in all, 1.18 lakh agricultural pumps were energized, bringing the total number of agricultural pumps energized in the state to 28.95 lakh by the end of March, 2008. The number of pending applications for energization of pump sets as on 31<sup>st</sup> March, 2008 was three lakhs.

## **RENEWABLE ENERGY**

Maharashtra State Energy Development Agency (MEDA) is a Government of Maharashtra undertaking and is functioning under the ministry of non-conventional energy. MEDA has been actively engaged in implementation, propagation and promotion of renewable energy and conducting energy conservation programmes especially in rural areas. MEDA has identified potential of 7,852 mw of renewable sources in the state. The total renewable energy generated in the state during 2007-08 was 2,584 mkwh. Maharashtra stands second after Tamil Nadu in generation of renewable energy in the country.

## **ENERGY CONSERVATION PROGRAMME**

Under this programme, energy audits of various industrial establishments are undertaken by MEDA in order to identify inefficient use of energy and to suggest ways and means to save the energy. The estimated scope for energy conservation in industrial, agricultural, domestic and commercial sectors is 25%, 30%, 20% and 30% respectively. Energy audit was carried out in 458 industries up to 30<sup>th</sup> September, 2008 which resulted in substantial energy saving.

## **CONCLUSION**

The National Electricity Policy (NEP) stipulates power for all and annual per capita consumption of electricity to rise to 1000 units by 2012. This entails provision of adequate reliable power, at affordable cost with access to all citizens. Electricity is in the Concurrent List in the Constitution and the primary responsibility of structuring its availability and distribution is that of the states. However, both the centre and states have to play a decisive and positive role. While shortages are presently being experienced by each region, it is much more acute in the case of Maharashtra and other States. An improvement in the available situation of the Maharashtra state following measures / strategies will be more useful for government as well as general electricity consumer. Renewable Sources, particularly Wind Power, Solar Energy and Lighting efficiency can help to reduce the need for load shedding by 2,584 MW. The realization of these estimates would need policies and other measures such as:

(1) Transmission Strategy with focus on development of National Grid including Interstate connections, Technology up gradation & optimization of transmission cost.

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continuing insights into organizational effectiveness, issue of organizational culture in both the organizations are as important as mission visions, goals and objectives of the organization. The observation attributed to the fact that work culture of an organization is an important determinant of overall effectiveness of the organization.

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- (2) Innovative lighting efficiency programmes with agreements with manufacturers to recover capital costs from the electricity bills.
- (3) Use of mass media to create awareness among consumers: The Bureau of Energy Efficiency has already initiated standards and labeling programme for major energy consuming appliances.
- (4) Innovative financing and dissemination strategies for solar water heaters along with the equipment manufacturers.
- (5) Feeder-wise strategies for energy conservation and load reduction. If the amount that can be supplied by MSEDCL is kept constant and user groups are able to devise strategies for managing their consumption within this, they may be exempt from load shedding.
- (6) Distribution strategy to achieve Distribution Reforms with focus on System up gradation, loss reduction, theft control, consumer service orientation, quality power supply commercialization, Decentralized distributed generation and supply for rural areas.
- (7) Regulation Strategy aimed at protecting Consumer interests and making the sector commercially viable.

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