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MAHARASHTRA STATE POWERSUPPLY AND DEMAND SCENARIO – A CASE STUDY

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ABSTRACT

"*The demand from the power sector will increase to 400,000 MW from existing 120,000 MW, assuming an energy growth rate of five per cent per annum. Energy security leading to energy independence is certainly possible and is within the capability of the nation.....*"

Dr. APJ Abdul KALAM

Today electricity is an important infrastructure for socio – economic development of mankind, the per capita use of electrical energy of a country influence the standard of living index of the people of a great extent. It is difficult to conceive comfortable and purposeful lifestyle without electricity. Electricity has become a common essential day – to –day commodity for most people irrespective of position, place, time and field of work. It is, therefore, necessary to make gate way for energy - of an efficient and effective management strategy - into the electrical sector with respect to planning, construction, production, distribution and utilization activities. Rising electricity demand-supply gap have created a vital need for maximizing the energy efficiency, thus the emergence of several technological and research challenges. Uninterrupted, reliable and quality electric power production and supply are required [1]. Rapid industrialization has resulted in fast increasing in per capita consumption of electricity in the world. The authors have studied the demand and supply of electricity of Maharashtra state from 2001to 2010. While survey and study it is found due to the gap between demand and supply Mahavitaran have adopted load shedding. In the year 2008 to 10 the average electricity shortage at regular and peak hours in the state were 2,600 MW and 4,500 MW experienced respectively. It is also observed that every year there is up word inclinations of electricity utilities in the state. There are different reasons of the electricity shortage like technical losses, thefts. In this paper it is discussed about load dispatching centre and MSEB working to resolve for better management. Calculations are made to construct the table which can give ready mate or hand on information for further decision makings. We have tried to make the analysis very simple to use for further study. This analysis will useful to decide the future requirements and also suggested few recommendations to sort out the problem of shortage of electricity in the state.

KeyWords: Electricity demand and supply, Shortage, Load shedding, losses

INTRODUCTION

Conventionally, MSEB was looking the all functions like electricity generation, transmission, distribution to welfare of consumers in the Indian state of Maharashtra. There was dearth of professional staff and no. of positions was vacant,

also lack of coordination between different departments created mess and no future threat was recognized. Due to the overburden and preferential inaccuracy of this organization, Maharashtra state is experiencing shortage of electricity from last five to six years. To manage shortage of electricity Mahavitran has implemented load shedding since last six years. The efforts of authors are to evaluate the situation with respect to electricity load shedding and on the basis of consumers demand and supply. The efforts will search out some aspects like electricity load shedding, how it is implemented to various consumers, how the authority tried to cope up the situations, also when it will reduced or completely closed. The researchers have considered the opinions of few stake holders. Due to different T & D losses there is increase in demand and supply dissimilarity.

Electricity variations scenario

The power required is growing every day and it shows deviations in all hours of a day. Usually at nightfall electricity constraint is more and it is called as peak period, it is also observed that evening peak is higher than that of morning peak. At evening all types of users utilizing required power including farmers, tiny industries, and small business ventures to operate their systems [1]. Hence demand exceeds in this period. Our electricity generation mainly depends on the innate resources such as coal, oil, gas etc. one day which are going to end, No major hydro potential resources, nuclear project's investment cost and now a days people agitations, and also no more research in non conventional energy generation system.

In Maharashtra there was severe electricity shortage was experienced by people of the state particularly in peak hours of a day. It is also clear that the shortage is doubles at some months of the year [2]. In a normal situation, there is a gap between supply and demand. Hence there is load shedding by MSEDCL.

When we calculated the annual average demand and supply for the five successive years it shows that in 2011 demand exceeds to 19000MW at peak hours of a day which gives an idea of future requirements of the electricity. The following table gives detail information of the same.

Table no. I: The annual average demand and supply of electricity in a day at regular hours:

Year / Electricity MW	2008	2009	2010
Regular hours demand (Avg)	10141	10,300	10593
Regular hours Supply (Avg)	7918	8325	8667

Table No. II: shows the annual average demand and supply of electricity in a day at Peak hours of a day:

Years / Electricity MW	2008	2009	2010
Peak hours demand (Avg)	17266	17,879	18168
Peak hours Supply (Avg)	12578	13504	14353

From the table no II &III, it is clear that every year average electricity utility is increased and trend is ever rising. Due to industrial growth and agricultural developments the trend will remains constant in forthcoming years also. If we calculate the annual boost in demand and supply of electricity to the previous year in last five years we will get the rising inclination of demand and supply which can be utilized for further decision making to avoid shortage of electricity [4]. From the above table it is found that the net annual increase in demand and supply of electricity is as shown in following table.

Table no. III: The year wise boost in demand and supply to previous year of last five years:

Year	Regular hrs		Peak hrs	
	Demand (MW)	Supply (MW)	Demand (MW)	Supply (MW)
2008	566	92	474	118
2009	159	402	613	926

2010	293	342	289	849
2011	632	908	937	1281

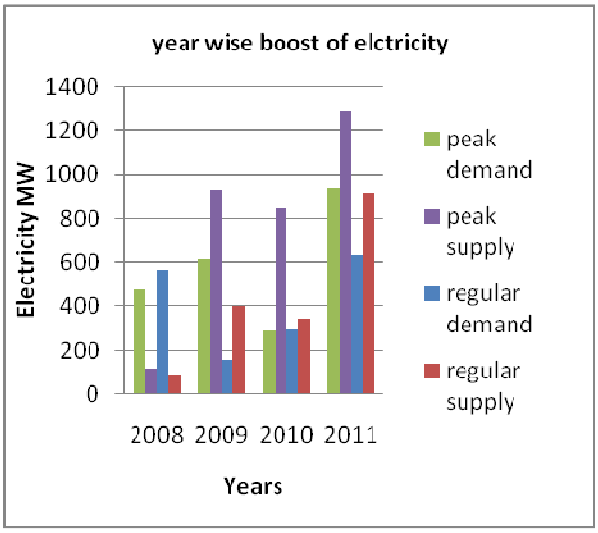

Figure no I: The boost in every years demand and supply of electricity

In 2011 the peak hours supply is increased by more 1200 MW of electricity which indicates that the strategies of MSEB are correct and after few years Load shedding may clogged completely. Difference in peak demand and regular supply in 2011 are near to close as compare to 2008.

Table no. IV: Gap between demand and supply of electricity at regular hours in a day:

Year	Regular hrs demand (MW)	Regular hrs supply (MW)	disparity (MW)
2007	9575	7826	1749
2008	10141	7918	2223
2009	10300	8325	1975
2010	10593	8667	1926
2011	11225	9596	1629

Above information tells us that at normal day time the difference in demand and supply average remains more than 1600 MW per day. In last five years this difference remains constant it shows that responsible authorities are have no control on circumstances. This electricity shortage is dangerous for developments of the state.

Table no. V: The disparity between peak & regular supply of electricity of last five years

Year	**Regular hrs Supply (MW)**	**Peak hrs Supply (MW)**	**disparity (MW)**
2007	7826	12460	4634
2008	7918	12578	4660
2009	8325	13504	5179
2010	8667	14353	5686
2011	9575	15634	6059

Table no. VI: The average difference between electricity demand at peak hours and supply at regular hours:

Year	**Regular hrs supply (MW)**	**Peak hrs demand (MW)**	**disparity (MW)**
2007	7826	16792	8966
2008	7918	17266	9348
2009	8325	17879	9554
2010	8667	18168	9501
2011	9575	19105	9530

Above table is arranged to find out the utmost gap among demand and supply in a day i e peak demand and regular hrs electricity supplied. From the above figures it is clear that approximately 9530 MW shortage of electricity observed in Maharashtra in the year 2011. This data indicate that in future more than 60 % of Maharashtra might be in dark every day. Today electricity is made available from different sources by direct purchasing, captive generations, grid transfer and any other. There are certain elements which can affect on purchasing of electricity from other states or coal may be clogged or any other man made difficulties or natural disasters will hamper the activities of Maharavitran.

Load dispatch center: To manage electricity load of a different areas Load Dispatch Centre is established at Kalwa, Maharashtra. Load dispatch center is a coordinating organization for Maharashtra state electricity boards for assuring a

system for safe and sound and protected grid operation. Load dispatch center is a significant connection between generation and transmission, which harmonizes the provisions of electricity to consumers. This is the nerve centre for the operation, planning, monitoring and control of the power system [12]. Electricity cannot be stored and has to be produced when it is needed. It is therefore essential that power system is planned and operated optimally & economically. This is the main objective of Load Dispatch Centre. The objective of Load Dispatch Department is

- Matching the power demand with system integrity, reliability and security of generation and transmission facilities
- Regulating the system frequency
- Optimum utilization of resources
- Quick restoration of normalcy after system disturbances

Thus the objectives of Load Dispatch Department are to co-ordinate generation, transmission and distribution of electricity from moment to moment to achieve maximum security and efficiency [2]. The functions of Load Dispatch Department are Dynamic in nature. While performing the functions the policies laid down by management are strictly followed. A similar Area Load Dispatch Centre was also set up at Ambazari near Nagpur for VKM region. The electricity sector of Maharashtra is divided in to two regions one is Mumbai, and remaining part of the state. Tata Power and Reliance, supplies electricity to Mumbai and the other part served by the Mahavitaran.

The State Load Dispatch Centre (SLDC) at Kalwa is implementing the load shedding plan in Maharashtra. The load shedding plan allocates the load to be shed by urban and rural regions. On a given day, SLDC instructs operators of chief substations to shed the load based on this plan with certain modifications that are based on specific conditions of demand and supply prevailing on that day. Operators at main substations then plan and implement feeder-wise load shedding programs [12].

T & D Losses: It is indeed alarming to know the level of losses in Indian electricity and transmission business. These losses not only eat the revenues of the companies but also hinder the financing of future projects, which require huge capital, because of increased risk. It is observed that today T and D losses are more than 20 %. The losses in electrical energy systems can be broadly classified as follows:

- Electrical losses in power generating, transmitting, and distributing equipments. Mechanical losses in rotating systems.
- Transmission and distribution line / cable losses. Losses in cooling systems. Commercial, metering, VAR loading etc losses.
- Loss due to interruption of supply and breakdown. Losses due to poor earthings.
- Losses within consumers / industrial premises. Corona losses in EHV voltage levels and above. The above mentioned causes are major but in practice we would found other few are affecting on losses of electricity [6].

Months	Loss %	Months	Loss %
Apr 2008	4.93	Apr 2009	4.52
May 2008	5.69	May 2009	4.57
Jun 2008	4.62	Jun 2009	4.79
Jul 2008	4.48	Jul 2009	4.68
Aug 2008	3.84	Aug 2009	4.22
Sep 2008	4.27	Sep 2009	4.78
Oct 2008	5.09	Oct 2009	4.82
Nov 2008	5.39	Nov 2009	4.9
Dec 2008	5.01	Dec 2009	4.58
9-Jan 2009	5.13	Jan 2010	4.47
9-Feb 2009	4.85	Feb 2010	4.32
9-Mar 2009	4.97	Mar 2010	4.49

Table no. VII: The grid loss in 2008 - 2010

Source: load Dispatch Centre KalwaFrom the above table it is clear that the average loss is 4.69 %.

ZONE	% Distribution Loss												
	May 08 - Oct 08	Jun 08 - Nov 08	Jul 08 - Dec 08	Aug 08 - Jan 09	Sep 08 - Feb 09	Oct 08 - Mar 09	Nov 08 - Apr 09	Dec 08 - May 09	Jan 09 - Jun 09	Feb 09 - Jul 09	Mar 09 - Aug 09	Apr 09 - Sep 09	May 09 - Oct 09
Pune %	14	12	14	16	17	20	21	22	22	21	21	17	15

Table no. VIII: Zone-wise Six Monthly Sliding Average Percentage Distribution Loss
Source: Mahavitran (MSEDCL) 2009

The above table no. VII & VIII give the information about T % D losses which can be reduced by collective efforts and proper coordination between MSETCL, MSEDCL and national grid.

To avoid the losses and theft, responsible authorities have started different schemes and activities to minimize it. However, it would be significant to know the categorization of technical and commercial losses that contribute to the total losses. Low tension lines are many times over the high tension lines causing more technical I2R losses [1]. Transformer are administering at less than best possible efficiency when in fact it should have the efficiency rate close to 98% while they do not have any moving part!

Theft is a vicious circle as theft is done when people are not willing to pay the high price of electricity. Power companies, as per the regulatory framework, are assured their 16% ROI in distribution business and hence, the most of the losses are again put back to the consumer with increase in tariff. It's never the power companies which decide the tariff; it's the regulator [5]. Very few people realize this fact. When power is generated, transmitted a distributed from one place to other, due to inherent characteristics of the system, certain losses would occur. These losses can not be eliminated, but it will be possible to reduce such losses. A reduction in 1 % of T % D losses would result in a saving of thousand's Lakh units of electricity every year. State power distribution utility Maharashtra State Electricity Distribution Company Ltd (Mahavitran) has reportedly contained its distribution losses to 17.28 per cent in 2010-11. In conjunction with the 5 per cent transmission losses, the state's ATC losses worked out to just over 22 per cent. In 1999-00, ATC losses of the state were over 40 per cent, and in 2005, when Mahavitran was incorporated, distribution losses were 31.72 per cent. MERC had fixed the target for distribution losses for 2010-11 at 17.20percent. The loss reduction was achieved through a number of initiatives. Special women's' squads, Damini Pathak, were constituted for detecting faulty meters. In many cases power pilferers alleged that MSEDCL staffers misbehaved. MSEDCL also constituted 120 flying squads and six dedicated police stations for dealing with power theft cases [1]. The company continued to crack down on power theft continuously. In 2010-11, 17,269 cases of power theft were detected and 5,058 cases of theft were registered. The company recovered a penalty of ₹14.24 crore. Thousands of slow and faulty meters were also replaced. By the end of 2010-11, energy meters were installed on 2.23 lakh distribution transformers. This enabled the company to find out high loss pockets. Meters were installed on all feeders too. Another important step taken for reducing loss was up gradation of power network. The overburdened infrastructure had increased technical losses. Also, old equipment was less efficient and causing power loss. Replacement of this equipment reduced the losses.

CONCLUSION:

The authors have assessed the Maharashtra's power situation; it exposes an average electricity shortage at different situation which ranges from 160 MW to 9600MW approximately. In 2011 Minimum shortage of electricity is 1629 MW for

MSEDCL and a peak shortage is approximately 6000 MW. The seasonal deviation of the shortages has been focused by using the monthly load duration curves. The average and peak energy requirements in 2010-11 have been computed as 11,200 MW and 19000 MW respectively. Study is divided in to two parts one is demand and supply of each month from April 2008 to March 2010 and other part five years' annual average demand and supply. This paper calculated the shortages and made available an analysis of option. In this paper overall study of demand and supply, shortage of electricity, T & D losses and load shedding issues are discussed to focus on the current situations in the leading state Maharashtra of India, This information can be used to make further analysis for better decision making and to reduce load shedding.

1) Captive power generation by different private and cooperative industries is one of the best alternatives to resolve electricity shortage.

(2) Innovative pump sets programs of central government must be once again initiated for economic use of electricity of farming sector.

(3) Exploitation of different sources like televisions, internet is to educate /inform customers. The awareness camps among consumers to use electric equipment having more stars.

(4) Feeder-wise energy conservation must be analyzed for load inspection.

(5) Losses and thefts must be reduced to its minimum level by installing new advanced appliances at sub station level.

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