Consumers' Awareness About Electricity Shortfall and Initiatives Taken by MSEDCL for DSM

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Abstract

Continuous electricity at an affordable rate is most important for the socioeconomic development of a country. However, since the last few decades, there has been an alarming increase in the demand - supply gap. This gap is filled by load shedding, which results in public outcry, *morchas*, and loss of property. In every five year plans, GoI envisages generation capacity addition, but because of numerous reasons, the demand always outstrips the supply, and the utilities have to resort to load shedding. Capacity addition requires proper project management skills and has to overcome hurdles of land acquisition, rehabilitation, environmental problems, and so forth. In India, it is seen that generation projects are delayed by a significant amount of time. Demand side management (DSM) such as energy conservation programs can give an urgent relief to this problem, and will improve the electricity efficiency throughout the country. Electricity utility companies are executing various awareness campaigns for DSM (demand side management) . This paper tried to find out the reasons for demand supply gap in case of electricity, and examined the efforts of MSEDCL for the implementation of the energy saving campaign.

***Keywords :*electricity, consumer awareness, DSM, energy saving program, demand & supply**

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Quoting Former Prime Minister, Shri Atal Bihari Vajpayee's address at the Chief Ministers' Conference on Power Sector Reforms on March 3, 2001 (Government of India, Press Information Bureau (PIB), 2001) :

> Power is what powers a nation's economic progress... almost all parts of the country are facing power shortages - and the scarcity is acute in many places. Without adequate, affordable, and reliable power, neither agriculture nor industry and services can grow to their full potential. And without accelerated economic growth, we cannot make a faster and more visible dent in poverty and unemployment. (para 19)

The Report presented by FICCI (Federation of Indian Chambers of Commerce & Industry) explains the Indian power sector scenario. As per the BRIEF report of the industrial revolution, continuous, affordable, and quality power has become the most basic requirement for the economic development of any country. Each segment of modern society is dependent on power, from domestic, agriculture and industrial, to service and governmental operations; all require electricity and energy to function, without which the world, regardless of a specific sector, would come to a standstill, and India is no exception to this fact. A growing and empowered population requires an increase in production of electricity. India currently ranks fifth in the global scale in terms of the generation of electricity. With an installed capacity of 2,07,006 MW, India is falling short to meet the demands of a rapidly growing economy and population.

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Electricity is an essential requirement for all facets of our life. It has been recognized as a basic human need. It is a critical infrastructure on which the socioeconomic development of a country depends. Supply of electricity at a reasonable rate to rural India is essential for its overall development. Equally important is the availability of reliable and quality power at affordable rates to the Indian industry to make it come upto global standards. In short, 24*7 availability of electricity is the need of the hour.

The Demand – Supply Gap in India

Electricity is the most important commodity for a growing economy, and it cannot be stored, means it should be

Table 1. Demand and Supply of Electricity in the Country from 1984-85 to 2010-11

YEAR	Energy Requirement	Energy Availability	Energy Deficit	Rate of Growth	
				Energy Requirement	Energy Availability
	(MU)	(MU)	(MU)	(%)	(%)
1984-85	155432	145013	10419		
1985-86	170746	157262	13484	8.97	7.79
1986-87	192356	174276	18080	11.23	9.76
1987-88	210993	187976	23017	8.83	7.29
1988-89	223194	205909	17285	5.47	8.71
1989-90	247762	228151	19611	9.92	9.75
1990-91	267632	246560	21072	7.42	7.47
1991-92	288974	266432	22542	7.39	7.46
1992-93	305266	279824	25442	5.34	4.79
1993-94	323252	299494	23758	5.56	6.57
1994-95	352260	327281	24979	8.23	8.49
1995-96	389721	354045	35676	9.61	7.56
1996-97	413490	365900	47590	5.75	3.24
1997-98	424505	390330	34175	2.59	6.26
1998-99	446584	420235	26349	4.94	7.12
1999-00	480430	450594	29836	7.04	6.74
2000-01	507216	467409	39807	5.28	3.6
2001-02	522537	483350	39187	2.93	3.3
2002-03	545674	497589	48085	4.24	2.86
2003-04	559264	519398	39866	2.43	4.2
2004-05	591373	548115	43258	5.43	5.24
2005-06	631757	578819	52938	6.39	5.3
2006-07	690587	624495	66092	8.52	7.31
2007-08	739343	666007	73336	6.59	6.23
2008-09	777039	691038	86001	4.85	3.62
2009-10	830594	746644	83950	6.45	7.45
2010-11	861591	788355	73236	3.6	5.29
Average Rate of Growth				**6.35**	**6.28**

Source : Government of India, Ministry of Power, Central Electricity Authority. (2011)

utilized when produced. Increase in demand needs to be matched by an increase in supply or else there is a scarcity of electricity, which India is facing since the last many decades. The phenomenal increase in demand of electricity due to electrification, expansion of the economy, and irrigation of land was not met by increase in supply, which landed India in a power deficit. The situation has gone from bad to worse in Maharashtra, and there is massive load shedding.

Ideally, the capacity should have been added at a higher pace, but issues such as environmental clearances, resettlement and rehabilitation of project affected people, law and order problems, slow progress of civil works, poor geology, difficult site conditions, shortage of manpower, and so forth have hampered the rate of capacity addition.

From the Table 1, it is clear that despite the continuous addition of electricity ; still, the demand is outstripping the supply. It means that supply of electricity is not matching the growing demand. The demand - supply gap increased from the year 1994-95 from 25,000 MU to 35,000 MU in 2010-11. The average growth rate is 6.35% for energy requirement and 6.28 % for energy availability, which explains that the demand for electricity has been increasing at a faster rate than the supply. In the year 2011, the energy deficit was 73263 MU, and this was managed by load shedding.

The Demand – Supply Gap in Maharashtra

The demand supply gap of electricity in Maharashtra state started since 1994-95. The quantum of deficit was less (229 MW) in 1994-95, but it has risen continuously since 1998-99 to 2010-11. The demand for electricity in Maharashtra in FY-2011 was 16778 MW, and the supply was 16778 MW, which resulted in 4606 MW of shortfall, and this shortfall was managed by load shedding, which is not a desirable way to mitigate the demand. The situation was the worst in 2007-08, when the electricity shortfall reached to 5277 MW. This fact can be understood from the figures depicted in the Table 2.

Table 2. Demand and Supply of Electricity in Maharashtra from 1995 to 2011

Year	Demand (MW)	Supply (MW)	Shortfall (MW)
1994-95	6829	6600	229
1995-96	7309	6873	436
1996-97	7887	7145	742
1997-98	8105	7878	227
1998-99	8985	7690	1295
1999-00	9741	8334	1407
2000-01	10473	8651	1822
2001-02	10119	9103	1016
2002-03	10131	9020	1021
2003-04	11357	9315	2042
2004-05	12749	9704	3045
2005-06	14061	9856	4205
2006-07	14825	10298	4527
2007-08	15689	10412	5277
2008-09	15656	10715	4941
2009-10	15494	11653	3841
20010-11	16778	12172	4606

Source: Maharashtra State Load Dispatch Centre (SLDC) , Kalwa.Thane

Coefficient of correlation = 0.970704 (Highly correlated)

The degree of correlation in Table 2 between demand and the shortfall is 0.971. The compounded annual growth rate (CAGR) during this period was 8.40 %. The government must plan to add capacity that is in tandem with the growth rate. This situation of electricity shortage has been continuing since the last decade, and this shows that due to lack of planning, the demand and supply gap has been continuously increasing.

Demand Drivers of Electricity

Demand for electricity has shown a continuous increasing trend due to numerous reasons. Today, due to the advent of the Internet, mobile phones, and other electronic gadgets, no one in urban areas can live life without electricity. Moreover, due to the continuous increase in irrigated land, economic development, increase in per capita income, and so forth, the demand for electricity is increasing at a fast pace, and this issue is posing problems for the policy makers. The following are the few major determinants of electricity consumption :

(1) Population : Out of the 1.4 billion people of the world who have no access to electricity, India accounts for over 300 million people. The power sector is continuously trying to meet this demand by capacity addition but has not achieved success, and one of the reasons for this is population (Agarwal & Maroo, 2013). As population increases, the number of persons in a family increases, and the family also disintegrates, creating new households in villages or towns. This leads to either new electricity connections or increase in consumption due to addition of new appliances.

(2) Economic Development : Consumption of electricity is directly proportional to the economic activities. Consumption increases as the economic activities grow in society. An economic activity takes place as and when different resources are used and combined to produce meaningful and useful objects which people use to satisfy their needs and wants. Speed of conversion can be increased by use of automatic appliances and equipments, which use electricity. It is evident from many empirical research studies that increase in economic development increases per capita consumption of electricity in that country. In the last three to four decades, India has witnessed a drastic increase in activities in all three major sectors of the economy, that is, agricultural, industrial, and the services sectors.

(3) Industrialization : In the first few five year plans, the emphasis was on industrial development. This legacy was continued by Mr. Rajiv Gandhi in 1986 by bringing out the New Industrial Policy. These efforts led to the foundation of India as an industrial country. In the year, 1991, with the introduction of the economic reforms, the opening up of the Indian economy to private players led to industrial development. This has also increased the consumption of electricity.

(4) Development and Introduction of New Technology : Electricity is one of the most important blessings that science has given to mankind. It has also become a part of modern life and one cannot think of a world without it. Due to inventions and due to the availability of electricity and electrification of villages, people have started using digital appliances, equipments, and so on to make life easy and hassle free.

(5) Increase in Disposable Incomes : Increase in industrialization resulted in economic development and growth of the service sector like BPOs, call centers, IT industry. This growth has increased the disposable income of many individuals and families. Rising salaries of these professionals in the private sector and salary hikes of govt. employees lead to an increase in disposable incomes, which resulted in increase in demand of electronic gadgets like laptops, plasma TVs, digital cameras, computers, and so forth, which has increased the usage of electricity in the domestic sector.

(6) Changing Lifestyles : Post the economic reforms in 1991, many businesses opened up for the private sector, and subsequently, the opening of the FDI limit in certain sectors provided huge employment opportunities to Indians. This resulted in the husband - wife working culture. This changed family patterns, and changed the lifestyle of the Indian youth. More and more families shifted to automated home appliances, which increased electricity consumption.

(7) Agricultural Growth : There has been a drastic change in the demand for electricity in the agriculture sector in recent years. Nearly 30% of the total energy is used in this sector. Demand for electricity even grows in case of delayed monsoon or failure of monsoon as due to less monsoon, the water levels of the earth deplete. Lift irrigation like use of borewells requires a large amount of electricity. Also, the use of new design instruments in agricultural processes like cultivation, harrowing, weeding increases the usage of electricity.

(8) Urbanization : Urbanization means movement of people towards the urban areas. People are moving towards urban regions because they want a comfortable life and more opportunities for growth and employment. A major problem in rural areas is unemployment and the non availability of resources like the Internet. Many villages in India are not yet electrified .This is one of the reasons for the displacement of people from rural to urban areas. Normally, urban areas are electrified and hence, this movement of people to urban areas leads to more consumption of electricity.

(9) Rising Trend of Average Temperature of Earth : Deforestation, less rainfall, and increase in pollution levels have increased the average temperatures. Hence, the use and sale of ACs and refrigerators is directly proportional to the increase in average temperature of the earth. According to a survey conducted by the UN, 3% of the growth in electricity demand is caused by global warming.

Need for Demand Side Management (DSM)

To fill the gap of demand and supply by increasing supply through capacity addition may create several environmental and socioeconomic problems in the country. Therefore, to solve this problem, energy conservation is the best way. To meet the vision of "power for all," there is a need to find out the reasons for gap in demand and supply and explain the ways to solve the problem by giving importance to proper communication to address people about the problem, and influence them to go in for energy conservation (DSM), which is only the way to tackle the problem as per the various summits and meetings of the Govt. and energy utility related companies.

Research Objectives

(1) To analyze the demand - supply situation of electricity in Maharashtra.

(2) To identify the determinants of rise in electricity demand and reasons for the shortfall.

(3) To understand the consumers' awareness regarding the real problems of the shortfall, and to examine the initiatives taken by MSEDCL for the proper implementation of DSM.

Rationale Behind the Topic

Availability of electricity all the time and at affordable rates is the key to the socioeconomic growth and development of all sections of the society. Looking into the importance of electricity in solving social problems

like illiteracy, poverty and underdevelopment, it is imperative that everybody shall have equal right to use electricity and try to change his/her life. This can only happen if we all understand and try to solve the problem of shortfall of electricity and problem of misuse of electricity.

In India, because of the increase in industrialization, economic growth, improvement in the standards of living, increase in purchasing power parity, and per capita increase in incomes, the demand for electricity always outstrips the supply. Maharashtra being an industrialized and developed state vis-a-vis other Indian states, here the scenario is very poor, and there has been huge public outcry over this issue. This increase in gap is the result of poor planning and operational inefficiencies built over a period of time. This issue of the demand - supply gap in electricity in Maharashtra is a prime issue in front of the government since the last decade. All the concerned departments have been trying their level best to resolve this issue on a war footing. However, the solution to this problem requires structural changes on all fronts of the electricity value chain - ranging from development of coal mines, improvement in generation, transmission and distribution segments. Short term solutions to mitigate public outcry is to manage demand side as supply addition takes its own time.

This led me to study and identify the issues involved in increase in demand for electricity, consumers' perception, and behavior related to load shedding. I also examined the government's measures for the implementation of DSM, consumers' awareness and action taken for DSM, and so forth.

Statement of the Problem

Frequent and long hours of load shedding affect the daily lives of the consumers. Even if it is varied in different seasons, it lasts for 8-12 hours in the rural areas, which causes unrest among the consumers, and results in agitation, *morchas*, fire in local MSEDCL offices. Therefore, to find out the reasons of increasing demand, shortage of supply, and reasons for huge public outcry against the utility, this topic was selected for research. Electricity utilities try to manage this demand - supply gap by DSM. But the consumers are very large in number, and the utility companies are not able to communicate their suggestions properly. Therefore, for understanding the gap between the consumers and the utilities, the consumers' perception and awareness about DSM were examined.

Research Methodology

↳ **Sampling Frame :** The consumers of MSEDCL are spread widely and are diverse in nature. A sample of 1000 consumers of Amravati zone , consisting of five districts were selected, and care was taken that this sample represents the total population under research. This sample size was then distributed according to the consumer mix of MSEDCL by giving weight to all districts according to their population.

↳ **Sampling Unit and Sampling Size :** The electricity utility company itself divides the consumers into different segments such as : industrial, agricultural, commercial, domestic, and public water works for the convenience of handling. I also used the same because the data available from MSEDCL is in the same form and for understanding and calculation, the segregation was helpful. The Table 3 depicts the category wise distribution of the sample.

Data Collection

The data used for the study of MSEDCL from 1994 to 2011 was collected from State Load Dispatch Centre, (SLDC), Kalwa (Mumbai) by personal visits; for the Indian power sector (1984-2011), the data were collected from the power report . Duration of the study is for 3 years : 2011- 2012.

Table 3. Sector Wise Customer Sample

Sr.No.	Sectors	No. or respondents	% of total
1	Industrial	150	15
2	Agricultural	150	15
3	Commercial	200	20
4	Domestic	300	30
5	Experts from Sector	200	20
	Total	**1000**	**100**

↳ **Primary Data :** In this method, the data were collected directly from the consumers through field visits and survey forms. The information was gathered by visiting consumers personally or getting in touch via phone or over the Internet. Majority of the primary data were collected from the urban regions.

↳ **Secondary Data :** Demand - supply data of the post independence period was available on the websites of different government agencies and departments.

Scope of the Study

The electricity sector in India is grappling with many issues and challenges. There are various factors which affect the demand for electricity in any region. This paper tries to identify the major factors which affected the demand for electricity and what were the major reasons for an increase in those variables. The consumer base of MSEDCL is spread over the whole of Maharashtra, and it would have been difficult and time consuming to cover the entire state. Hence, the primary survey of research to gauge the awareness, perceptions of the consumers, and utilities measured regarding the demand - supply gap was confined to Amravati region. The consumption pattern and timing of load shedding is more or less same in other regions of Maharashtra. Hence, the Amravati region is representative of the entire state of Maharashtra.

Analysis and Results

(1) Advertisements by MSEDCL and Their Effectiveness : From the responses given in the Table 4, it is clear that the promotional techniques adopted by MSEDCL were not effective in penetrating the idea of DSM and conservation of electricity into the minds of the consumers. The people responded in a negative manner to the maximum questions. Nearly 65% of the respondents showed their disagreement over this issue of effectiveness of the advertisements. Hence, it is imperative to use a different kind of strategy to promote DSM among the people.

(2) Consumers' Awareness about Government Plans and Policies : From the Table 5, it can be inferred that there was a mixed response to this factor. It may be because some people might have become aware of the plans advertised or informed by the Government from the newspapers. Some respondents might have not been reading the newspapers, and hence, they gave neutral answers. Overall, the respondents agreed that the government was taking various initiatives to manage the demand - supply gap.

If we analyze the questions and the responses, the picture will be clear. In response to the government's initiative to manage the demand - supply gap, nearly 60% of the people responded in a negative way. That may be because they were not satisfied with the efforts undertaken by the Govt. On the contrary, with respect to capacity addition, 40% of the people gave a positive response. As per the answer to the question whether they knew that MSEDCL was purchasing power, 51% of the people responded in a positive manner and 15% gave a neutral response.

Table 4. Advertisements by MSEDCL & Their Effectiveness

Sr. No		*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	Local newspapers contain daily advertisement regarding DSM and its effective implementation.	245	585	72	84	14
2	MSEDCL company is advertising about DSM program actively.	165	550	173	97	15
3	I have started using energy saving equipments after going through leaflet advertised by MSEDCL.	225	529	36	87	123
4	My family members are energy conscious after utilities awareness programme.	76	214	356	256	98
	Average (Total)	178	469	159	131	63
	% of Total	17.8	46.9	15.9	13.1	6.3

Table 5. Consumers' Awareness about Government Plans and Policies

Sr.No	Sectors	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	Change in government is responsible for increase in consumption.	125	565	145	160	5
2	Government has not taken proper initiative to maintain demand supply gap under control.	23	301	26	585	65
3	Government has taken several initiatives to enhance capacity of electricity generation in Maharashtra.	65	325	65	422	123
4	MSEDCL is purchasing power from other sources to meet the demand.	86	429	152	232	101
	Average (Total)	74.75	405	97	349.7	73.5
	% of Total	7.47	40.50	9.70	34.98	7.35

(3) Initiatives Taken by MSEDCL for the Proper Implementation of DSM : The Table 6 reveals that the respondents discarded the initiatives taken by MSEDCL for implementation of DSM. On an average, 38% of the people agreed with the fact that MSEDCL had taken an initiative. Responses to the question on meeting with an eminent personality and educating customers by employees were highly negative, which means that MSEDCL never invited participation of eminent members of the society for spreading awareness related to their energy saving programme or other initiatives. Participation is necessary for effective implementation of DSM, and the public's anger could have been avoided if measures were implemented well in advance, before the electricity crisis became huge.

(4) Awareness among the Consumers Regarding the Real Problems : From responses to the questions depicted in the Table 7, it is clear that many people knew the fact that demand for electricity always showed a rising trend. This raised questions as to why did the government planners and policy makers not know this fact, and why didn't the government implement effective strategies to resolve this crisis in advance ; 60 % - 65% of the respondents agreed to these questions ; 71.3 % of the respondents responded in a positive manner with regard to the question that Maharashtra is facing acute shortage of supply of electricity. The respondents also gave a 70% positive response to the question of seasonal fluctuations affecting the demand for electricity.

(5) Consumers' Perceptions Regarding Ability of MSEDCL to Handle the Problems : The Table 8 reveals that the consumers were partially in favor of MSEDCL's efforts to tackle the situation ; 80% of the people said that they were aware of the load shedding time table and this was because MSEDCL released information regarding

Table 6. Initiatives Taken by MSEDCL for Proper Implementation of the DSM

Sr.No	Sectors	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	MSEDCL conducts regular meetings with eminent customers from society to take care of their views on DSM implementation.	201	607	154	24	14
2	Employees of MSEDCL company are educating customers regarding judicious use of electricity.	83	513	75	285	44
3	The implementation of DSM program is effective and hence, load shedding is reduced.	58	420	102	322	98
4	I am fully aware regarding energy saving appliances used and their contribution towards energy saving.	23	162	64	626	125
	Average (Total)	91.25	425.5	98.75	314.2	70.25
	% of Total	9.12	42.55	9.87	31.42	7.02

Table 7. Awareness Among Consumers Regarding Real Problems

Sr.no.	Sectors	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	Maharashtra is the most preferred destination for industrial investment since the last 20 years & hence, consumption of electricity is increasing.	4	85	125	604	182
2	Day by day, the consumption of electricity is increasing.	9	203	21	644	123
3	Urbanization is responsible for increase in demand for electricity.	88	168	55	613	76
4	Maharashtra is facing acute shortage of electricity.	37	158	35	713	57
5	Seasonal fluctuation and changes increase the demand for electricity in Maharashtra.	16	246	198	455	85
	Average (Total)	30.8	172	86.8	605.8	105
	% of Total	3.08	17.2	8.68	60.58	10.5

the new time table in all newspapers and the time table was also displayed in all offices ; 53 % of the respondents said that MSEDCL implemented the load shedding as the per time table. This may be because of the supply remaining off due to maintenance work, break down, or reasons other than load shedding. Hence, MSEDCL must take care to cut the supply only as per the load shedding time table. The organization needs to invest in maintenance to avoid frequent breakdowns of supply lines. It needs to ensure proper scheduling of maintenance activities so that maintenance activities are carried out during the load shedding time table only so that the people are not inconvenienced further (as they were already bearing the load shedding schedule).

Findings

(1) Demand is outstripping the supply in India and in all states. The position is quite bad in Maharashtra from the year1994-95 onwards.

(2) In India, many discussions have been carried out by energy professionals, power ministry, utility members for the implementation of DSM. But from the survey, it was found that MSEDCL's advertisements for the implementation of DSM were less effective or were not advertised at all. Hence, this area needs considerable improvement and proper promotion so that this concept becomes clear to the people and gains popularity.

Table 8. Consumers' Perception Regarding Ability of MSEDCL to Handle the Problems

Sr.No	Sectors	*Strongly Disagree*	*Disagree*	*Neutral*	*Agree*	*Strongly Agree*
1	I am aware of load shedding time table.	8	185	6	575	226
2	MSEDCL implements load shedding as per time table published in newspapers.	76	342	48	411	123
3	The load shedding time table is prepared as per the convenience of the customer.	23	321	29	442	69
4	Employees are taking care that supply will be maintained other than load shedding.	45	474	40	356	85
	Average (Total)	38	330.5	30.75	446	125
	% of Total	4	33	3	46	14

(3) The consumers were not aware about the plans and efforts undertaken by the utility for the implementation of DSM. Frustrated people hurt the employees, set offices and property on fire, and create disturbances in society. If reasons of the demand -supply situation and reasons for the shortfall are explained by proper use of various media, then this problem of vandalism may not arise, and maybe, even the citizens will provide some solutions to solve the problem.

(4) Maximum consumers agreed that the load shedding time table was published in the newspapers and were aware that their state was facing an electricity crisis, and hence, MSEDCL was implementing load shedding.

Hypothesis Testing

➔ H1: Consumers were not aware about DSM and energy saving schemes.

This hypothesis was framed upon the basis of discussion with experts in the field and focus interviews. In order to ascertain the consumers' knowledge about DSM and their habit of using energy-saving appliances, the questions were framed and categorized into five factors as shown in the Table 9.

Nearly 65% of the respondents showed their disagreement over this issue of effectiveness of advertisements. There was a mixed response to this factor. It may be because some people might have come to know about the advertised plans or read about the same in the newspapers. With regard to the issue related to the government's initiative to manage the demand supply gap, 52% of the consumers responded in a negative way. On an average, 38% of the people agreed to this fact that MSEDCL had taken an initiative. The remaining were neutral because they might not have technical understanding about the issue.

With regard to awareness about the problem of the shortage of electricity supply due to increasing demand - 71% of the respondents said that they were aware of the same ; 71.3% of the people responded in a positive manner that knew that their state was facing acute shortage of electricity supply. Respondents also gave 70% positive response to the question that seasonal fluctuations affected the demand of electricity; 60% of the consumers gave a positive response regarding the ability of MSEDCL to handle the problem by implementing load shedding as per the time table published in newspapers ; 53 % of the respondents revealed that MSEDCL implemented load shedding as per the time table.

Hence, it is clear that the consumers were aware regarding the shortage of power supply. However, they were not quite aware about DSM and energy saving schemes implemented by MSEDCL. Therefore, H1 is accepted.

Recommendations and Suggestions for the Energy Conservation Program

After going through all aspects of the power sector, its problems, MSEDCL's efforts to meet the demand supply

Table 9. Consumers are Not Aware about DSM and Energy Saving Schemes

Sr. No	Factors	Agree (%)	Disagree (%)	Neutral (%)
1	Advertisement by MSEDCL & its Effectiveness	19	65	16
2	Consumer awareness about government plans and policies	42	48	10
3	Initiatives taken by MSEDCL for the proper implementation of the DSM	38	52	10
4	Awareness among consumers regarding real problems	71	20	9
5	Consumers' perception regarding ability of MSEDCL to handle the problems	60	37	3

gap through DSM, one thing predominantly emerges - that is, in all efforts, there is lack of connection and communication with the customers. Hence, the following action plan is recommended for effective implementation of DSM.

(1) Effective marketing strategies for the implementation of DSM.

(2) Integrated communication mechanism to reach the masses.

(1) Effective Marketing Strategies for the Implementation of DSM

↳ First of all, it is imperative to divide all the customers into different segmentation depending on their similar characteristics, needs, geographical position, and consumption of electricity patterns.

↳ Identify and design suitable plans to penetrate the ways and means of reducing consumption of electricity into the minds of customers for creating a sustainable future.

↳Next step in this strategy will be to position and promote this idea through a well crafted promotional technique.

↳ Communication plays an important role in promoting any idea ; hence, the help of advertisement agencies can be sought.

↳ MSEDCL has to communicate this idea to lakhs of people. Hence, due care must be taken to select a suitable communication medium to communicate with the customers. Details have been elaborated in the next paragraph :

↳ MSEDCL needs to devise various means of communication from print, audio-visual to individual for effective implementation of the energy conservation campaign. It must learn from the successful Pulse-Polio eradication campaign of the health ministry.

↳ The utility needs to establish institutional partnership and stakeholder engagement for better success.

↳ It needs to allocate adequate human and financial resources and explore ways and means to leverage funds from partners and stakeholders.

↳ It needs to monitor and evaluate the success and drawbacks so that these factors can be taken into consideration in designing the next energy efficiency cycle.

(2) Integrated Communication System for Creating Awareness About Energy Conservation : Integrated marketing communication means mobilizing all the resources by selecting proper channels and media so that a clear message can reach the consumer. There are various means and media of communication ; one has to use those as per the target audience.

The following are the recommendations and ways through which MSEDCL can improve its communication for this program.

(i) Communication with the Consumers : Consumers are the end users of electricity. Load shedding affects the life of these people .If they understand the importance and benefits of energy conservation, they will support the program. Awareness can be spread by using various communication tools - like leaflets , poster flyers, billboard messages, arranging conferences/workshops at schools/ colleges , direct mail, emailers, and so on.

(ii) Communication with Opinion Leaders and Mass Leaders : Persons like professionals in society, leaders of ruling and opposition parties at the tehsil level, and administrative heads of tehsils need to be involved in the process. After hearing the problems of the demand - supply gap, these leaders would be able to influence their followers to refrain from antinational activities and start using electricity in a judicious manner.

(iii) Communication with Employees : Employees at the front end are the consumer touch points of any service organization, and a company can reach the masses through these employees. The biggest positive point of MSEDCL is that it has nearly 70000 front end employees who impart services through different offices. These employees are having good contact with the consumers in their area, and they, if trained properly, can inform and influence the consumers to use electricity in a judicious manner.

(iv) Use of Various Other Means for Communication

- Public announcements,
- Paid advertising ,
- Communication through bills,
- Communicating at billing collection centers,
- Communicating and advertising at local events,
- Communicating through resident welfare associations (RWAs),
- Buy-in of community or local leaders,
- Target early adopters.

Conclusion and Implications

Electricity is a critical infrastructure on which the socioeconomic development of a country depends. In a growing economy, the demand for electricity increases at a faster rate due to numerous reasons that have been discussed in this study. Therefore, it is the responsibility of the government and the utility companies to provide continuous, affordable electricity to all, and if any structural problem is present, then the same needs to be communicated to the consumers. Utility companies use DSM strategies to bring awareness among consumers, but it has not been implemented properly in case of MSEDCL. Proper implementation of marketing strategies would bring in the required awareness among the consumers, and would help to solve the problems arising due to the demand - supply gap.

Judicious use of electricity will result in effective utilization of scare resources like coal because a large share of electricity in India is generated through thermal power plants, dam water, and so forth. Effective use of electricity will increase the efficiency of organizations and individual households, which will result in the progress of the nation. As we know, in India, the policy of land acquisition and non availability of water in the summers for electricity production creates a problem to satisfy the growing economic demand of the country. Judicious use of electricity may help to solve such problems. Lastly, environmental pollution is the biggest threat the world is facing today, and less electricity generation means less pollution. Therefore, it is essential to influence the consumer for its effective use.

Limitations of the Study and Scope for Further Research

The unavailability of data of previous years in a proper format on economic indicators & demand and supply of electricity is a major limitation of this research. Moreover, the agencies entrusted to maintain data are different; hence, their way of collecting data and displaying it is either different or is restricted for the public. There are numerous factors on which the demand for electricity depends. The time factor of many variables impacts the consumption of electricity - such factors and their relationships can be explored in future studies. The results of the study may not be generalized for the rest of Maharashtra. It is very difficult to identify and classify a consumer on the demographic basis as the same consumer falls in different categories. The responses from such consumers may be mixed due to their multi faceted personality.

Future studies can conduct a comparative analysis of different States of India so that overall, knowledge of consumers in different areas can be obtained, and different marketing strategies as per the consumers can be implemented.

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