CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

Kerala State Electricity Board (KSEB) was a statutory body constituted in 1957 under section 5 of the Electricity Supply Act 1948 for the coordinated development of generation, transmission and distribution of electricity in the state. The assets, liabilities, rights and obligations of KSED which was already vested into the state government, were re-vested to new successor entity Kerala State Electricity Board Limited (KSEBL) in 2008.

The major source of power generation in Kerala are hydel, thermal, wind and solar. The total installed capacity of power in the state as on 30 June 2021 was2983 MW. 694 MW was contributed by hydel projects2. Kerala had been an energy surplus state till 1983 and used to export electricity to other state but since 1983 Kerala become energy deficient state depending heavily on its hydro system for its elasticity needs. KSEB had a past of restricting the internal demand by under investing in transmission and distribution networks as well as keeping the supply voltage low. Electricity generation in Kerala heavily depends on the availability on monsoon and the recurring power shortage is a major obstacle for the industrial growth and economic development of Kerala.

Energy is an essential economic infrastructure required for a country or a region for accelerating its economic growth. A reliable and sustainable energy supply is much needed for generation of income, employment and growth of any region. India is the third largest producer of electricity in the world. The national electric grid in India has an installed capacity of 388.134 GW as of 31 August 2021. Renewable power plant, which also include largest hydroelectric plants, constitute 37% of India's total installed capacity. During the fiscal year (FY) 2019-20 the gross electricity generated by utilities in India was 1,383.5 Twh and total electricity generation in the country was 1598 Twh 1 . The gross electricity consumption in FY2019 was 1208 Kwh per capita.

Over the years, the consumption of heavily subsidized domestic sector has been increasing and now it accounts for approximately 46 percent of the total energy consumed.

The peak demand in the state has increased to almost twice the off-peak demand. This forced more investment in the power system to meet the peak demand and purchase from the outside the state. The Board has been supplying electricity at lowest price in the country for several decades. Because of this the Board had to resort to heavy borrowing to meet the expenses.

1.2 STATEMENT OF THE PROBLEM

Kerala State Electricity Board (KSEB) is the main channel to allocate the electricity needs in the state. The increase in demand will increase the average cost of supply, because of declining share of hydropower and need to buy costlier thermal power from other states. This creates further pressure on the financial position of the KSEB, or it will be forced to reduce the quality as well as quantity of power from national grid. So we want to depend up on the other neighboring states. Then the only option remaining is to reduce the use and waste of energy by following various demand management policies. For implementing this practice a basic knowledge about the demand and supply of electricity from the side of KSEB and household is essential. It is for this purpose the present study is designed.

Kerala is a state whose primary energy source is electricity generated from hydroelectric projects. Till mid 1980‟s Kerala was a state with excess supply of electricity which was sold to its neighboring states. But from 1985 onwards the trend started reversing mainly due to the unprecedented increase of household users basically due to massive home electrification. Currently the state faces acute shortage of electricity in summer especially in the years of monsoon failures. Lack of awareness of people regarding the need to save electricity, increased use of modern electric gadgets and home appliances made the crisis much worse. Many times the government and KSEB which is the monopoly electricity supplier in the state are forced to increase the tariff rates, impose power cuts and load shedding. At present

there is no proper policy to manage the household power consumption on supply side as well as demand side in Kerala.

1.3 SIGNIFICANCE OF THE STUDY

Electricity is a critical component as well as a determinant of nations development. It has become an inevitable influence up on life and forming consumption level in developed as well as developing countries. It has become a part of modern life and one cannot think a world without it. It has many uses in our day-to-day life. Modern means of transportation and communication have been depends up on it.

Kerala is a consumer state quite differ from other neighboring states like Tamil Nadu and Karnataka. In Kerala consumption of electricity is mainly for domestic purpose (53%). There are several external factors influencing our consumption pattern. The main factors are education, income, family size etc. These variables give direction to the electricity consumption. The consumerism led to the purchase of modern electronic gadgets even among the lower income groups which in turn increased the electricity consumption of household section. But the supply of electricity is less than proportionate to increase in electricity demand. There arises the gap between demand and supply of electricity level. This gap can be eliminated either through a reduction in demand or increases in supply. Increasing the supply of electricity to the level we actually required is not an easy task. Then the next alternative way is managing demand side. It is expected that the present study will help to create awareness about necessity of practicing demand management policies and also the policy makers can move in that direction.

1.4 OBJECTIVES OF THE STUDY

- To examine whether there is any significant mismatch between demand and supply of electricity in Kerala.
- To analyse the relationship between income of households and consumption of electricity.
- To examine various demand management policies adopted by both KSEB and consumers.

1.5 SCOPE OF THE STUDY

The scope of a study titled "A Study on Consumer Awareness and Perception Towards Credit Cards" involves a comprehensive investigation into how consumers perceive and understand credit cards. This study aims to explore various facets of consumer awareness and perception regarding credit cards, which can include the following key components: This aspect involves assessing the level of knowledge consumers possess about credit cards. It includes understanding whether consumers are aware of the basic features, terms, and conditions associated with credit cards. This part of the study focuses on how consumers perceive credit cards in terms of benefits, risks, and utility. It delves into consumers' attitudes and beliefs regarding credit card usage.

1.5 RESEARCH METHODOLOGY

The present study makes use of both primary and secondary sources for data. The primary data were collected from the residential consumers through a standardized questionnaire. In the study there exist 100 sample respondents. The secondary data has been collected from a wide range of official documents published by both governmental and nongovernmental organizations. All the source of information have been verified and providing correct information. The annual reports published by the Kerala State Electricity Board have been used. In order to analyze and interpret the available information, various measures like percentage, charts, diagrams etc. were used.

Statistical Tools Used

To strengthen the analysis some of the basic statistical tools like Mean, „t“ test, $\chi 2$ have been used.

Sample Design

A random sampling technique was used for the selection of households. The households are spread over 20, 31, 32 division of Kannur corporation.

1.7 PERIOD OF THE STUDY

The study is conducted on the period of 21 days.

1.8 LIMITATION OF THE STUDY

The present study has chosen one district for data collection and hence the result could not be generalized completely to macro level. Further the number of villages chosen from each region is very limited and hence it has not covered the maximum extent of the area of research.

The primary data collected from the respondents are not free from bias, since they have not maintained any record for their consumption activities; there are possibilities of getting the problems of recall errors. Thus, the information collected from them may not be cent per cent correct. This study concentrates only on household sectors. The other sectors like agriculture, industry and transport are not included hence the scope of the research is limited.

The tools used for the analysis may have their own limitations and the study suffer from the defects associated with them.

CHAPTER II

REVIEW OF LITERATURE

2.1 REVIEW OF LITERATURE

Merih, V, & Alan (2003) examines that two methods are currently used to model residential energy consumption at the national or regional level: the engineering method and the conditional demand analysis (CDA) method. One of the major difficulties with the use of engineering models is the inclusion of consumer behaviour and socioeconomic factors that have significant effects on the residential energy consumption. The CDA method can handle socioeconomic factors if they are included in the model formulation. However, the multicollinearity problem and the need for a very large amount of data make the use of CDA models very difficult. It is shown in this paper that the Neural Network (NN) method can be used to model the residential energy consumption with the inclusion of socioeconomic factors on appliances, lighting and cooling component of the NN based energy consumption developed for the Canadian residential sector is presented here and the effects on some socioeconomic factors on the residential energy consumption are examined using the model.

Uwe & Sylvia (2003) in their study empirically test the effectiveness of a customer information program to decrease energy demand by increasing efficient electricity use. The demand side management (DSM) program aims at reducing the lack of information on the customers side that is documented in this literature. The DSM program which is particularly well suited to investigate this issue as strategic behaviour is ruled out in this setting for both customers and suppliers. The study found that providing customers with information reduced overall electricity demand by roughly 7% as well as reducing demand fluctuations over the year. Further, find that the DSM program had a larger impact upon long run demand, with consumers short run demand behaviour not being changed significantly.

Naeem Ur (2010) the main purpose of his study was to explore the role of economic and non- economic factors in the determination of household‟s demand for electricity

in district of Peshawar. Primary data was collected for this purpose from 200 households. Multinomial logistic model was used to derive estimates. The study concluded that income,number of rooms, price of electricity, weather and education are important determinants of household demand for electricity in study area. The study suggested that a provincial level study was helpful for the government in understanding the real pattern of domestic demand for electricity.

Adjaye (2006) in his study validated the existence of long-run relationship between electricity consumption and GDP. GDP positively affects electricity consumption in the longrun and short-run as well. The energy consumption congregates to the long run by 17% convergence rate that confirms the system stability. The T – Y approach was used to investigate the direction of causality between electricity consumption and GDP.

Wilhite (2012) examined the reasons behind growth in middle class household electricity consumption in India. Where household appliances were rapidly taking a place in home cooking, cleaning and cooling consumption. An important finding was that women were indirectly responsible for increasing consumption as home appliances were purchased to alleviate time pressure. Social performance was also contributing to changing consumption; the purchase of household appliances was not only a sign of „ getting ahead‟ but also of„keeping up‟ with rapidly changing consumption norms.

Sharma, Parameswara, Nair, & Balasubramanian (2002) in their study found out that rapid growth in the demand for commercial energy in Kerala, posed serious development constraints in the recent past. The crucial issue of managing this demand will be of great importance in formulating the future development policy of the state. This study incorporated OLS estimation, Cochrane- Orkut method etc. The policy implications and related key issues have been addressed. The study identifies the urgent need for special attention in evolving effective energy policies to alleviate an energy famine in the near future.

CHAPTER-III

THEORETICAL FRAMEWORK

3.1 OVER VIEW OF ELECTRICITY SECTOR IN INDIA

The power sector in India has undergone significant progress after independence. When India become independent in 1947, the country had a power generating capacity of 1,362 MW. Hydro power and coal based Thermal power have been the main sources of generating electricity. Generation and distribution of electrical power was carried out primarily by private utility companies. Notable amongst them and still in existence is Calcutta Electric Power was available only in a few urban centers; rural area and villages did not have electricity. After 1947, State Electricity Boards (SEBs) were formed in all the states. The concept of operating power systems on a regional basis crossing the political boundaries of states was introduces in the early sixties. In spite of the overall development that has taken place, the power supply industry has been under constant pressure to bridge the gap between supply and demand.

Other than PSUs and state level corporations, private sector enterprises also play a major role in generation, transmission and distribution of power, about 21.17% (36761.19MW) of total installed capacity is generated by private sector. The Power Grid Corporation of India is responsible for the inter-state transmission of electricity and the development of national grid.

DEMAND AND SUPPLY OF ELECTRICITY IN INDIA

India is world's 6th largest energy consumer, accounting for 3.4% of global energy consumption. Due to India's economic rise, the demand for energy has grown at an average rate of 3.6% per annum over the last 30 years. At the end of 2021, installed power generation of India stood at 2983 MW while the per capita energy consumption was 733.54 kWh (200809). The Indian government had set an ambitious target to add approximately MW of generation capacity by 2012. The total demand for electricity in India is expected to cross 950,00 MW by 2030.

India is the sixth largest in terms of power generation. About 65% of the electricity consumed in India is generated by thermal power plants, 22% by hydroelectric power plants, 3% by nuclear power plants and rest by 10% from other alternate sources like solar, wind, biomass etc. 53.7% of India's commercial energy demand is met through the country's vast coal reservs. The country has also invested heavily in recent years on renewable sources of energy such as wind energy. In addition, India has committed massive amount of funds for the construction of various nuclear reactors which would generate at least 30,000 MW. India unveiled a $19 billion plan to produce 20,000 MW of solar power by 2020.

Due to shortage of electricity, power cuts are common throughout India and this has adversely effected the country's economic growth. Theft of electricity, common in most parts of urban India, amount to 1.5% of India's GDP. 84.9% of Indian villages have at least an electricity line(2010-11), just 46 percent of rural households have access to electricity3 . Now the thing was changed, electricity is access to almost all areas.

POWER SECTOR IN KERALA

The Kerala State Electricity Board Limited is the successor entity of State Electricity Board which was constituted by the Government of Kerala, as per order no. EL16475/56/PW dated 7-3-1957 of the Kerala State Government, under the Electricity(supply) Act, 1948 for carrying out the business of Generation, Transmission and Distribution of electricity in the state of Kerala.

As per section 172(a) of the Electricity Act 2003 and as mutually decided by the Government of India and Government of Kerala, KSEB had continued as Transmission utility and Distribution licensee till 24-04-2008. In exercise of the powers conferred under Section 131(2) of Electricity Act, 2003, Government of Kerala notified Kerala Electricity Second Transfer Scheme (Re-vesting) 2013. Through this notification all the assets, liabilities, rights and obligations of erstwhile KSEB vested into State Government by first transfer scheme dated 25.09.2008 were retested to the successor entity.

The Kerala State Electricity Board Limited has been incorporated under the Companies Act, 1956 on 14th January 2011 and started operations as independent company with effect from 1st November 2013. The Board consisting of the chairman and the members was Supreme Governing Body and the Board was required to place annual financial statement and supplementary statements before the State Electricity Consultative Council, constituted by State Government.

Over the last fifty nine years, the Board has grown from a total installed capacity of 109 MW to an installed capacity of 2823 MW and created Transmission and distribution networks of 10404 and 272480 circuit kilometers. There is an incremental growth in the power system brought several changes. The input cost structure and revenue composition have changes.

Over the years, the consumption of heavily domestic sector has been increasing and now, it is around 46% of total energy consumed. This forced more investment in the power system to meet the peak demand and purchase of energy from outside the state. The Board supplying electricity at lowest prices in the country over several decades. As a result the Board had to require heavy borrowings to meet the expenses.

DEMAND AND SUPPLY OF ELECTRICITY IN KERALA

As per the present power supply position in the state, Kerala has about 3.35% peak power shortage & 0.52% energy shortage during FY 2014-15. The state would see an increase in peak demand from 3727 MW at present (FY 2014-15) to 5821 MW in FY 201920 with corresponding increase in energy requirement from 22040 MW in FY 2014-15 to 39620 MW in FY 2019-20.

The available capacity for the state as on 31st march 2015 was 4412.87 MW. In order to meet the estimated increased demand for providing 24x7 power supply in the state, the state has already planned additional capacity availability of 2332.75 MW by FY 2019-20 through own generating stations, renewable energy sources, central generating stations and long-term medium term PPAs in a phased manner. Out of this, 822.40 MW shall be added through non- conventional energy sources and balance 1510.35 MW through conventional sources.

The state will have a surplus of about 10.4% to 2.43% in terms of peak demand during the FY 2015-16 to FY 2019-20. During the same period, state will also have availability of surplus energy in the range of 1.37% to 3.39% except during FY 2015-16 in which the state will have energy deficit of about 4.91%. Therefore, the Kerala state will remain as power surplus state during the entire study period having surplus in both peak power energy availability. As the state generation is heavily dependent on hydro & RES sources, the above surplus scenario may change slightly on year-to-year basis spending upon monsoon scenario in the state.

TRANSMISSION AND DISTRIBUTION OF ELECTRICITY

Transmission of electricity is defined as bulk transfer of power over a long distance at high voltage, generally of 132KV and above. In India bulk transmission has increased from 3,708 ckm in 1950 to more than 166000ckm, out of which 75556ckm is transmitted by Power Grid Corporation of India. The Kerala grid has grown considerably during recent years. We have as many as 418 Substations spread across the state as on 01.12.2019. Also, the total length of our transmission network is 12845.55 Ckm. The total power transfer capacity of our substations stands at 20,933.4 MVA as on 30.09.2019.

The entire country has been divided into five regions for transmission systems, namely, Northern Region, North Eastern Region, Southern Region and Western Region. The Interconnected transmission system between each region is also called regional grid.

The South region, headed by the chief Engineer (Distribution South) with headquarters at Thiruvananthapuram, has a consumer strength of 36,02,412. This region consists of 7 Electrical Circles, 20 Electrical Divisions, 64 Electrical Sub Divisions and 217 Electrical Sections, as on 31st march 2021.

The Central region is headed by the Chief Engineer (Distribution Central) with headquarters at Ernakulam, has a consumer strength of 39,78,099 and consists of 7 Electrical Circles, 24 Electrical Divisions, 70 Electrical Sub Divisions and 235 Electrical Sections, as on 31st march 2021.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

Table No. 4.1

Demographic Profile of the Respondents

Socio-demographic profile	Frequency	Percent
Gender		
Male	72	72.0
Female	28	28.0
Total	**100**	**100.0**
Educational qualification/ Equivalent Qualification		
SSLC and below	39	39.0
Plus two	32	32.0
Degree	19	19.0
PG	10	10.0
Total	**100**	**100.0**
Location of Residence		
Rural	54	54.0
Urban	46	46.0
Total	**100**	**100.0**
Monthly Family Income		
<15000	42	42.0
15000-25000	29	29.0
25000-35000	13	13.0
35000-45000	8	8.0
>45000	8	8.0
Total	**100**	**100.0**
Number of members in the family		
2 and below	5	5.0
3	16	16.0
4	48	48.0
5	24	24.0
6	3	3.0
7	3	3.0
11	1	1.0
Total	100	100.0

Source: Primary Data

The above table reveals that out of 100 total respondents, 72 percentage respondents were male and remaining respondents of 28 percentages were female domestic consumers of KSEB Ltd. Hence majority of the selected domestic consumers of KSEB Ltd were male. Out of the 100 total respondents, 39 percentage of respondents have qualification either SSLC or below and 32 percentage of respondents have Plus two qualification, 19 percentage of respondents have qualification of Degree and 10 percentage of respondents have PG qualification.

Out of total 100 respondents, 54 percentage respondents are from rural area and remaining 46 percentage respondents are from the urban area. Hence majority of the selected domestic consumers of KSEB are from the rural area. Out of this 100 samples, 42 percentage respondents have less than a monthly income of 15000, 29 percentage respondents have monthly income between 15000-25000, 18 percentage respondents monthly income between 25000-35000, 8 percentage respondents have the monthly income of 35000-45000 and the remaining 8 percentage respondents have the monthly income above 45000. It shows that more than half of the households have income are below 35000.

Out of our total respondents, 48 percentage respondents have four members in their family, 24 percentage respondents have five member family, only 7 percentage households have more than five member and 21 percentage respondents have below four member family.

Hence majority of the selected respondents are from a nuclear family.

Table No. 4.2

Details of Housing of Respondents

Housing Details	Frequency	Percentage
Type of Building		
Single storied	34	34.0
Multi storied	66	66.0
Total	**100**	**100.0**
Number of rooms		
Less than 6	14	14.0
6-8	49	49.0
8-10	30	30.0
Above 10	7	7.0
Total	**100**	**100.0**
Area in Square Feet		
Below 800	18	18.0
800-1300	42	42.0
1300-1800	28	28.0
1800-2300	10	10.0
Above 2300	2	2.0
Total	**100**	**100.0**

Source: Primary Data

The above table reveals that, out of the selected 100 respondents, 66 percentage respondents have multi-storied building and the remaining 34 percentage respondents have single storied building. Hence two third of the selected domestic consumers of KSEB Ltd. have multi-storied building. Out of the 100 respondents, 14 percentage respondents have less than 6 rooms in their house, 49 percentage respondents have 6-8 rooms, and the 7 percentage respondents have above 10 rooms. Thus near half of the respondents have 6-8 rooms in their house. Out of the 100 respondents, 42 percentage respondents have house of 800-1300 sq. Ft, 2 percentage respondents have above 2300 sq. ft. So, 42.0 percentage of the respondents have houses with 800-1300 sq. ft.

Consumption pattern of Electricity

This part of the chapter analyses the level of electricity consumption and type of electricity connection.

Table No. 4.3

Level of Electricity Consumption

Consumption level	Frequency	Percentage
High	34	34.0
Medium	40	40.0
Low	26	26.0
Total	**100**	**100.0**

Source: Primary Data

The above table deals with the level of electricity consumption by the domestic consumers of KSEB. The result identified that out of the 100 domestic consumers of KSEB, 40 percentage consumers consume moderately, 34 percentage respondents have high level of electricity consumption and the remaining 26 percentage respondents have only a low level of electricity consumption. From this, it is found that, most of the domestic consumers of KSEB Ltd. consume the electricity at a moderate level.

Table No 4.4

Type of Electricity Connection

Connection type	Frequency	Percent
Single phase	85	85.0
Three phase	15	15.0
Total	**100**	**100.0**

Source: Primary Data

Table _ deals with the type of electricity connection of the selected consumers of KSEB Ltd. It reveals that out of the 100 respondents, 85 percentage respondents have single phase connection in their house, remaining 15 percentage respondents have three phase connection. Hence majority of the respondents have single phase connection in their house.

Table No. 4.5

Consumption Pattern

Monthly income	Per capita consumption
<15000	12.71
15000-25000	16.04
25000-35000	23.25
35000-45000	34.03
>45000	41.30

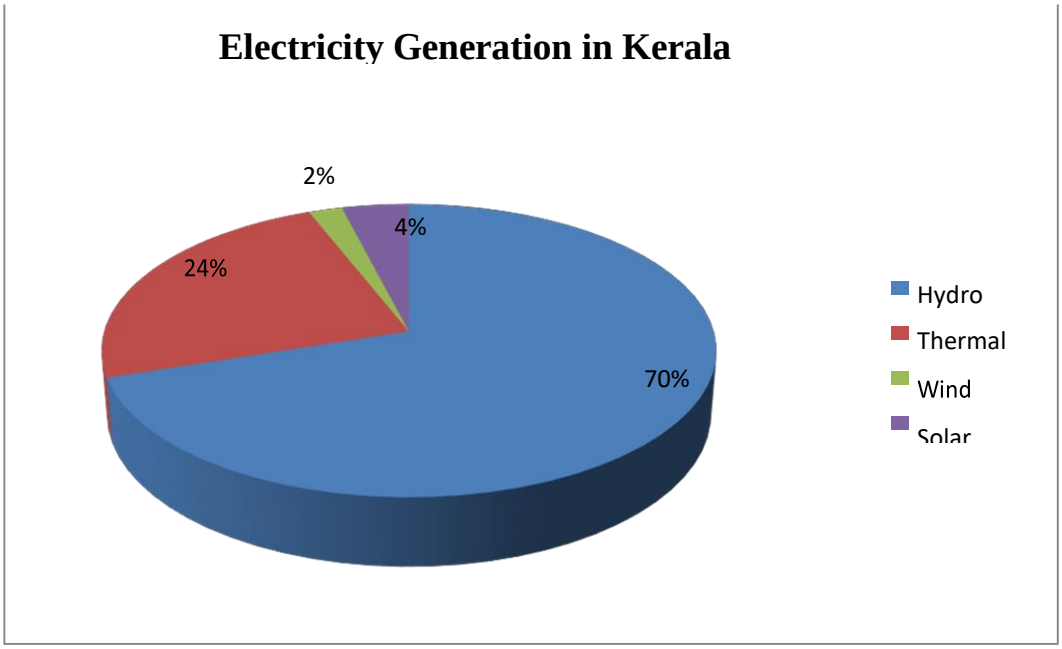
Source: Primary Data

The above table shows that per capita consumption is low for those whose monthly income is less than 15000 and high for those whose income is greater than 45000. It is observed that the per capita consumption of power increases according to their income.

Physical Performance of KSEB Ltd.

The physical performance is evaluated by assessing the demand and supply of electricity in state. Monsoon is essential to sustain the hydropower base in the state and the shortage in rainfall usually creates power crisis. It imports electricity from outside sources at a higher prices to meet the increasing demand. Hydel energy is the most reliable and dependable source in Kerala. The major sources of electricity generation and its contributions are shown through the following figure:

Sources: www.kseb.in



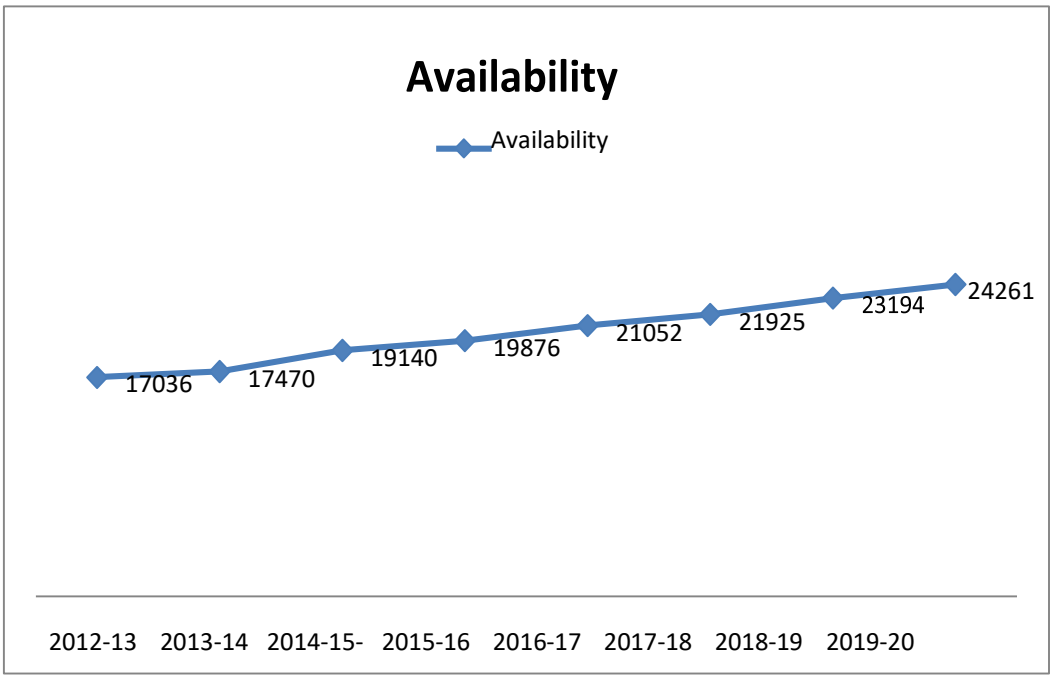
In this figure it is clear that major part of our electricity generated through hydel and the least source of generation is wind. We can say that is highly dependent on hydro project for electricity generation.

Distribution of Electricity in Kerala

The KSEB Ltd deemed distribution licensee. There is other distribution licensee in the state namely, Kannan Devan Hills, Thrissur municipal corporation, Cochin port trust etc. These distribution licencees purchase electricity from KSEB Ltd. and supply it to their consumers. A common uniform retail tariff is applicable for various categories of consumers.

Figure No. 4.2

Availability of Electricity in Kerala



Source: Report of KSEB Ltd

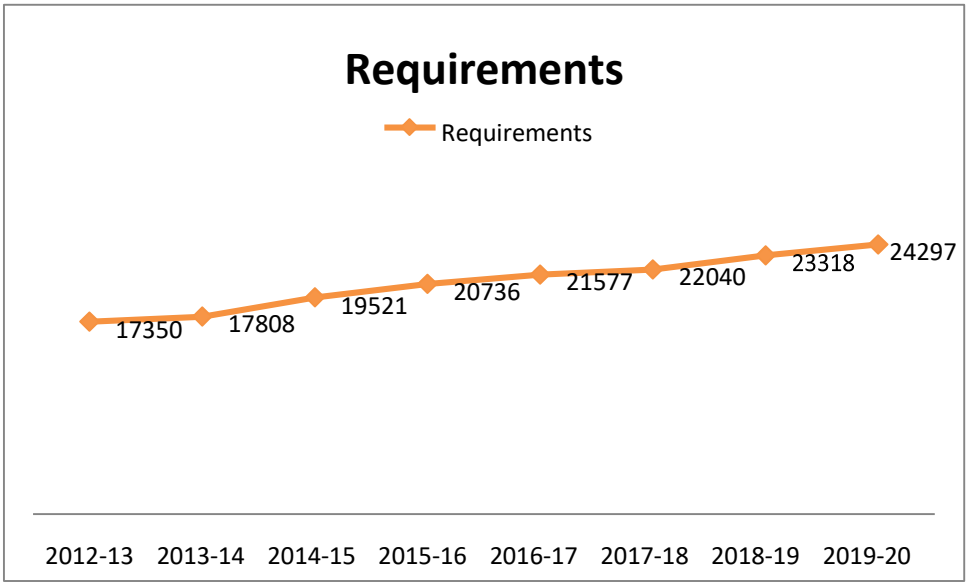
The above line graph represents the supply trend of electricity in Kerala. It shows an increasing trend. This supply is made on the basis of imports at higher costs. KSEB Ltd purchases power from the central Generation Stations, Independent power producers, Traders and through energy exchanges from generating stations outside Kerala at a higher cost to meet the power deficit.

Requirements of Electricity in Kerala

The requirements of electricity are increasing day by day. In the modern life style in order to make our work simple and easier modern electrical equipment are increasingly using even in the house. The following figure shows the requirement of electricity in Kerala in million units for a period of 8 years from 2012-13 to 2019-20.

Figure No. 4.3

Requirements of Electricity in Kerala



Source: Report of KSEB Ltd.

This figure shows increasing trend in the electricity requirements of the people. This increasing trend may because of the increased use of electrical equipment in the modern life style.

Growth Rate of Electricity Requirement and Availability

The following table shows growth rate of electricity requirement and availability in Kerala for the eight years.

Table No. 4.6

Growth Rate of Electricity Requirement and Availability

Year	Electricity Requirement Growth Rate %	Electricity Availability Growth Rate %
2012-13	0	0
2013-14	2.64	2.55
2014-15	9.62	9.56

2015-16	6.22	3.85
2016-17	4.06	5.92
2017-18	2.15	4.15
2018-19	5.8	5.79
2019-20	4.20	4.6
Average Annual Growth Rate	4.96	5.2

Source: Report of KSEBL

In the above figure we can see that in certain years our requirements are greater than the existing available electricity supply. That is there exist deficit in the electricity supply and as a result we have to depend more up on the borrowing of electricity from the other states.

Growth Rate of Per capita Consumption

The following table shows growth rate of per capita consumption of electricity for the last10 years.

Table No. 4.7

Growth rate of per capita consumption of electricity

Year	Per capita Consumption (kWh)	Growth Rate (%)
2009-10	345	0
2010-11	366	6.09
2011-12	375	2.46
2012-13	420	12
2013-14	436	3.81
2014-15	478	9.63
2015-16	501	4.81
2016-17	516	2.99
2009-10	345	0
2017-18	544	5.43

2018-19	565	3.86
2019-20	592	4.78
Average Growth Rate		5.59

Source: Power system statistics report

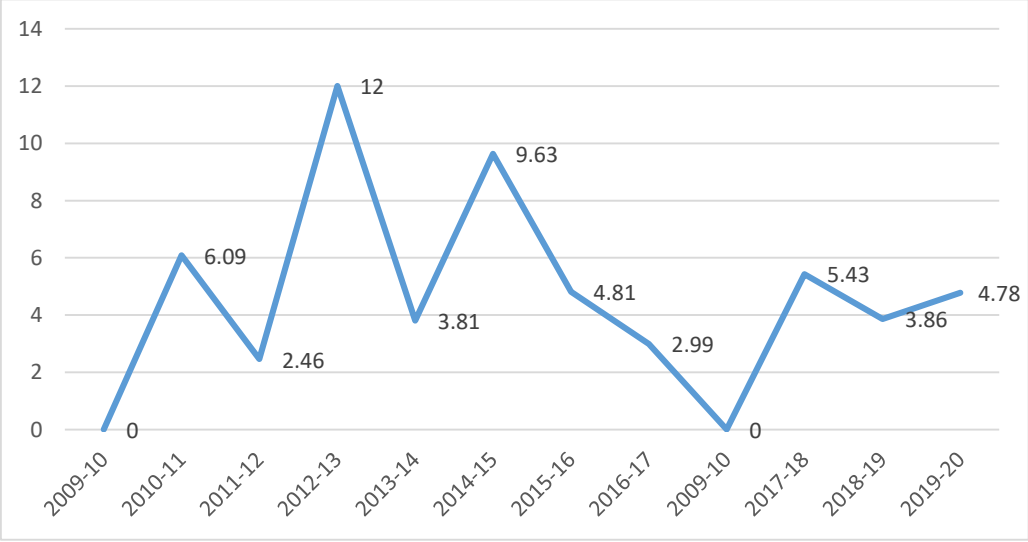
The above table reveals that the Average Annual Growth Rate is 5.59%. The period 2012-13 shows an increase in the per capita consumption of electricity, i.e. 12% and where as, it was only 9.63% for 2014-15. For all the other years, there is no significant variation.

Deficit of electricity in Kerala

We know that Kerala is facing deficit in electricity supply. This is because our demand exceeds our existing supply of electricity. Following line chart shows the deficit of electricity in Kerala for the last eight years.

Figure No. 4.4

Electricity Deficit in Kerala



Sources: Report of KSEB Ltd

The above line chart reveals that there is a wide gap in the electricity demand and supply in Kerala. In the early time periods there is increase in deficit of electricity availability and reach to a peak, after that there is a decline in the deficit. To meet the increasing electricity requirement, KSEB Ltd made capacity additions and power purchase agreements with central generating stations and independent power producers.

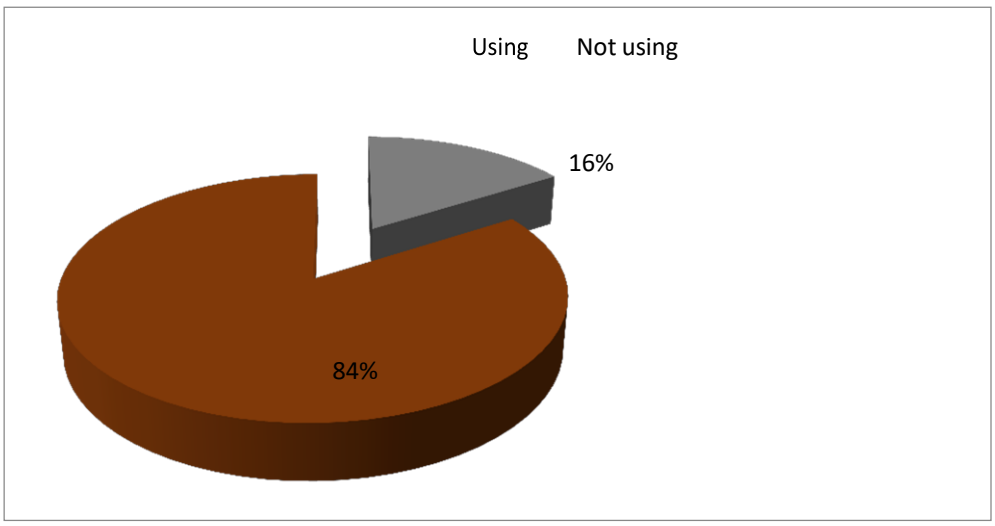
Scope for Demand Side Management

This part deals with the scope for Demand Side Management in the household sector. It involves the scope for alternative source of energy, time span of electrical appliances and the time use of appliances.

The usage of alternative source of energy play important role in the demand side management policies. The alternative source represents substitutes of electricity that can be used in our day to day activities for the reduction of dependency up on electricity and there by reduce its usage. Usage of alternative source of energy in the household sectors is shown by the following figure.

Figure No. 4.5

Use of Alternative Source of Energy by Households



Source: Primary Data

The above figure represent that 16% of the households are using alternative source of energy. Solar or biomass or other are commonly used alternatives by the domestic consumers. 84% households are not using any alternative sources. There is wide scope for DSM through the use of alternative sources.

Table No. 4.8

Time Span of Electrical Home Appliances

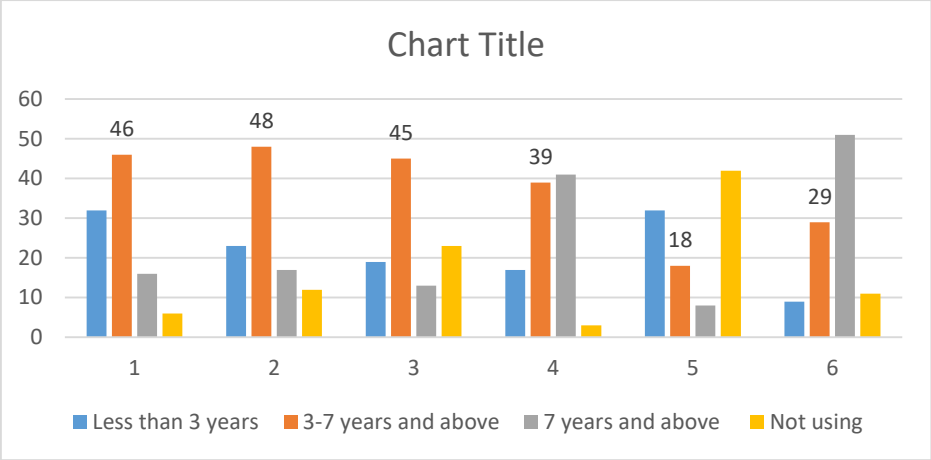
Time Span	Television	Fridge	Washing Machine	Fan	computer	Motor pump
Less than 3 years	32	23	19	17	32	9
3-7 years and above	46	48	45	39	18	29
7 years and above	16	17	13	41	8	51
Not using	6	12	23	3	42	11
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Primary Data

The above table represents the time span of selected electrical home appliances. The households are using different types of home appliances, but only the appliances having high penetration like TV, Fridge, Washing Machine, Fan, Computer and Motor pump are selected for the study

Figure No 4.6

Time Span of Selected Electrical Home Appliances



Source: Primary Data

The above chart shows the time span of selected electrical home appliances. Older electrical appliances consume more electricity. Motor pump is the appliance with the longest time span used by 51 percentage of people. Only 9 percentages of people are using new motor pump. Following the motor pump, Fans having a lifespan of 7 years and above are used by 41 percentage people. Fan has highest penetration, only 3 percentage are not using fans. Computer is the appliance having time span of less than three years used by 32 percentage of consumers and 42 percentage of households are not using computer at all. The next is fridge, with a life span of 3-7 years which is used by 48 percentage households. About half of the consumers have appliances which are 3-7 years old, including TV (46), Fridge (48) and Washing Machine (45). These appliances will be consuming the maximum amount of electricity.

So in case of implementing a DSM project for replacing electrical home appliances, motor pumps and fans be given prior consideration because they are oldest and inefficient appliance as compared to other appliances. There exists scope for DSM through replacement of inefficient lamps.

Table No. 4.9

Time of High Use of Electrical Home Appliances

Time of use	TV	Washing Machine	Computer	Motor pump	Lights	Fans
	Frequency	Frequency	Frequency	Frequency	Frequency	Frequency
6AM - 10 AM	13	31	2	21	17	11
10AM - 6 PM	24	32	11	25	0	16
6PM - 10PM	33	11	30	22	69	42
10PM - 6AM	24	3	15	21	14	28
Not Using	6	23	42	11	0	3
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Primary Data

The above table represents the time of high use of selected electrical appliances. Fridge has an even use irrespective of the time. Light and fan have high use at evening and night. The table shows that TV and computers have high use during the peak hours (6PM – 10PM) .

Association between the Size of the Household and the Level of Electricity Consumption

H0: There is no significant association between the size of the household and the level of electricity consumption.

In order to analyse the association between the size of the household and the level of electricity consumption, chi square test for association is conducted and the results are presented in the following table:

Table No. 4.10

Association between the Size of Household and Level of Electricity Consumption

Number of family members	Level of electricity consumption			Total
	High	Medium	Low	
<4	3	8	10	21
4-6	27	29	16	72
>6	3	2	2	7
Total	33	39	28	100
p value 0. 44				
D.F			**4**	

Source: Primary Data

From the above table, it is clear that p value (0.144) is greater than 5% level of significance. Thus the null hypothesis is not rejected. Hence, there is no significant association between the size of household and the level of electricity consumption among the domestic consumers of KSEB Ltd.

Association between the Location of Residence and the Level of Electricity Consumption

H0: There is no significant association between the location of residence and the level of electricity consumption.

In order to analyse the association between the location of residence and the level of electricity consumption, chi square test for association is conducted and the results are presented in the following table:

Table No. 4.11

Association between the Location of Residence and Level of Electricity Consumption

Location of Residence	Level of electricity consumption			
	High	Medium	Low	Total
Rural	16	20	18	54
Urban	17	19	10	46
Total	**33**	**39**	**28**	**100**
p value			0.45	
DF			**2**	

Source: Primary Data

From the above table, it is clear that p value (0.45) is greater than the significant level 5% . Therefore there is no significant association between the location of the residence and the level of electricity consumption among the domestic consumers of KSEB Ltd. It reveals that level of electricity consumption in rural and urban area are more or less same level.

Association between the Location of the Residence and the Use of Alternative Source of Energy

H0: There is no significant association between the Location of the Residence and the Use of Alternative Source of Energy

In order to analyse the association between the location of residence and the use of alternative source of energy, chi square test for association is conducted and the result are presented in the following table:

Table No. 4.12

Association between the Location of the Residence and Use of Alternative Source of Energy

Location of Residence	Using alternative source of energy		Total
	Using	Not Using	
Rural	9	45	54
Urban	7	39	46
Total	16	84	100
p value		0.844	
DF		1	

Source: Primary Data

From the above table, it is clear that Pearson Chi – Square with p value 0.844 is greater than 5% level of significance. Thus there is no significant association between the location of residence and the use of alternative source of energy.

Consumer Perception towards Demand Side Management Policies

Consumer perception refers to the process by which a consumer selects, organizes and interprets information or stimuli to create a meaningful image of the product which influence their decision making. Consumer perception towards DSM was analysed by examining the factors considered by the domestic consumers while purchasing the electrical home appliances

Factor/s Considered while Purchasing Electrical Home Appliances

Factors considered by the domestic consumers while purchasing electrical home appliances are analysed here. This helps to understand the perception of consumer regarding the quality and appearance of household appliances.

Table No. 4.13

Factors Considered while Purchasing Electrical Home Appliances

Factors	**Percent**
Colour	2.0
Brand name	27.0
Star rating	39.0
Convenience in use	18.0
Price	14.0
Total	**100.0**

Source: Primary Data

The above table shows the preference of factors while purchasing home appliances. The results identified that major portion of the selected households consider the Star rating of appliances at the time of its purchase. That is 39 percent are considered Star rating. After that 27 percent are considered its Brand name. The least number of domestic consumers, that is only 2 percent are considered Colour while purchasing appliances.

Table No. 4.13

Perception Regarding Satisfaction in Practising DSM between Rural and Urban Consumers

Variable	Label	Frequency	Mean	SD	t	p	Significance
Level of satisfaction	Rural	54	3.43	1.06	1.69	0.09	Not Significant
	urban	46	3.3	1.12			

Source: Primary Data

The above table reveals the result of independent sample „t" test applied to test the significant difference in the level of satisfaction in practicing DSM between the rural and urban domestic consumers of KSEB Ltd. The calculated value for the level of satisfaction (t value = 1.69) shows that there is no significant difference between the

rural and urban domestic consumers of electricity. Since p value (0.09) is more than 5% level of significant.

Table No. 4.14

Clustering of Demand Side Management Measures

Factor	Parameters	Rotated factor loadings
Energy Conservation Measures 26.57 % of Variance	Switching off lights, fans and other appliances when not in use	0.579
	Iron the clothes once in a week instead of ironing 1 or 2 items daily	0.654
	Use alternative sources of energy	0.489
	Use of natural sunlight whenever possible	0.468
	Use of proper ventilation of fans and cooling systems	0.661
	Defrost the freezers in refrigerator	0.637
Load Management Measure 19.62 % of Variance	Shift the use of energy from peak hours 6.00 pm-10.00 pm to off-peak hours	0.654
	Switch off fridge for few hours during peak time	0.473
	Do not use two or more heavy electricity appliances at a time	0.594
	Avoid using current under low voltage conditions	0.526
	Do not make excess use during festive seasons and occasions	0.509
Energy Efficiency Measure 15.17 % of Variance	Use of LED bulbs instead of CFLs	0.699
	Purchase of Star rated appliances	0.766
	Use of 1 watt LED bulbs instead of zero watt bulbs	0.709
	Use of Energy Efficient Fans	0.718
	Replacing old and inefficient heavy electrical appliances	0.515
	Use of Energy Efficient tube lights	0.671
Total Variance Explained: 61.95% Variance		

The above table indicate the factor model of demand side management measures. Total variance of demand side management measure is 61.95 percentage. The Energy Conservation Measures with 26.57 percentage variance. The Load Management Measures with variance of

19.62 percentage and the Energy Efficiency Measures with variance of 15.71 percentage. It is identified that the loading patterns of the factors suggest a strong association and contributing to the demand side management measures.

Demarketing Strategies Implemented by the KSEB Ltd. for the Promotion of DSM

Demarketing is a significant strategy adopted in the circumstances of over demand. It is the reverse of marketing and is used in the Electricity Sectors as a tool for managing the demand for electricity. The following table makes a review of the demarketing strategies implemented for the domestic consumers of KSEB Ltd.

Table No. 4.15

DE marketing Mix in the KSEB

4 P's	**Strategies Used**	**Programmes implemented**
Product	CFL / LED distribution	a) Bachat Lamp Yojana (BLY), Domestic Efficient Lighting Programme, Labha Prabha b) Energy Labelling c) Super-Efficient Equipment Programme d) Solar, Bio mass, etc. are the commonly used alternative sources
	Star rated equipment	
	Energy efficient equipment	
	Alternative Source of energy	
Price	Increase in Tariff Rates	a) Tariff Hike b) Telescopic billing
Physical Distribution	Load shedding	a) Load Management b) Load Shifting c) Smart Metering d) Demand Response e) Smart Grids

Promotion	Sponsored Programmes / Advertisement in various media	a) TV b) Radio c) Printed Media d) Online e) Other media
	Energy Education Programmes	Energy Conservation Classes, Seminars, Video Clippings, Poster Making etc. are carried out through schools, colleges and
	Public Awareness Campaigns	Camps, Exhibition, Energy Management classes for households, etc. for creating awareness.

Source: www.kseb.in

3.6.3 Evaluating Efficiency of Various Types of Bulbs

The following table shows efficiency of various types of bulbs that are commonly used by households.

Table No. 4.16

Efficiency of Various Bulbs

	Incandescent	**Fluorescent**	**CFL**	**LED**
Watts	60	36	15	10
Units(kWh) consumed in a year	131.40	78.80	32.80	21.90
Life span (hours)	1200	15000	10000	50000
Cost per bulbs	12	85	200	950
Cost of electricity consumed a year	722.70	433.62	180.40	120.45
Total cost of electricity and bulb for 50000 hours	28000	10155	7325	5900

Source: KSEB Annual Report

In the above table we can see that LED is the most expensive while an incandescent bulb is the cheapest. Without taking into account the cost of the fixtures, an LED bulb can cost as much as 950, a CFL of watts 200, a fluorescent tube of 36 watts 85, while a 100 watt incandescent bulb costs around 12. The LED lights last the long. This table reveals that CFL and LED bulbs are more efficient than the incandescent and fluorescent bulbs. There for by using CFL and LED we can efficiently utilise electricity.

Table No.4.17

Bi Monthly Electricity Charges

Slab	Rate per Unit	
	Old	New
0-40 (BPL)	1.50	1.50
0-50	3.15	3.50
51-100	3.70	4.10
101-150	4.80	5.50
151-200	6.40	7.00
201-250	7.60	8.00
0-300 (for all units)	6.60	7.20
0-400	6.90	7.40
0-500	7.10	7.60
500 above	7.90	8.20

Source: KSEB Annual Report

This method of differentiated pricing encourages the domestic consumers to bring down their energy consumption to the lower slabs. Due to increased demand for the electricity and existing shortage the authority decided to change the old slabs to new higher slab in order to reduce demand for electricity.

3.7.2 Minimum Charge and Electricity Duty

The following table represents the minimum charge and duty fixed by the KSEB.

Table No. 4.18

Minimum Charge and Electricity Duty

Fixed Charge (minimum charge)	
Single phase	90
Three phase	150
Electricity Duty (10% on fixed charge)	
Single phase	9
Three phase	15

Source: Annual Report of KSEB Ltd

3.7.3 Calculation of Electricity Bill

Bill amount = Energy Charge + Fixed Charge – Subsidy if any + Duty + Meter rent

3.8 Demand Side Management from the Perspective of KSEB Ltd.

Demand side management programs consist of the planning, implementing and monitoring activities of electric utilities which are designed to encourage consumers to modify their level and pattern of electricity usage. In the past, the primary objective of most DSM programs was to provide cost effective energy and capacity resources to help defer the need for new sources of power, including generating facilities, power purchases, transmission and distribution capacity additions. DSM refers to only energy and load shape modifying activities that are undertaken in response to utility administered programs. It does not refer to energy and load shape changes arising from the normal operation of the marketplace or from government mandated energy efficiency standards.

KSEB tries to create behavioural modification using demarketing strategies. This will bring down the demand for electricity as shown below:

CHAPTER IV

FINDINGS, SUGGESTIONS AND CONCLUSION

MAJOR FINDINGS OF THE STUDY

The major findings of the study are summarised below.

Socio – Demographic Profile of the Respondents

- Out of 100 total respondents, 72 percentage were male and 28 percentage were female. Hence majority of the selected domestic consumers of KSEB Ltd.were male.
- Among the total samples,39 percentage respondents have SSLC qualification. 32 percentage of selected domestic consumers of KSEB Ltd. have plus two qualification, only 10 percentage of respondents were passed the PG and 19 percentage have degree qualification. Hence majority have education SSLC and below SSLC level.
- Out of total respondents, 54 percentage are from the rural area. Hence majority of the selected domestic consumers of KSEB Ltd. are from the rural area.
- 42 percentage of selected respondents have monthly income less than 15000 and only 8 percentage have income greater than 45000.
- 48 percentage of the respondents have four members in their family. There fore majority of the selected respondents have nuclear family.
- Majority of the selected domestic consumers of KSEB Ltd. have multi storied building, 66 percentage.
- Out of 100 respondents, 49 percentage have 6-8 rooms (including hall and kitchen). Near half of the respondents have 6-8 rooms.
- 42 percentage of respondents belongs to house of 800-1300 sq.ft.

Consumption Pattern of Electricity

- Analysis of the level of electricity consumption reveals that 40 percentage consume electricity moderately

- The analysis of the type of electricity connection of the selected consumers of KSEB Ltd. reveals that out of the selected 100 respondents, 85 percentage have single phase connection in their houses. Hence majority of the respondents have single phase connection in their house.
- Per capita power consumption increases according to income.

Physical Performance of KSEB Ltd.

- The major source of renewable energy in Kerala is the small hydro plants. 70 percentage of electricity generated from hydro sources.
- The electricity requirement and availability in Kerala shows an increasing trend. The average growth rate of electricity requirement is 4.96 % and electricity availability is 5.20 %.
- The average annual growth rate of per capita consumption of electricity is 5.59 %. The growth rate for the period 2012-13 and 2014-15 is more than the AAGR, 12% and 9.63% respectively.The loss for KSEB Ltd has increased due to decrease in revenue and increase in the expenses .

Scope for Demand Side Management Policies

- Solar or biomass or both are the commonly used alternatives by the domestic consumers. 84 % houses are not using any alternative sources. There is wide scope for DSM through the using alternative sources of energy
- Motor pump is the appliance with the longest time span used by 51 % of people. Only 9% of people are using new motor pumps. Following the motor pump, Fan having a lifespan of 7 years and above is used by 41% of respondents. Computer is the appliance having time span of less than three years used by 32% of consumers
- About half of the consumers have appliances which are 3-7 years old. These appliances will be consuming maximum amount of electricity. So in the case of implementing a DSM project for replacing electrical home appliances, motor pumps, and fans can be given prior consideration becauuse they are the old and most inefficient appliance as compared to other appliances.

- Light and fans have high use at evening and at night. TV and computers have high use during the peak hours (6 PM to 10 PM) . There is great scope for load shifting in Kerala.
- There is no significant association between the size of the house hold and level of electricity consumption among the domestic consumers of KSEB Ltd.
- There is no significant association between location of the residence and level of electricity consumption among the domestic consumers of KSEB Ltd. It revealed that the urban and rural consumption level of electricity are near similar to each other
- There is no significant association between the location of residence and use of alternative sources of energy. It found that the usage of alternative source of energy are near similar among the rural and urban domestic consumers of KSEB Ltd.

Consumer Perception towards Demand Side Management

- The factors considered by the domestic consumers while purchasing the electrical home appliances are analysed. The highest respondents are considered the factor of star rating and second factor is brand name. The factor considered the least is colour of appliances.
- There is no significant difference between the rural and urban domestic consumer in practicing DSM policies.
- If energy conservation measures is increased by one unit, then it can be seen that the future electricity consumption is reduced by 0.516.
- If load management measures is increased by one unit, then it can be seen that the future electricity consumption reduced by 0.655.
- If energy efficiency measure is increased by one unit, then it can be seen that the future electricity consumption is reduced by 0.466.
- All the measures of DSM have 55 percentage influence on the future electricity consumption.

Demand Side Management Measures of KSEB Ltd.

- Tariff hike, telescopic billing, time of use billing etc. are the pricing strategies used.
- Load management, load shifting, smart metering, smart grids and demand response are the strategies used as part of physical distribution.
- Consumers have exposure to the demarketing strategies promoted by KSEB Ltd. and are motivated to make cautious usage of electricity.

SUGGESTIONS

- Consumers are aware about the importance of energy management but not fully aware of the monetary benefits that can be attained through DSM. The energy education programmes should be concentrated on this aspect. Then only the consumers will become more responsible.
- Inefficient and low quality electrical gadgets are available in the market at lower cost. The standards and labeling programme should be made mandatory and the sale of such gadgets should be prohibited.
- The promotion of star rated energy efficient products and CFLs and LEDs are very effective for DSM. Significant steps should be taken by the Electricity Board and the government for providing financial assistance for this.
- Safe disposal of used CFL lamps is required to avoid mercury pollution. A recycling plant is required in Kerala for the disposal of inefficient or used electrical appliances under appropriate administrative machinery.
- Programmes like energy clinics for households are to be encouraged to make aware of DSM.
- Majority of the consumers are aware of DSM measures but not practicing them due to inconvenience, time factors etc. Observance of the statutory measures should be made more stringent.
- Load Management Strategies are to be adopted by the electricity board, to modify customer load pattern and to reduce their peak demands. Load management strategies may be demonstrated to the consumers, so that they can make voluntary load curtailment during peak hours.
- In order to carry out DSM successfully, the government should specify the target to be attained in terms of fund or units of energy savings to be attained through DSM.
- To reduce the transmission and distribution loss it is essential that the number of substations, transformers and length of cables should be enhanced.
- In order to improvise DSM power tariff has to be restructured.
- Power sector investment may be controlled by the central government and state government. In order to ensure reliable and quality power in Kerala.

CONCLUSION

This study dealt with the electricity consumption behaviour of the household sector and the need for the Demand Side Management policies by the Electricity Board. The study shows that, the Demand Side Management only can solve the problem of power crisis in Kerala. Since the power requirement is high compared to the power generated by KSEB Ltd.

Replacing Energy Efficient appliances, promotion of star rated equipment, distribution of Compact Fluorescent Lamps (CFL) and LED lamps etc. are the significant measures adopted by KSEB Ltd. to achieve Demand Side Management. Raising tariff rates, telescopic pricing, time of use pricing, load shedding and rationing of energy on equitable basis etc. are also carried out. Consumer awareness programmes like save energy, Labhaprabha, Smart energy programmes, advertisements, poster making etc. are also conducted by KSEB Ltd. The above said measures of demand management help to make the consumers aware of the electricity crisis. The only way to meet the shortage is efficient utilization of available energy. We cannot increase our supply of electricity as much as we needed, because of various obstacles existing in the production of electricity. So we cannot increase our supply but we can reduce our demand by the adoption of Demand Side Management measures.

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QUESTIONNAIRE

A) General Details

1. Place Name
2. Name of the head of household : :
3. Nature of the head of household : Male/Female
4. Type of Area : Code: - Rural (1), Urban (2)
5. Religion : Code: - Hindu (1), Muslim (2), Christian (3),
6. Nature of the family Others (4): Code: - Joint (1), Nuclear (2)
7. Number of family members :
8. Household details :

SI **A**	Name **B**	Age **C**	Gender **D**	Marital Status **E**	Education Completed **F**	Occupation **G**	Monthly Income **H**	Family Income **I**

Code for D :-Male(1), Female(2),Code for E :- Married(1), Unmarried(2), Widow(3), Divorced(4), Code for F :- Bellow SSLC(1), SSLC(2), +2(3), Degree(4), PG(5), Diploma(6), Professional(7), Other(8), Code for G : Govt employ (1), Self employed (2), Skilled and semi skilled (3)

8. Average monthly income of the family :

a) Less than 15000

b) 15000-25000

c) 25000-35000

d) 35000-45000

Above 45000

9. Table about students in the household

SI **A**	Course studying **B**	Study Time in hrs **C**	Type of scholar **D**	Average study in hrs **E**

Code for B :- same as code F in question 9, Code for D :- Hostel(1), Day scholar

B) Housing Details

1. Ownership of the household :

Own(1) Rented(2) Quarters(3) Others(4)

2. If rented/ quarters who pays the electricity bill :

Self(1) Landlord/ Company(2)

3. Type of ration card

APL(1) BPL(2) AAY(3)

1. No of rooms in the house(including hall & kitchen) :
2. Source of Drinking Water :

Well(1) Pipe connection(2) Public Tap(3) Others(4)

6. Size of Water tank : in litres

7.How many times you are filling water tank in a day :

C) Consumption details of electricity

1. Consumer No :

2. Year of electrification in the house:

3.Connection Type :

Single phase(1) Double phase(2)

4. Electricity Charge(last month) :

5. Electricity Meter reding in units(last month) :

6. Number of fans :

7. Type of fan regulator :

No regulator(1) Ordinary regulator(2)

8. Details regarding light

No of tube light	**No of incandesent bulbs**	**No of CFL / LED**

9. Which type of tube light is using : Old type(1) New type(2)

10. Total number of plug points in the households :

11. Whether pump set use for domestic purpose :

12. Whether there is star labelling / ISI mark on the pump set :

13. Whether motor pump is earthed :

14. Do you use inverter/generator :

15. If yes, daily using hours of inverter :

16. If no, why don't use inverter :

Cost(1) not interested(2) use of other energy saver(3)

17. Do you use any special type of lamp :

Solar(1) Emergency lamp(2) Gas lamp(3) Biogaslamp(4) Other/Specify(5)

18. Type of appliances used in the households

SI no	Type of appliances	No of equipments	Watt	Usage in hrs /weekly	Year of purchase
1	Mixer grinder				
2	Mixy				
3	Refrigerator				
4	Motor pump				
5	Iron box				
6	Washing machine				
7	Induction cooker				
8	Chappathi maker				
9	Microwave oven				
10	Emergency lamp				
11	Air conditioner				
12	Electronic heater				
13	Water cooler				
14	Vacuum cleaner				
15	Electronic				
16	Television				
17	Computer/ laptop				
18	Other / Specify				

19. Do you aware of current unit pricing of electricity :

20. What is your electricity bill trend :

Codes:- Increasing(1) Decreasing(2) Constant(3)

21. When electricity fails source of lighting :

Codes:- Kerosene lamp(1), Candle(2), Emergency lamp(3), Inverter(4)

22. Payment mode of facility using for cooking :

Code:- Direct payment(1), Online payment(2)

23. Are you using non-conventional source for electricity purpose:

Code:- Solar energy(1), Bio gas for cooking(2), Solar heater(3), Hot box(4)

D) Consumer perception towards DSM

- Awareness about Energy saving methods

Code:- Never(1), Rarely(2), Sometimes(3), Often(4), Always(5)

- Switch off bulb / tubes when it's not in use to reduce the electricity consumption.
- Use of CFL / LED lights help to reduce the electricity consumption
- Switch off Refrigerator during peak time to reduce electricity consumption Knowing that even zero watt bulb consume nearly 15 watt/hrs of electricity.
- Use of renewable/alternative energy source in home to reduce the electricity consumption.
- Use of fans set full speed to increase the electricity consumption
- Avoid frequently closing/opening doors of Refrigerator to reduce the electricity consumption.
- Putting hot dishes and food items into the Refrigerators to increase the electricity consumption.
- Avoid frequently ironing of cloths to reduce electricity consumption.
- Use of mixer Grander in overload mode to increase the electricity consumption
- Light coloured walls reflect more light and hence minimum lamps are needed to reduce energy consumption.
- Clean bulbs/tube lights and fan leafs periodically to avoid reduction in illumination.
- Use energy efficient star labeled gadgets to reduce energy consumption.
- Use of solar equipments to reduce electricity consumption.

- Factors considered while purchasing electrical appliances

Factors	Please rank
1.Colour	
2.Design	
3.Brand name	
4.Star rating	
5.Convenience in using	
6.Price	

Whether you are heard about demand management policies? Yes/ No

Demand side management	**Willingness to practice**				
Energy efficiency	Very high	High	Medium	Low	Very low
Use of LED bulbs instead of CFLs					
Purchase of stared appliances					
Use of EE tubelights					
Use of energy efficient fans					
Energy conservation measures	**Very high**	**High**	**Medium**	**Low**	**Very low**
Switch off lights,fans and other appliances when not in use					
Iron the clothes once in a week instead of ironing daily					
Use of alternative source of energy					
Use of proper ventilation instead of cooling systems					
Defrost the freezers in refrigerator in periodically					
Load management measures	Very high	High	Medium	Low	Very low

Shift the use of energy from peak hours 6pm-10pm to off peak hours					
Switch off fridge for few hours during peak time					
Do not use two or more heavy electricity appliances at a time					
Avoid using current under low voltage conditions					
Do not make excess use during festive seasons and occasions					

- Are you aware about electricity shortage in our sate ?
- What is your suggestion regarding this correction of electricity shortage?
- Whether any electric equipment usage is avoided due to the increase in electricity price?
- Are you willing to adopt solar panel in your building?