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RESEARCH ARTICLE

POWER SHORTAGE FOR THE INDUSTRIAL SECTOR IN KERALA AND THEIR PROBLEMS.

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Abstract

This paper aims at studying the factors responsible for the power shortage for the industrial sector in Kerala and figure out their problems. We will discuss the introduction, Kerala power sector projections, power state in kerala,Energy source of Kerala etc. while studying we will suggest the conclusion and recommendations in order to get rid from the problem of power shortage in Kerala state region.

Energy is an essential input for economic development and improving the quality of life. Development of conventional forms of energy for meeting the growing needs of society at a reasonable cost is the responsibility of the Government Development and promotion of non-conventional /alternative/ new and renewable sources of energy such as solar, wind and bio energy etc. are getting sustained attention. Nuclear energy development being geared up to contribute significantly to the overall energy availability in the country.

The industrial production capacity of micro, small and medium enterprises (MSME) in Kerala has declined past years alone due to power crisis, and, if the trend continues, small industries will face a bleak future.

Introduction:-

The electricity scenario in Kerala is at a turning point, as the state is making a shift from hydro sources to non-hydro sources (fossil fuel) of power generation. The year 1940 marked the beginning of the electricity generation in Kerala, under the Department of Electricity, at Pallivassal. This hydroelectric project with an installed capacity of 37.5 MW was the first of its kind in Kerala. With another 8 more hydroelectric projects including the Sabarigiri Project (1966), with an installed capacity of 300 MW and the Idukki Stage I (1976), with an installed capacity of 390 MW, the total installed capacity in Kerala had gone up to 1011.5 MW by 1976.

Later, with the commissioning of more hydroelectric projects, Kerala achieved the status of a power surplus state, which lasted till the late 1980"s. The period of surplus between 1969 and 1985 enabled Kerala to sell power to the neighboring states at very cheap rates.

During this period, the state resolved to encourage the setting up of power intensive industrial units. In the case of some of the industries, power is used as a raw material. Examples are the Indian Aluminum Co. Alwaye, the Travancore Electro Chemicals, Kottayam etc. In1979-80 as against 35.82 paisa per unit realized from the domestic consumers, the realization from these big industries was a mere 9.36 paisa per unit.

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However, by the late 1980"s there occurred a total reversal, from a position of power surplus, to one of power deficiency. This reversal was explained away by the KSEB as a monsoon failure. "A power surplus state till 1987, when the state was in a position to supply power to the neighboring states, Kerala faces to lay a reversal of the situation with power shortages of varying magnitudes, depending on the intensity and vagaries of the monsoons.

Kerala's Power Sector Projections:-
In the past, the energy demand was presumed to be basis with load factor being used to convert the projected energy demand to peak MW demand. The projected energy demand was worked out by a combination of end use and time series analysis. This was the methodology used in the Electric Power Surveys (EPS) conducted by CEA in conjunction with the State Electricity Boards. One of the problems with the above approach has been the consistent over projection of peak demand. The annual growth of peak power demand has been assumed to be of the order of 7-8% and this has resulted in projections well beyond actual demands realized. Some of these anomalies have been corrected in the current EPS conducted and the projections for Kerala as continued in the 17th Draft EPS.

From 17th EPS Draft Report, there are a number of assumptions, which may result in the actual demand being more than what is being projected in the EPS or being less. KSEB's own projections taking into account a higher growth rate and a slightly lower load factor projects the following demands for the 11th plan period.

Kerala Power Sector:-
Power Sector in Kerala plays significant role all told organic process activities in Kerala. clearly power crisis is that the Prime Obstacle to begin new initiatives within the industrial field. The necessity for power is increasing and {also the} production of power ought to also increase consequently. Monsoon is crucial to sustain the hydropower base within the state and also the shortage in rain sometimes creates power crisis. Kerala received copious monsoon throughout the present year and it augmented the flow in to KSEB reservoirs; the KSEB might manage the ability offer scenario with higher quantum of cheaper hydel power. Kerala is one amongst the only a few states within the country wherever there was no load shedding and power cut throughout 2009-10. KSEB has been answerable for the generation, transmission and provide of electricity within the wave of Kerala, with explicit stress to supply electricity at reasonable price to the domestic yet as for agricultural functions. The Board has been passing through a transmutation section of reforms within the electricity sector. The Electricity Act 2003 envisages separate organizations for Transmission and Distribution.

Energy Sources of Kerala:-
Power System in Kerala encompasses hydel, thermal and wind sources. Hydel energy is the most reliable and dependable source in Kerala. Of the total installed capacity, 2746.19 MW, the lion's share of 1933 MW of installed capacity comes from 24 hydel stations; 783.11 MW is contributed by the thermal projects including NTPC at Kayamkulam which is Kerala's dedicated thermal station. Kanji ode wind farm, Palakkad has an installed capacity of 2.03MW. Wind Energy from IPP is 28.05 MW. Capacity addition during 2009-10 was only 51.44 MW (1.9 %) to 2746.19 MW as on 31-3-2010 from 2694.75 MW on 31-3-2009.

Monsoon is essential to sustain the hydropower base in the state and the shortage in rainfall usually creates power crisis. Hydel energy is the most reliable and dependable source in Kerala. Of the total installed capacity of 2881 MW during 2012-13, hydel contributed the major share of 2053 MW (71%); while 793MW was contributed by thermal projects including NTPC at Kayamkulam (Kerala's dedicated thermal station) and Kanjikode wind farm, Palakkad has contributed 2MW, Wind Energy from IPP is 33 MW.

According to the reports 2014, total installed capacity of power in the state as on March 2014 is 2892 MW. Of which, hydel contributed the major share of 2064 MW (71%); while 793MW was contributed by thermal projects including NTPC at Kayamkulam (Kerala's dedicated thermal station) and 35 MW from wind. Additional capacity generated during 2013-14 was only 13 MW (0.46%) that is 2892 MW in 2013-14 against 2878 MW in 2012-13. shows details of energy source and its installed capacity during the last five years.

Energy Sources in Kerala from2009-20014

S.NO.	Sources of Energy	2009-10	2010-11	2011-12	2012-13	2013-14
1.	Hydel: KSEBL	1893.00	1997.80	2008.80	2007.4	2008.65
2.	Thermal: KSEBL	234.60	234.60	234.60	234.60	234.60
3.	Wind: KSEBL	2.03	2.03	2.03	2.03	2.03
4.	NTPC	359.58	359.58	359.58	359.58	359.58
5.	Thermal: IPP	188.93	188.93	188.93	188.93	188.93
6.	Hydel: Captive	33.00	33.00	33.00	33.00	33.00
7.	Hydel: IPP	7.00	10.00	10.00	10.00	22.11
8.	Wind: IPP	28.05	31.65	32.85	32.85	32.85
	Total	2746.19	2857.59	2879.79	2878.39	2891.75

Capacity Addition during 2010-11:-

Power System in Kerala consisted of hydel, thermal and wind sources. Hydelenergy is the most reliable and dependable source in Kerala. Of the total installed capacity, 2857.59 MW during 2011, the lion's share of 2040.8 MW of installed capacity comes from 24 hydel stations; 783.11 MW is from the thermal projects including NTPC at Kayamkulam which is Kerala's dedicated thermal station. Kanji ode wind farm, Palakkad has an installed capacity of 2.03 MW. Wind Energy from IPP is 31.65 MW. Capacity addition made during 2010-11 was only111.40 (4%) that of 2746.19 MW on 2009-10.

The history of Hydro Power development in Kerala begins with the commissioning of Pallivasal Hydro Electric Project in 1940. Next few decades reflected the progressive developments of various hydroelectric schemes implemented in the state. Sabarigiri in 1966 and Idukki in 1976 are milestones of power development in Kerala. The achievement in generation sector is not up to the level expected. Total installed capacity of power in the state as on March 2013 is 2881 MW, of which the contribution of state sector is 2246.68 MW (78%), central sector 359.58 MW (12%) and private sector 274.78 MW (10%).Of the total installed capacity of 2892 MW during 2013-14, the contribution of State sector is 2245MW (78%),

Power Purchase Agreement (PPA):-

KSEB has entered into PPA with various Central Generating Stations of NTPC, NLC, NPCIL etc. envisaged for Southern Region. In addition to this, power was purchased from Rajiv Gandhi combined cycle power plant of NTPC at Kayamkulam, BSES Kerala Power Ltd, Kochi and Kasaragod Power Corporation Ltd., Mylatti. Recently, KSEB has also executed PPAs with Mega Power Projects such as SIMHADRI Stage II, NLC, Tutucorin-a joint venture project of NLC and TNEB, NLC Stage II expansion etc. As a measure to encourage non-conventional sources of energy, KSEB has executed 38 PPAs for purchase of power from wind energy projects and from two Small Hydro Projects, namely, Meenvallom and Iruttikkanam. Power Purchase Agreement with Power Generation Stations

To encourage non-conventional sources of energy, KSEB has executed PPAs for purchase of power from Wind Energy Projects, Agali (13.8 MW) & Ramakkalmedu (14.25MW) and from a small Hydro Projects Iruttukkanam (4.5 MW) during 2012-13. Power is also being purchased from Ullunkal Small Hydro Projects (7MW) and a co-generation plant of MPS steel, Kanjikode (8MW) and Philips Carbon Black Ltd., Kochi (10MW). The capacity allocated from various stations for which the PPAs have been executed is shown here:

During 2013-14, as a measure to encourage non-conventional sources of energy, KSEB has executed PPAs for purchase of power from Wind Energy Projects, Agali (18.60 MW) & Ramakkalmedu (14.25MW) and from a small Hydro Projects Iruttukkanam (4.5 MW), Karikkayam (15 MW) and Ullunkal (7 MW). Power is also being purchased from co-generation plant of MPS steel, Kanjikode (10MW) and Philips Carbon Black Ltd., Kochi (10MW). The capacity allocated from various stations for which the PPAs have been executed.

Power System growth in Kerala:-
Growth is necessary in every sector in the power system particularly, generation, and transmission. As on 30.09.2010, installed capacity has been hiked by 2746.19 MW as against the 2685 MW in the same period of previous year. Likewise, per-capita consumption has also been increased by 544 KWh. The details of growth of power system in Kerala during various years are given here.

Kerala generates power from four sources-hydro power, thermal power, wind power and solar power. Of these, hydel and thermal power generations account for the considerable majority whereas wind and solar power generations make only marginal additions.

Transmission:-
The Kerala power system consists of 13 hydel stations, 11 small hydel stations, 2 captive power plants, 2 thermal stations, 3 IPPs, and 1 wind mill. The grid is connected to the Southern Region Transmission system through two 400kV double circuit lines at Madakkathara and Trivandrum. There are 5 major inter-state transmission lines. The major substations include one 400 KV sub-station, and fourteen 220 KV substations and four 220kV substations under construction. The main grid comprises of the 220 KV systems. The net energy requirements for the year 2006-07 are estimated to be 14,687mu. Out of this about 7,457mu is expected from hydel sources, 7804 from central generating stations, and from the remaining sources. The present peak load demand is about 2700MW and is expected to increase up to 2,800 MW during April/May. The hydel potential is about 6130MU if the inflow is normal. We have a storage capacity of 4083MU. Kerala's Transmission system consisting of substations and its connected lines.

During the year 2013-14, commissioning of 26 substations and construction of 314.6 KM of Transmission lines has been targeted. In the Transmission sector, many planned works could not be taken up due to land acquisition and right of way related issues. Kerala's Transmission system consisting of substations and its connected lines are given below. The performance of the construction of substation with various capacities has not achieved the desired target. Out of the target of 5 numbers of 110 KV substations, only 1 substation is completed and in the case of 33 KV substations, 8 substations are completed against the target of 9 numbers. In the case of 220KV and 66 KV substations, nothing has been achieved.

Distribution:-
KSEB is the sole distributor of the Electrical Energy for the state of Kerala except Thrissur Corporation and Munnar where the distribution is managed by licensees. In Thrissur, City Corporation and in Munnar M/s Tata Tea Ltd are the licensees. The system as on 29/02/2009 Distribution Sector is a profound area, which provides electricity to all consumers in Kerala. In the distribution segment, 3398.27 kms of 11 KV lines, 7838 kms of LT lines and 5790 no's of distribution transformers were added during the period under review. Kerala has achieved full electrification in all villages, which is above average of national level. KSEB has given great attention to strengthen the distribution backbone by new ventures of Restructured- Accelerated Power Development and Reforms Programme (R- APDRP) and Rajiv Gandhi Grameen Vidhythikaran Yojana (RGGVY). The power consumption comes to all time high. As on 31.3.2010, total number of consumers has increased to 9743476 no's against the 9363461 no's as on 31.3.2009. The distribution infrastructure is essential part of electrifying all domestic and non-domestic purpose.

In the distribution segment, 53193 Circuit Kms of 11 KV lines, 274230 Kms of LT lines, 65686 nos. of distribution transformers and 1279379 street lights are existing as on 30th Sept 2013. Service connections aggregating to 10963365 were effected during the years 2008-2013. During the financial year 2013-14, 190186 service connections were given up (against the target of 458130), 486.518kms of 11 KV line (against the target of 3430kms), 927 nos. of transformers (against the target of 4400 nos.) and 1415.5 kms of LT line (against the target of 6900 kms) were commissioned (up to 30.09.2013).

The domestic category consumers showed a reasonable growth of 4.27 percentages to 7760645 in 2009-10 from 7443028 in 2008-09. But LT & HT Commercial category consumers registered an increase of 4.71 percentages over 2008-09. Growth of other agricultural pumping, Licensees (Bulk supply) also increased substantially over the year. The sale of energy has increased corresponding to the increase of total consumers. During 2009- 10, 14047.75 MU of energy was sold showing an increase of 1170.1 MU as compared to the last year (12877.65 MU). As per the 17th Power Survey, it is estimated that by the end of 11th plan period (2012), the annual consumption and maximum demand will be 19230 MU and 3528 MW respectively. LT Consumers as on 2005 and 2009.

KSEB has given great attention to strengthen the distribution backbone by introducing new ventures of Restructured- Accelerated Power Development and Reforms Programme (R-APDRP) and Rajiv Gandhi Grameen Vidyuthikaran Yojana (RGGVY). The power consumption comes to all time high. As on 2012-13, total number of consumers has increased to 108.07 lakhs against 104.58 lakhs during 2011-12.

Methods of Power Saving:-

Lighting:-

- Do not forget to SWITCH OFF lights and fans when not required.
- Utilize the SUNLIGHT wherever and whenever available.
- A house should be designed in such a way that maximum sunlight and ventilation are obtained.
- Light coloured walls reflect more light and hence minimum lamps are enough.
- As far as possible, use task lighting which focuses light where it is needed.
- Make use of Compact Fluorescent Lamps (CFL) in place of incandescent lamps.
- 36 Watt slim tube lights give equivalent light output as that of 40 Watt tube lights.
- Use electronic ballasts / electronic choke against conventional electromagnetic ballasts tube lights for they consume less power.
- A so called zero watt bulb consumes 12 to 15 Watts / hour. CFL's are available in 5, 7,9,11 watts capacities and they give better light output.
- Many automatic devices can help in saving energy used in lighting. Consider employing infrared sensors, motion sensors, automatic timers, dimmers and solar cells wherever applicable, to switch on/off lighting circuits.
- Clean bulbs and tube lights periodically to avoid reduction in illumination.

Fans and motors:-

- Use light weight / energy efficient fans.
- Use electronic regulators for fans for they consume less power and provide fine control.
- Avoid rewinding of motors.
- Clean fan blades periodically.
- Lubricate bearing of motor periodically.

Grinders:-

- Use energy efficient motors for grinders.
- Always use nylon belt in grinders.
- Use grinder to its full capacity.
- Clean and lubricate grinder parts periodically.

Washing machine:-

- Use washing machine to its full capacity.
- Avoid using dryer in washing machines whenever possible

Air-conditioner:-

- Use correct capacity air-conditioner to suit the requirement.
- Avoid frequent opening and closing of air-conditioned room.
- Clean the AC filters periodically.
- Air-conditioned room must be leak proof.
- Set the thermostat of room air conditioner at 25° (77° C F) to provide the most comfort at the least cost.
- Use energy efficient star labeled new air conditioner in place of older ones which need repair.

Ironing:-

- Avoid ironing one or two clothes daily and adopt large scale ironing.

Refrigerator:-

- Keep refrigerator away from the wall to allow air to circulate around the refrigerator.
- Avoid frequent closing and opening of refrigerator door.
- Allow heated food stuff to cool down to normal temperature before refrigerating.

- ❖ Make sure foods are covered before they are kept in the refrigerator.
- ❖ Defrost regularly to keep freezers working their best.
- ❖ Thermostat control in refrigerators should be adjusted
- ❖ to optimum level depending upon climatic condition.
- ❖ Use energy efficient star labeled refrigerators.

Water pumps:-

- ❖ Use energy efficient water pumps.
- ❖ Use correct size PVC piping system in water lines.
- ❖ Arrest leakage of water in taps / joints.
- ❖ Use capacitors for water pumps to improve power factor.
- ❖ Use level controllers for tripping of water pumps while pumping of water to overhead tanks etc.

Water heaters:-

- ❖ Use solar water heaters wherever possible.
- ❖ Avoid water leakage in taps / joints.
- ❖ Always insulate hot water pipes to reduce heat loss.

Computers:-

- ❖ Turn off your home office equipment when not in use. A computer that runs 24 hours a day, for instance, uses - more power than an energy-efficient refrigerator.
- ❖ If your computer must be left on, turn off the monitor; this device alone uses more than half the system's energy.
- ❖ Setting computers, monitors, and copiers to use sleep-mode when not in use helps cut energy costs by approximately 40%.
- ❖ Screen savers save computer screens, not energy. Start-ups and shutdowns do not use any extra energy, nor are they hard on your computer components. In fact, shutting computers down when you are finished using them actually reduces system wear - and saves energy.

Agricultural:-

- ❖ Substitute rusted G.I suction/delivery pipes by low friction rigid PVC pipes of correct diameter.
- ❖ Replace substandard foot valve by ISI marked foot valve.
- ❖ Replace substandard pump set by energy efficient pump sets.
- ❖ Use correct size pump sets and associated accessories.
- ❖ Provide and maintain capacitors in good condition.
- ❖ Avoid operation under low voltage conditions.
- ❖ Install, repair pump set motors and wiring by competent electrical personnel.
- ❖ Ensure adequate water availability when pump sets are operated.
- ❖ Avoid rewinding of motors.

Power Conservation Tips:-

- Do plug power equipment into wall receptacles with power switches in the OFF position.
- Do unplug electrical equipment by grasping the plug and then pulling. Do not pull or jerk the cord to unplug the equipment.
- Do check the receptacle for missing or damaged parts.
- Do check for defective cord clamps at locations where the power cord enters the equipment for the attachment plug.
- Maintenance personnel should know the location of electrical circuit breaker panels that control equipment and lighting in their respective areas. Circuits and equipments disconnects must be identified.
- Use a danger tag on any electrical equipment which causes shocks or has high leakage.

Problems:-

- The most important problem faced by the industrial units is the lack of government support and harassment by the government departments. The government is slowly withdrawing the benefits given to the industrial units.
- Instead of acting as promoters of industrialization many of the government departments especially electricity department is creating headache to the industrial units. In many occasions the entrepreneurs are discouraged due to the non-co-operation of the government departments.
- Only three percent of the entrepreneurs report that transportation is a problem for them which indicate that Kerala has to develop its infrastructure.
- The miscellaneous group includes problems like lack of industrial culture, mismanagement, use of obsolete machineries etc. The attitude of the entire society should be shifted towards industrialization. The entrepreneurs have a feeling that people do not give due importance to them as they give to other professionals. Lack of industrial culture in the society creates many difficulties to the entrepreneurs. Use of obsolete machinery becomes a problem to them because it increases cost of production.

Conclusion:-

It is hoped that the industrial sector of Kerala can come forward and contribute more to the GDP of the country. The problems of these units listed above can be solved if the entrepreneurs, financial institutions, government and the society co-operate and move together which leads to low profitability and inefficiency. Modernization requires huge expenditure and moreover it results in retrenchment of labourers which is undesirable to the society. A few of the entrepreneurs are worried about the corruption and mismanagement of the top officials.

It may be because of these problems that the contribution of the manufacturing sector has been low in 2000-01.
The state has therefore been looking for options to meet the demand for power from non-hydro sources such as coal, diesel, etc. The statistics indicate the growing shift towards non-hydro options. However, the search for non-hydro options is not going to be very smooth, on the following grounds:

- The coal bearing regions being situated far from the state, it may not be economically viable to operate coal-based systems.
- It is not easy to find out locations for coal based thermal power stations anywhere near the sensitive coastline or within the densely populated midlands.
- High per unit cost of power production in the case of any option other than hydro, including diesel and naphtha make it less attractive. However, the state has decided to go in for non-hydro options, so much so that by 2002 AD, as much as 50% of the state's electricity needs will be met from non-hydro sources.

The above is an outline of the pattern of electricity generation in Kerala, and the proposed plan for the future. It is in this present context of declining priority given to hydropower that we need to evaluate the history, potential and the future of SHP "s in Kerala.

Suggestions & Recommendations:-

The following suggestions could be proposed to improve the conditions of the Kerala power sector.

- Complete all hydel plants that have already been started. This will add capacity of about150-200 MW.
- Construct MINI-MICRO Hydel plants to the extent possible. Feasibility studies have been completed for more than 100 such units. Some experts indicate the possibility of capacity addition of about 4000 MW though this type of plants.
- Continue the betterment of T & D system to reduce the losses at least by 10% so as to save 200 MW at least.
- Reduce the usage of thermal plants to a minimum. Stop construction of all Diesel plants immediately.
- Reduce unnecessary wastage of energy in public and private sector.
- Change the industrialization pattern of the state (this is to reduce the population in the state where the pollution density is very high). Move towards industries using the available skilled labour and away from the present energy-intensive chemical industries

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