

INDIAN ENERGY SCENARIO AND ENERGY CONSERVATION OPPORTUNITIES IN DIFFERENT SECTORS

Mallikarjun.G. Hudedmani¹, Vishwanath M. Soppimath²

^{1,2}Associate professor, Department of Electrical and Electronics Engineering, KLE Institute of Technology,
Opposite to Airport, Gokul, Hubballi, Karnataka, (India)

ABSTRACT

Energy usage index indicates the country's state of economy, growth and standard of living. But the rate at which the energy demands and prices are increasing, it may be difficult to get the correct rate of development. The result of the same is to enforce retarding action on the growth and industrialization programs of developing countries like India for the want of sufficient energy reserves. Besides this the environmental implications play another vital role. Hence all over the place energy utilization need to be closely studied to avoid in-efficient use of energy. Energy conservation being a quick technical approach finds its potential to provide an effective solution to emerging environmental issues. In the current energy scenario of the India, a fast and efficient solution is needed to review Industrial sector, manufacturing technologies and its energy (utilization) efficiency. The wastage of energy or loss in old and obsolete industrial technologies and machinery needs to be considered carefully as it has been noticed from the survey reports. Energy Conservation potential in the industrial sector of our nation has been projected between 35 to 45 %. Energy conservation measures range from simple good house-keeping to modern state of art practices in plants and methodologies. To have proper understanding it is very essential to know what amount of energy is being consumed. Monitoring industrial energy utilization on continuous basis and relating it to the production is the first step of any energy conservation program. The agricultural sector is amongst the major energy consuming sectors followed by industrial sector. The two main energy sources used in the agriculture sector are electricity and oil for cultivation, irrigation, harvesting and processing agro-products. Energy used at home comprises of energy for cooking and food processing, comforts and luxuries. In an urban home gas is used for cooking. Electricity is used for illumination and heating/cooling requirements. 85- 90% of the energy demand of a rural home is dependent on fire wood or fuel wood. It is found that 50-55% of the energy consumption of the country is utilized for cooking activity – considering commercial as well as non-commercial energy.

Keywords: Conservation, Environmental impacts, Energy usage index, Energy scenario, Sector Wise Energy

India being a developing country the energy generation and usage is as shown below. For any country the growth in over all can be understood from such data. The Fig1 and Fig 2 show the energy generation from different sources and sharing by central and state is mentioned [1-5]. The energy generated from different sources give the insight to the usage of resources to meet the demand. RES includes all the renewable and new sources of generations. Fig 3 gives the statistics of energy over the years and energy units are in MU [3, 4-8]. As stated earlier the energy consumption is witnessing the country’s growth in overall. Fig 4 shows per capita energy consumption of India. As India one of the growing country and it is clearly self explanatory. It is an indicator of either lesser production or practice of conservation measures [5,10,11].

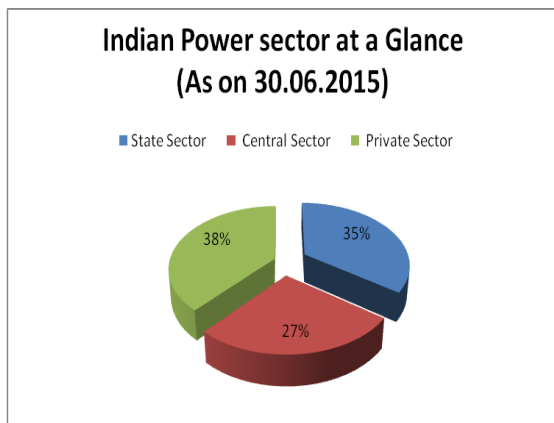


Fig 1 Energy Generation and Sharing by Central and State

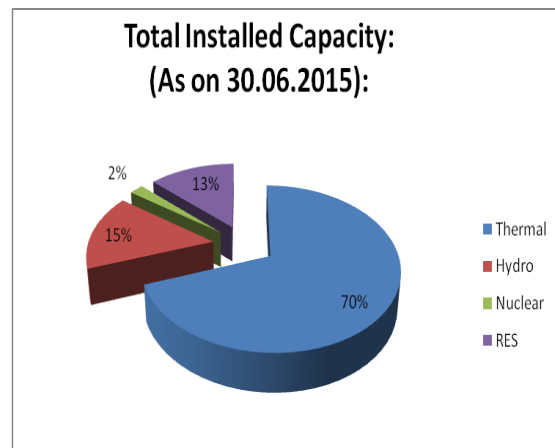


Fig 2 Energy Generation from Different Sources

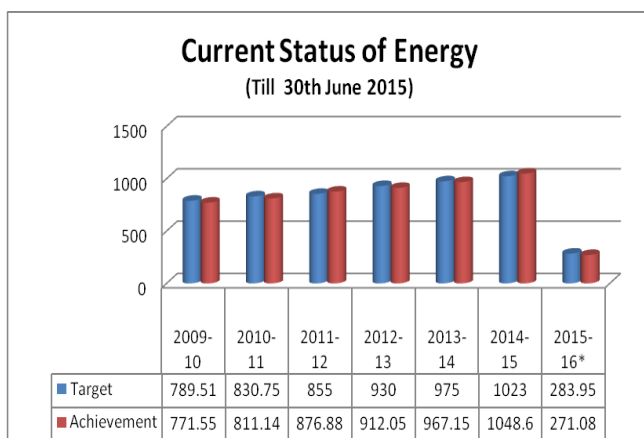


Fig 3 Comparative Study of Required Achieved Energy

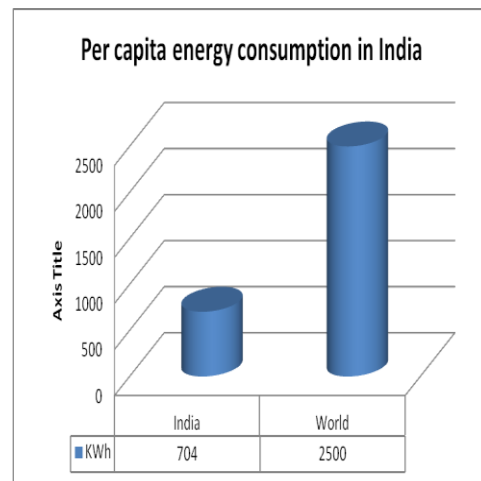


Fig 4 Per Capita Energy Consumption and Requirements

II. ENERGY CONSERVATION AND OPPORTUNITIES

Energy conservation is the scientific method of decreasing the quantity of energy used while achieving a similar outcome of end use [6]. This practice enhances the national and personal security, human comfort and environmental value. Energy conservation is the most economical solution to energy shortages and more

environmental friendly to benign with alternative to reduce energy production [8-11]. Energy conservation has been recognized as a national priority for saving energy and resources for the future use since a very long time. It is the lack of strong steps, seriousness, energy perspective and determination causing a minor short fall in the achievement of the country’s target towards the same. The direct consumers like individuals and organizations need to conserve energy in order to reduce energy costs and promote economic, political and environmental state of the country. Industrial and commercial users need to find out solutions to increase efficiency and thus maximize profit by ultimate reduction in emissions [9-11]. As energy conservation is an important part of reducing climate change thus incorporation of renewable energy systems adds the credits to the same.

2.1 Domestic Sector

In the present scenario, 50% of the energy is used for cooking activity by considering commercial and non commercial energy. Ideally energy is used for cooking, processing and for human comfort in homes. In case of urban home largely gas is preferred for cooking and electricity for the other energy requirements. Likely 90-92% of the energy demand of a rural home is dependent on fire wood or fuel wood. Fig 5 shows a typical energy scenario of domestic sector of the country [3,9-10] and Table 1 gives an possible saving of energy percentage by adopting techniques like, periodic energy audit, selecting energy efficient equipments, proper capacity, proper ambient and good operation and maintenance[6-11].

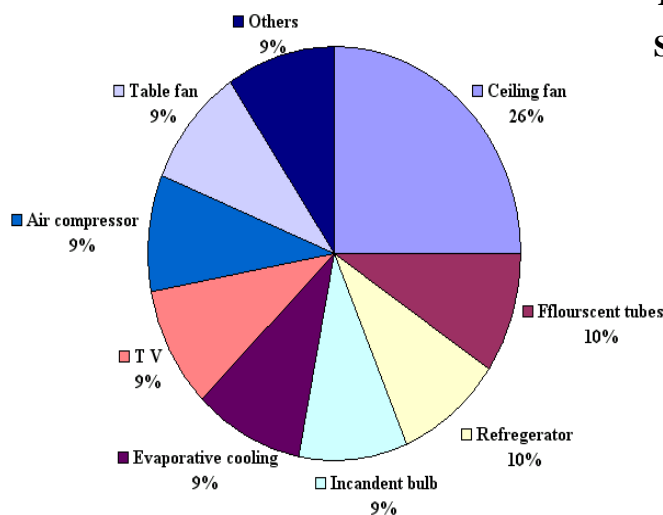


Fig 5 Energy Usage in Domestic Sector

Table 1 Energy Conservation in Domestic Sector

Process	Energy Saving
1 Organized cooking	15-20%
2 Planned choice quantity of water reduces the gas usage	50-55%
3 On flame cooking	6- 8%
4 Use of CFL /LED lamps	10- 25%
5 Planned ambience	10-12%
6 Proper maintenance	5-8%

2.2 Industrial Sector

Entire growth of a country mainly depends on industry and trading that result revenue to the country [1,3,10,11]. The industrial sector is a major energy-consuming sector accounting nearly 45-50 % of the commercial energy available in the country. The general sources of energy for industries is from the coal accounts 56%, oil and gas about 40%, hydroelectric power of 3% and nuclear power 1%. Net industrial energy requirement is based on type of industry, capacity and location [5-7, 9].

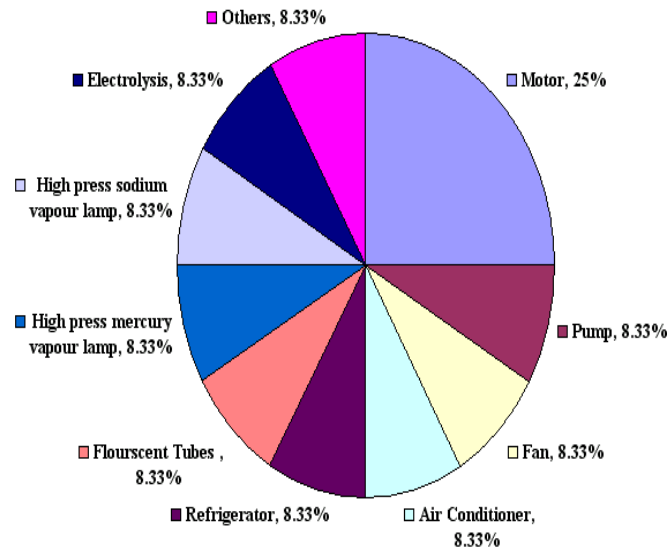


Fig.6 Energy usage in Industrial sectors

Table 2 Energy Conservation in Industrial Sector

Process	Energy Saving Extent
1 Choice location	Greater
2 Properly planned connected Capacity	Moderate
3 Standard of machines and equipments	Good
4 Sequence of operation	Good
5 Periodic calibration and maintenance	Good
6 Use of latest state of Technology, awareness of energy conservation measures/ Audit	Moderate

The industrial sector represents all production and processing of goods, including manufacturing, construction, farming, water management and mining. Typical components of the industries that consume power are represented in Fig 6. Increasing costs have forced energy-intensive industries to make substantial efficiency improvements in the past 30-35 years. A noticeable reduction in energy usage in steel and paper is about 35-45%, about 25% reduction in petroleum/aluminum refining and cement production. The reason for the reduction would be recycling the reusable/waste material and the practice of cogeneration equipment for electricity and heating. Fig. No: 6 shows electricity usage in Industrial sectors in India and Table 2 presents a possible opportunities in each of the industries [1,6,8-11]

2.3 Transport Sector

Transport sector is another major energy consuming area next to industries. A proper transport and means of such indicate the level of civilization and standard of living. Over the years, the traditional systems of transport have changed to the mechanized ones, i.e. car, scooter, bus, truck, train, aero plane and ships etc. The manufacturers of automobiles must be given incentives to produce energy efficient machines and mechanisms [3,8-9]. The government should initiate the energy policy where in the automobile manufacturers contribution in generation of energy must be tied up based on the sale of such individual's products in the market. This really brings eco-friendly designs, practices keeping energy sense and also a healthy competition in the market. Ultimately an unexpected growth of load by some ones sale or transaction should not burden the nation's sources of energy causing citizens of the country to pay for the same in the form of Tax or Levis even though they may not be owning such [6,8-11]. The major form of fuel for these modes of transport is still the fossil fuel sources of energy. The serious point is the pollution caused by the burning of fossil fuels, therefore the need of the hour is conservation of energy in the this sector. The individual owners of vehicles and the transport

operators need to adopt efficient, cost effective mechanisms and sensible to the conserve energy to protect the environment. Fig 7 shows consumption of fuel in Transport sectors and Table 3 gives possible avenues to conserve energy in this sector [1-6,9]

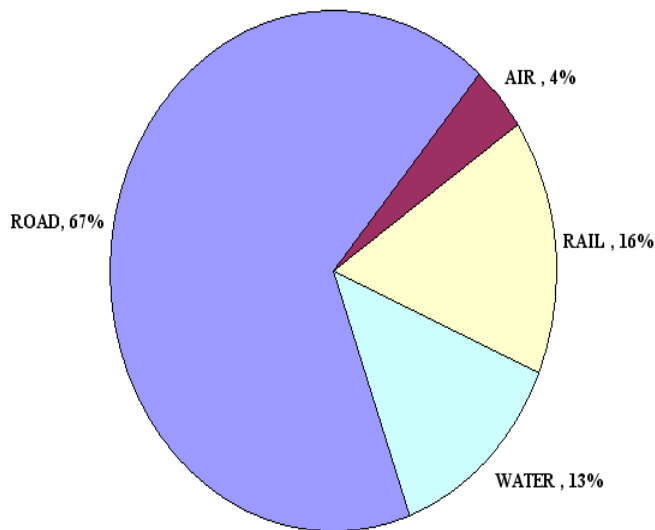


Fig.7 Distribution of Fuel Usage in Transport Sector

Table 3 Energy Conservation in Transport

Process	Energy Saving Extent
1 Planned travel in teams to avoid waste of fuel	Greater
2 Practice of public transport rather than own	Moderate
3 Proper choice of mode Based on persons (Scooter/car/bus/train etc)	Good
4 Choice of fuel (Liquid/Gas etc)	Little
5 Awareness of energy conservation measures/ Energy Audit	Moderate

2.4 Commercial Sector

The commercial sector includes retail shops, offices business and government, hotels, lodge and restaurants, schools and other workplaces. The form of energy used here is same as that of residential type with small change in proportions. Commercial lighting consumes about 55-60% of the consumption of this sector and generally the most wasteful component of commercial use. A number of case studies indicate that more efficient lighting and elimination of over-illumination can reduce lighting energy by 40-50%. Space conditioning (Heating ventilating and cooling) is again the single biggest consumption area but it represents only about 30-35% of the energy use of commercial buildings [1,3,6,9-11].

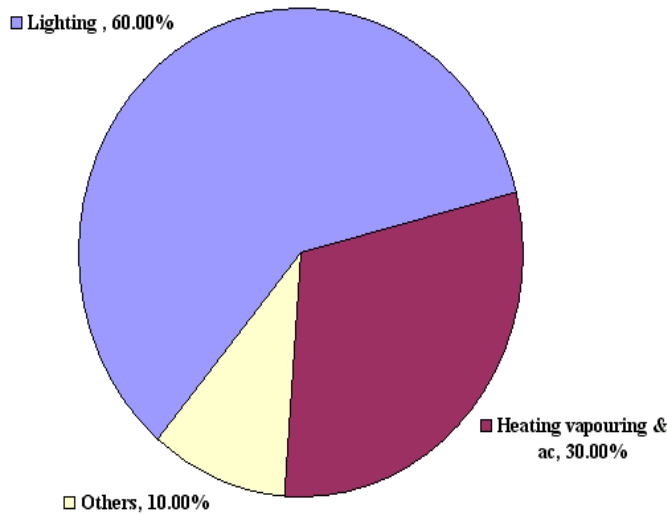


Fig 8 Energy Usage in Commercial Sector

Table 4 Energy Conservation in Commercial Sector

Process	Energy Saving Extent
1 Proper illumination (calculated practically)	Greater
2 Practice standard and Efficient Equipment or accessories	Greater
3 Use of Eco-friendly Controller(Intelligent)	Good
4 Awareness of energy conservation measures/ Energy Audit	Moderate

III. CONCLUSIONS

Energy conservation is being the most effective way to reduce the wastage of energy resulting in lesser burden on generating systems. The seriousness of the energy, the use and methods of conservation of the same were highlighted in various sectors of the country and opportunities to achieve the energy balance were thought. The practice of the same should be done nationwide and by everyone. Industries must try to improve the energy efficiency by using latest promising technologies with state-of-the-art machines, processes, etc. Periodic maintenance and calibration makes the systems to be more efficient and thereby helping the fuel conservation and reduction in emission. The government should improve and give priority to the use of public transport which will lower energy consumption. Also should think of imposing strict policy on the user of the energy such that the seriousness must be there to produce part of that is being used by providing subsidy or such initiatives.

IV. ACKNOWLEDGEMENT

The national and regional official websites, technical papers, the text book materials are used in this work and they stand as reference for the current work. We acknowledge the great work and contribution from them.

REFERENCES

[1] Energy Statistics 2015. Ministry of statistics and program implementation government of India
 [2] Renewable energy in India: Growth and Targets. Ministry of New and renewable energy (MNRE) 13th May 2015
 [3] Executive Summary Power Sector January-15

- [4] Power sector at a glance, Official websites of Ministry of Power Government of India
- [5] India Renewable energy status report 2014.
- [6] Mallikarjun G Hudedmani, Vishwanath M Soppimath. Energy Audit: an initiative to energy conservation. Discovery, 2015,38 (173), 46-51
- [7] Rai G D, Non Conventional Energy Sources, Khanna Publishers Delhi, Fourth Edition.
- [8] Rao S, Purlekar B B, Energy Technology, Khanna Publishers Delhi
- [9] Raminder Kaur 'Energy Conservation And Demand Side Management In Present Indian Power Sector Scenario' International Journal of Power System Operation and Energy Management ISSN (PRINT): 2231 – 4407, Volume-3, Issue-1, 2013
- [10] Ramesh S P , M Emran Khan ' Energy Scenario and Energy Efficiency: Programme and Policies of Booming India' ,American International Journal of Research in Science, Technology, Engineering & Mathematics
- [11] Vijaykumar Kulkarni , Pradip Katti, 'Policies and Strategies for the Improvement in Energy Efficiency in Industries Indian Experience' International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277- 3878, Volume-2, Issue-2, May 2013