

Energy and its Need Today and Tomorrow-An Overview

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Abstract: Energy provides the Power to progress. The natural resources of a country may be large but they can only be turned into wealth if they are developed, used and exchanged for other goods. This cannot be achieved without energy. Availability of sufficient energy and its proper use in any country can result in its people rising from subsistence level to the highest standard of living. Thus energy is a vital asset for human beings. In this paper an overview is presented on the importance of energy and its need in various sectors. Energy demand and its challenges along with Energy conservation are also emphasized

Keywords: Energy, Energy demand, Energy challenge, Energy conservation.

I. Introduction

Energy, its generation and effective utilization has become one of the challenging tasks that World is currently facing and striving hard to overcome the worst scenarios with innovative trends. The way energy is produced and used has a considerable impact on our economy, society and environment as whole; and socially desirable and economic opportunities which are rapidly rising can be harvested by integrating energy with other important enablers of our society such as the urban agenda, living and transport. Energy plays a vital role in achieving the desired economic growth of a nation. Every nation is making efforts for economic growth through energy intensive paths. Energy intensities are valuable indicators in explaining the energy used for the entire production chains. The combination of sectorial energy intensities with the demands for sectorial outputs provides insight into complete energy use in an economy. [i], [vi], [vii] Variations in energy use reflect the combined effects of changes in energy intensities in different sectors and changes in the volume and structure of demand. Energy required per unit of production (referred as energy intensity or specific energy consumption) shows the sensitivity of products or sectors to variation in energy rates. In general energy can be classified as shown in figure 1. [iii]

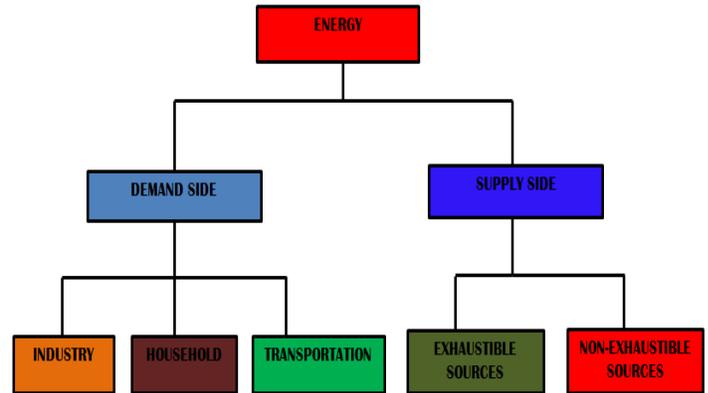


Figure-1. Classification of energy based on demand side and supply side.

Energy is utilized in various sectors as follows,

Industrial sector: Power generation industries, manufacturing industries (iron manufacture, non-ferrous manufacture, ceramic industry, textile industry, paper and pulp industry, food industry etc.), factories, city gas, petroleum products, and heat supply.

Household sector: Homes, Buildings, offices, shopping malls, hospitals and hotels etc.

Transportation sector: Transportation systems, trains, vehicles, boats and vessels, aircrafts and physical distribution systems. [iii]

Sources of energy

The energy sources are basically of two type's namely conventional energy sources and non-conventional energy sources. Conventional energy sources include coal, petroleum, diesel and natural gas etc. Non-conventional sources of energy include solar power generation, wind power generation, geothermal energy generation, tidal power generation, biomass energy, solar cells, fuel cells, thermo electric generator, etc. In broader sense conventional sources are Non-renewable sources and Non-conventional sources are Renewable sources of energy. [iv], [vii]. A general energy system structure is depicted in figure 2.

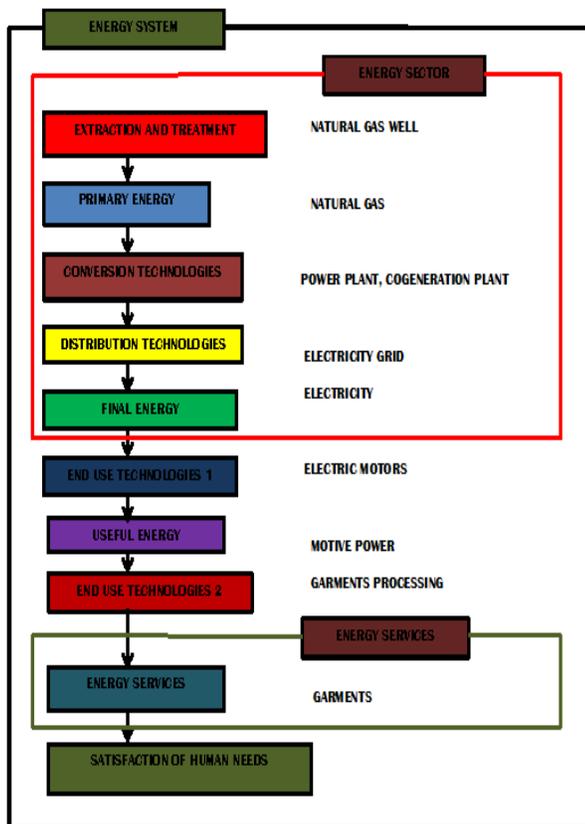


Figure 2. Energy Structure.

The rest of the paper is organized into sections as follows. Section II deals with Energy demand and Energy management. Section III focuses on the Energy challenge. Section IV includes the transformation need of global energy system. Section V describes the Energy conservation scheme. Finally section VI summarizes the paper and presents the concluding remark.

II. Energy Demand and Management

The supply and demand of energy determine the course of global development in every sphere of human activity. Sufficient supplies of clean energy are intimately linked with global stability, economic prosperity and quality of life. Finding energy sources to satisfy World's growing demand is one of the society's foremost challenges for the next half century. The importance of this pervasive problem and perplexing technical difficulty of solving it requires a concerted national effort marshalling our most advanced scientific and technological capabilities. The technological and social dynamics that determine energy demand of central importance to managing energy systems. Total demand for primary energy resources depends on both the efficiency of the processes used to convert primary energy to useful energy and the intensity with which useful energy is used to deliver services. [i]. Energy demand forecasting is an essential component for energy planning, formulating strategies and recommending energy policies. The task is challenging not only in developing countries where necessary data,

appropriate models and required institutions are lacking, but also in industrialized countries in which these limitations are somewhat serious. Projected energy demands are also found to deviate from the actual demands due to limitations in the model structure or appropriate assumptions. [ix]

After generating the energy and providing it to the customers effectively, management of energy should be done carefully. Energy manager system means the "framework to allocate energy conservation engineers with excellent knowledge and skills under the responsibilities of enterprises (especially in power plants, industries and factories), and to promote energy conservation in the entire industry through planning, implementation, and evaluation of energy conservation conducted by the engineers in enterprises". Engineers with excellent knowledge and skills in the field of energy conservation are "Energy managers". The framework would not function if energy conservation is totally subject to the self-efforts endeavours of each enterprise and if enterprises do not have the relevant technologies, since the enterprise tends to prioritize improvement of productivity rather than energy conservation. Thus policies need to encourage enterprises commitment to the assignment of personnel responsible for energy management in each factory. [iii]

III. Energy challenge

The world now uses energy at a rate of approximately 4.1×10^{20} joules/year equivalent to a continuous power consumption of 13 trillion watts or 13 tetra watts (TW). Even with aggressive conservation and energy efficient measures, an increase of the earth's population to 9 billion, accompanied by rapid technology development and economic growth worldwide is projected to produce more than double the demand for energy (to 30 TW) by 2050 and more than triple the demand (to 46 TW) by the end of the century. The reserves of fossil fuels that currently power society will fall short of this demand over the long term, and their continued use produces harmful side effects such as pollution that threatens human health associated with climatic change.

Four key energy system challenges for the entire energy system have been identified to meet the three over latching energy and climate: security of supply, competitiveness and sustainability.

1. Active consumer at the centre of energy system: Engaging consumers through better understanding, information and market transformation, and activating them through innovative technologies, products and services.

2. Demand focus – Increasing energy efficiency across the energy system: increasing energy efficiency in buildings, in heating and cooling, in industry (energy intensive sectors) and services. This challenge should result in the development and market uptake of innovative energy efficient systems, technologies, products and services.

3. Systems optimisation: Modernising the electricity grid and establishing synergies between the various energy carriers and networks; unlocking the potential of energy storage and conversion of electricity to other energy carriers; providing the energy system with flexibility, demand response, security and cost effectiveness and developing and demonstrating holistic system optimisation at rural and urban level.

4. Secure, cost effective, clean and competitive supply:

Making renewable electricity and heating /cooling technologies competitive; enabling the decarbonisation and increase efficiency of the energy supply in the fossil fuel based power sector and energy intensive industry sectors; supporting safe and efficient operation of nuclear systems and development of innovative reactor concepts and sustainable solutions for the management of fissile materials and radioactive waste (both from fission and fusion systems); and developing sustainable biofuels, fuel cells and hydrogen and alternative fuels.[i]

IV. Transformation need of Global Energy System

A transformation of the global energy system is needed to:

[i] Protect the global life support system, especially by mitigating climatic change.

[ii] Eradicate energy poverty in developing countries.

[iii] Reduce the risk of geopolitical conflicts over energy resources.

[iv] Establish a secure and reliable energy supply system.

Alongside major improvements in energy efficiency, energy conversions and transportation systems, the extensive use of demanding renewable energy sources such as solar and wind will make a major contribution to future sustainable energy systems. This transformation to a sustainable global energy system is urgent and a sustained policy activity is essential. This needs to take place at multiple levels, for example, through international treaties, regulations, development mechanisms and market deployment schemes. [i]

V. Energy Conservation

Energy conservation is the reduction of the quantity of energy used. As a broader definition in development assistance, "Energy conservation means enhancing efficiency of energy consumption throughout society. Energy conservation supports the eco-friendly life style by providing energy which saves the money and at the same time saves the earth. There is a good scope of energy conservation in various sectors like domestic, industrial and agricultural. As energy is an important asset and is required in various sectors, its availability has to be ensured on sustainable basis. On the other hand, the demand for energy is growing tremendously and the energy sources are becoming scarce and costlier. Among the various strategies to be evolved for meeting the energy demand, energy conservation emerges as the least cost option in any given strategies, apart from being environmentally benign. The figure 3, depicts the significance of energy conservation



Figure 3 Energy conservation

A. Significance of Energy conservation

In situations where nations try to accelerate its development process and cope with increasing energy demands, energy conservation and energy efficiency measures will play a vital role in the energy policies worldwide. Also national movements for energy conservation can drastically minimize the need for fresh investments in energy supply systems in the coming periods. Energy conservation is a vital element of energy policy on a big scale. In general, it reduces the energy demand per capita and energy consumption. This reduces the increase in energy costs and reduces the requirement of new power plants and energy imports. Conservation of energy is an objective to which all the citizens in the country can contribute. In various sectors where energy is utilized, every user and producer of energy must make this effort for his own profit as well as that of the nation. Thus, energy conservation is an important tool to deal with global issues such as future exhaustion of resources and global warming. [ii], [x], [xi]

B. Need of energy conservation

There are three significant goals to implement energy conservation.

[i] Reduction of energy consumption.

[ii] Reduction of greenhouse gases.

[iii] Reduction of costs.

Furthermore, three overall goals of energy conservation are set as follows

[1] Energy security

Energy security is to ensure a constant and stable supply of energy. In order to maintain the supply, it is necessary for nations to increase the domestic energy self-sufficiency ratio and to undertake diplomatic endeavours to secure stable energy supplies. Increasing the energy self-sufficiency ratio is a direct means to achieve the goal. In order to increase the energy self-sufficiency, it is necessary to develop and promote the use of domestic untapped energy such as solar, wind, nuclear energy, and to enhance effective utilization of existing energies (Energy conservation). In this way energy conservation serves as a solution to the global issues such as energy security and possible future exhaustion of resources. [iii]

[2] Measures of global environment

Global warming has been one of the globally concerned issues. To deal with such an issue international frameworks have been established. Under this circumstance, concrete measures are required to regulate greenhouse gas emissions with efforts by government and private sectors. Since energy conservation limits the greenhouse gas emissions (carbon di oxide CO₂, in particular) which lead to global warming, the measures for energy conservation functions as those for elimination of greenhouse gas emissions. Energy conservation is conventionally implemented for the purpose of raising income and ensuring energy security in many cases. However, in recent years, the effect of CO₂ reduction has been gaining attention, and in many cases, energy conservation has been implemented for preventing global warming.

[3] Raising income

Increase in income by reducing costs for energy utilities is a direct purpose and incentive of energy conservation. Through the implementation of energy conservation, the expenses for

wasteful energy consumption can be reduced and the income will increase equivalent to the amount of the reduction. Through effective energy conservation measures, expenses for the utility of electricity and gas will decrease and these savings can be utilized for other expenditures at the household level. In industrial sector and business levels, the decrease of energy consumption per unit of production (cost reduction of production) will increase their competitiveness to a high level. Increase in income and enhancing business competitiveness at the national level contributes to economic growth.

C. Effective policy approaches to Energy conservation

There are three points of effective policy approaches concerning energy conservation

[i]. Establishing energy conservation systems

Establishing a system to take advantages of human resources inside factories and a system to utilize outsourcing services.

[ii]. Implementation of administrative services relating to energy conservation

Implementation of training courses, Energy audit (EA) for factories, and activities of publicity, awareness and dissemination.

[iii]. Promoting energy conservation business market

In order to promote energy conservation it is important to establish energy saving activities framework. At the same time, it is also essential to ensure a change in attitude of energy consumers and to promote voluntary activities of energy conservation through performing the activities of publicity, awareness, and dissemination of energy conservation. [ii], [iii]

VI. Conclusion

Energy plays a vital role in achieving the desired economic growth of a nation. The overall fabric of development targets and goals are webbed around successful energy policies and strategies. Nowadays, the quality of energy supply and reliability is becoming a huge task for the consumer's satisfaction. Finding sufficient supplies of clean energy for the future is one of the society's most daunting challenges. The gap between energy supply and demand is raising continuously inspite of the big outlay for energy sector. The gap between supply of energy and its demand can be overcome with the conservation of energy which is considered as a new useful energy resource and is environmental friendly. Thus energy conservation is cost effective. The future energy strategies should be flexible and rational considering available energy sources and developing efficient technologies for production, supply and its use. Furthermore, conservation of energy is needed for economic growth and environmental protection.

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References

- i. *Strategic Energy technology (SET) plan, "Towards an Integrated Roadmap: Research & Innovation Challenges and Needs of the EU Energy System, December 2014*
- ii. *Shri P M Sayeed Honourable minister of power, article on the occasion of Energy conservation day 14th December 2005.*
- iii. *JICA thematic guidelines on energy conservation, February 2005.*
- iv. *Dr. T.V Ramachandra, "Renewable Energy Transition: Perspective and Challenges".*
- v. *Gian Paolo Beretta, "World energy consumption and resources: An outlook for the rest of the century".*
- vi. *Kristin Meek, Rebecca Gasper, Noah Kaufman, "Detailed overview of Methods: How states can meet their clean power plan targets", fact sheet, World resource Institute November 2015.*
- vii. *A. Chakrabarti, M.L. Soni, P.V Gupta, U.S Bhatnagar "A Text book on Power System Engineering" Dhanpat Rai & Co.*
- viii. *Mary Ma, professor Hallstead, "Renew the Energy crisis: the bright future of Renewable sources". September 20, 2010.*
- ix. *Subhes C. Bhattacharya, Govinda R. Timilsina, "Energy demand models for policy formulation " The World bank development research group environment and energy team March 2009*
- x. *Er. Harpreet kaur, M/s Kamal deep kaur, "Energy conservation: An effective way of energy utilization", IJMIE, vol 2, issue 5, may 2012.*
- xi. *Kamalapur GD, Uday Kumar RY, "Electrical energy conservation in India- challenges and achievements", International conference on Control, Automation, Communication and Energy conservation 2009*