

Need for Energy Conservation for Sustainability

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Abstract— This paper outlines the present scenario of fossil fuels in India and need for study of different alternatives for fossil fuels for conservation of energy and also focuses the effects of fossil fuels on environment and sustainability. As tremendous amount of energy is required for manufacturing, transportation and maintenance of construction materials so we need to focus on alternative building materials having low embodied energy so that impact of development will not effect the environment.

Keywords- Alternative Energy Sources, Sustainability, Embodied Energy, Fossil fuels, Energy efficiency

I. INTRODUCTION

It India is witnessing tremendous amount of growth in construction sector. The largest economic activities in India is considered to be construction Industry which is growing at average rate of 9% compared to global average rate of 6%. As this sector is growing at a rapidly, So preserving the environment poses many challenges, also construction sector therefore needs to contribute towards environmental and climate change responsibly.

Man has needed and used energy at an increased rate for his sustenance and well being ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food, So he started cooking for which energy is supplied by biomass or wood. There exists a strong relation between the kind of lifestyles pursued by a community and their sustainability and as a community's attitude determines its lifestyles, there is a very strong connection between community and sustainability.[3]

II. ENERGY SCEANARIO IN INDIA

With economic growth rate of 8.9%, Which is the second fastest in the world and GDP that is fourth largest in terms of PPP at US \$3.6 Trillion [6] India's energy intensity in comparison to the world average is very low. In other words the urban population's energy consumption and expenditure on energy are markedly higher than that of rural's energy population, where the energy costs are cross subsidized by the commercial and industrial sectors of the country. With near consistent 8% rise in annual energy consumption in the residential and commercial sectors Building Energy consumption has seen an increase from a low 14% in 1970s to nearly 33% in 2004-2005[6]

India's conventional energy reserves are limited and a lot of stress has been laid under the Integrated Energy policy on energy efficiency and conservation, with emphasis on efficiency of electricity generation, transmission, distribution and end-use. Over the next 25 years energy efficiency and conservation would be very critical to ensure energy security and water and these two are poised to be biggest constraints to India's growth Table 1 Shows current energy scenario in India

Table 1. Current Energy Scenario in India

FUEL	MW	PERCENTAGE
Total Thermal	141713.68	66.91
Coal	121610.88	57.42
Gas	18903.05	8.92
Oil	1199.75	.56
Hydro	39416.40	18.61
Nuclear	4780.00	2.25
RES	25856.14	12.20
Total	211766.22	100

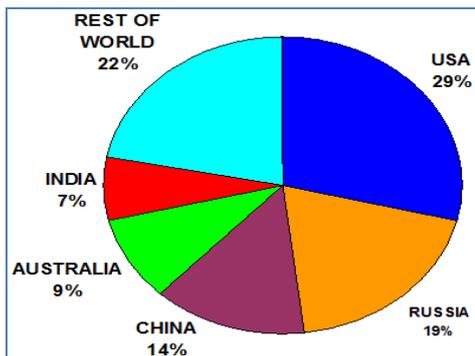
III. FOSSIL FUELS

A. Coal

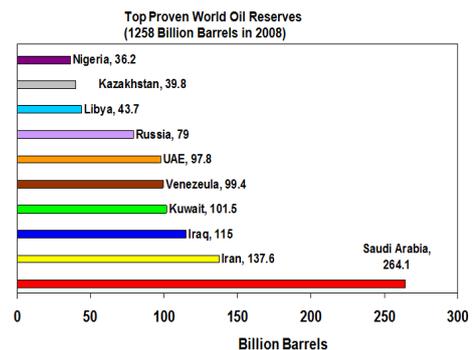
India has fairly large reserves of coal . It can be seen that the reserves have been increasing because of the location of more coal fields .This value is about 9.8 percent of the world’s proved reserves. Fig 1 shows the world coal reserves

B. Oil

According 2006 estimates 786 MT of oil reserves are recoverable. The position regarding reserves is rather uncertain In the event that no substantial discoveries are being made the position is rather serious . The present domestic production cannot be sustained for more than 20 years [7]. Fig .2 shows the the oil reserves of world



“Figure 1. World Coal Reserves”



“Figure 2. World Oil Reserves”

C. Natural Gas

The Proved reserved estimate for the country as a whole to 1101Billion m³ in 2005 . The prospects of finding more gas reserves are good .One of the major problems concerning gas in India is that a significant amount is in the form of associated gas.[7].Fig 3 shows natural gas reserves of world

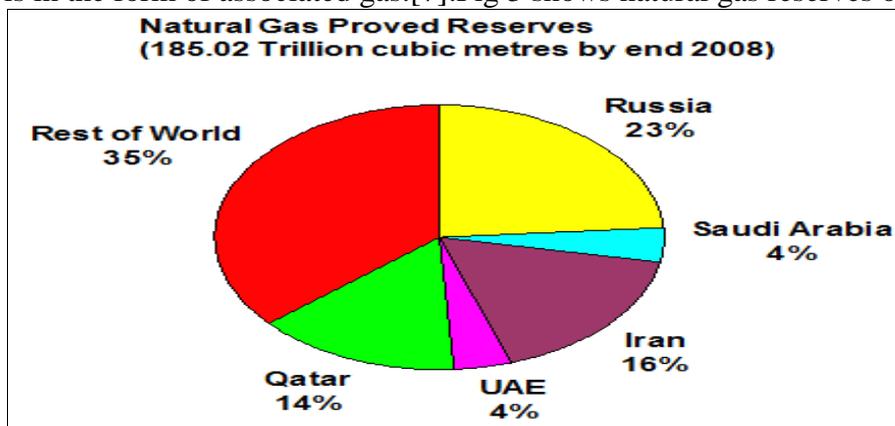


Figure 3. Natural Gas Proved Reserves

D. Water Power

Data on the installed capacity of hydroelectric power in India and the electricity produced from it from 1994 onwards is presented in fig. The water power reserves of India have been estimated by the Central Electricity Authority. It is estimated that there is potential for installing about 148700MW in the near future. Region wise Breakup of power Potential in India [7]

‘Table 2. Water – Power potential in India’

Sr.No	Region	Potential (MW)
1	Northeast	58971
2	East	10949
3	North	53395
4	West	8928
5	South	16458
6	Total	148701

E. Nuclear Power

The installed capacity of Nuclear Power plants in India 2006 is shown in Table. As India’s resources of uranium are not extensive, It is estimated that reserves available are about 61000T [7]

F. Miscellaneous Sources

We now discuss contribution of Some miscellaneous sources for generating electrical energy. In India, Miscellaneous sources are renewable sources like Wind Energy, Biomass, Small hydropower etc.

IV. NEED FOR ALTERNATIVES TO FOSSIL FUELS

The average rate of increase of oil production in the world is declining and its peak production may be reached around 2016 (if no significant addition occurs to be proved reserves). Thereafter the production will go down gradually and all the oil reserves of the world are likely to be consumed by the end of present century 2070-2080. 30% of the world’s need for energy from commercial sources and that oil is the fuel used in most of world’s transportation system [7]

Production of natural Gas is continuing to increase at a rate of about 4 % every year. Present indications are that a peak in gas production will come around 2025 about 10 years after the peak in oil production

As oil and natural gas becomes scarce a greater burden will fall on coal .It is likely that production of coal will touch peak in around 2050 Finally resources deplete so need for using fossil fuels exclusively for such purposes may become greater.

India stands fourth in the world in total energy consumption although in absolute figures it amounts to 3.4% of the global energy consumption. India depends for petroleum and oil resources on imported stocks. About thirty five percent of India’s current energy needs are fulfilled by imports. Coal is still considered as primary energy resource even in long term.

V. ALTERNATIVE ENERGY SOURCES

As of April 2013, the Indian government estimated the country’s renewable energy potential at over 254,000 MW, mostly from solar and wind. Converted to fossil fuel equivalents, this is about 52,000 MW of continuous power. And this estimate ignores the conservation potential, which could reduce peak demand by 25% or 6,500 MW annually, using only self-funding, off-the-shelf technologies and strategies currently supported by SEUs elsewhere[7]

A. Solar Energy

Solar Energy is a very large inexhaustible source of energy. The Power from the sun intercepted by the Earth is approximately 18×10^{11} MW which many thousands of times larger than the present consumption on the earth of all commercial energy sources. Thus it is one of the most promising of the nonconventional energy sources. It has two other significant factors two its advantage unlike fossil fuels & nuclear power it is an environmentally clean source of energy. Secondly it is free and available in adequate quantities in almost all parts of world The only problem associated with it is a dilute source of energy.[7]

B. Tidal Energy

Tides are generated primarily by the gravitational attraction between the earth and moon acting upon the oceans of the earth. The two main potential regions for exploiting tidal energy are Gulf of Khambat and Gulf of Kutch in Gujarat. Large Size Commercial power plants have not been constructed mainly because building the long barrages required for tidal power stations is costly [7]

C. Geothermal Energy

Geothermal Energy is energy coming out of the molten interior of the earth. The average rate at which this heat emerges is about 0.05 W/m^2 While radial temperature gradient which causes this heat flow is about 0.03°C per metre [7]

D. Hydrogen Energy

Hydrogen is considered widely as a secondary energy alternative as an energy sources hydrogen has a number of advantages. it is non-toxic, clean fuel and has high specific energy on a mass basis. For e.g: The energy content of 9.5kg of hydrogen is equivalent to that of 25kg of gasoline. In addition to it can be stored for long periods of time easily be transported. The main disadvantage being it burns readily when mixed with air causing safety problems [7]

VI. ENERGY IN BUILDINGS

Building materials and technologies & Building Practices have evolved through ages. Construction of Building started initially with the use of green materials like stones, soil, leaves & unprocessed timber. so very less energy is consumed while processing of these natural materials in construction. Burning of Brick represents one of the earliest examples of using thermal energy to produce durable building material. Portland cement and steel brought revelation in construction Industry. Now plastic, aluminium, & plastic products have become important part of construction practices.[1]

So we moved from low energy materials to more modern materials which are more durable but consumes significantly higher energy compared to older materials, but for sustainable development we have to consider selection materials with reference to following context.

1. Raw materials
2. Recycling
3. Low Embodied energy
4. Impact on environment

Embodied energy is the energy needed in preparing and extracting the raw materials, energy for transportation of the same and the external energy applied to raw materials in producing or assembling the final product [2]

VII. SUSTAINABLE BUILDING MATERIALS

A. Use of Natural Materials

Natural materials are generally lower in embodied energy and toxicity than man-made materials. They require less processing and are less damaging to the environment. Many like wood, are theoretically renewable. When low embodied energy natural materials are incorporated into

building products, the products become more sustainable.[4]The use of Fly ash bricks in place of clay bricks saves almost 72% energy consumption and carbon emission by 27% [5]

B. Longer life

Materials with a longer life relative to other materials designed for the same purpose need to be replaced less often. This reduces the natural resources required for manufacturing and amount of money spent on installation and the associated labour. Durable materials that require less maintenance produce less landfill waste over the building's lifetime.

C. Reusability

Reusability is a function of the age and durability of a material, very durable materials may outlast the building itself and can be reused at a new site. These materials may have many useful years of service left when the building in which they are installed is decommissioned and may be easily extracted and reinstalled at a new site.

D. Biodegradability

The biodegradability of a material refers to its potential to naturally decompose when discarded. Organic materials can return to the earth rapidly, while others like steel take a long time. An important consideration is whether the material in question will produce hazardous materials as it decomposes either alone or in combination with other substances

VIII. CONCLUSION

1. Energy demand fulfilled by fossil fuels pollutes environment
2. Concrete blocks a suitable replacement, particularly in areas where stone or aggregates are available in abundance. Major advantage in saving top soil by not using clay for manufacturing of bricks.
3. Sustainability of rural settlements is important especially in fast growing economy like India due to modern, urban influences and transitions in this built environment and lifestyle aspirations.
4. The fossil fuels resources are fast depleting and that the fossil fuel era is gradually coming to an end. As the figures suggest we should go alternatives to fossil fuels.
5. Use of Energy efficient buildings and equipment's should be more.

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