

Analysis of coal as the most dominant non renewable energy resource in India and its role in electric power generation



Engineering

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Shalom Akhai

Assistant professor, Department of Mechanical Engineering, PEC University of Technology, Chandigarh, India.

Yogyank Mishra

Undergraduate student, Department of Mechanical Engineering, University Institute of Engineering and Technology, Panjab University

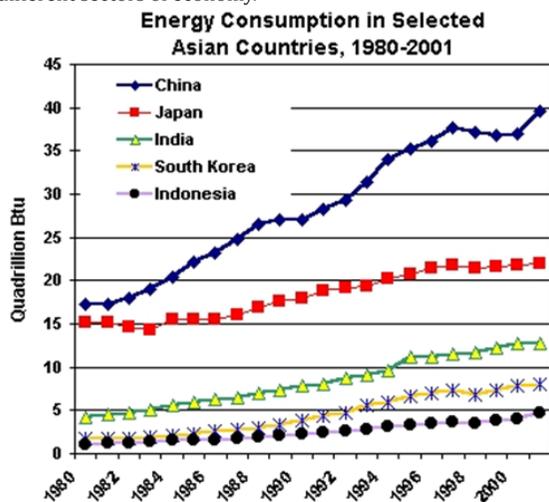
ABSTRACT

India faces a significant challenge in providing access to adequate, affordable and clean sources of energy, especially electricity generation for a large section of the population, most of who live in rural areas. The electricity in India is mostly generated by coal based thermal power plants. This leads us to understand the importance of the non-renewable or perishable resource coal and its gradually increasing consumption. Since the energy needs have increased the exploitation of fossil fuels has also augmented since the two are correlated. In fossil fuels again coal is one of the most utilized and in demand fossil fuel. It is also the chief source of energy in the Indian subcontinent. Harvesting coal is not an easy task because it can cause a lot of problems to the labor including death. Not only that it is a dangerous occupation but it also has a negative impact on our environment. Since coal is a non-renewable resource it should be conserved properly. The dominance of coal in power generation is quite strong. But coal is a perishable resource, which can only last for a few more years therefore we need to find an immediate substitute of coal and its uses. Nuclear power plants are a very good option and so are Hydro power plants.

GROWING ENERGY NEEDS

Energy is an important input for development. It is mainly used for domestic, agriculture, transportation and industrial purposes. The commercial energy consumption in the developed world has increased during last 3-4 decades. More than 80% of the total consumption of energy is by developed countries, which accounts for 30% of world population while 20% of the energy is consumed by 70% of the world population in developing countries. The development of energy resources requires intensive and huge investments to fulfill the requirement of energy for the different sectors of economy.

21.6%. Fossil fuels are the hub of industrial revolution. They supply power to industry, transport, agriculture, and domestic uses.



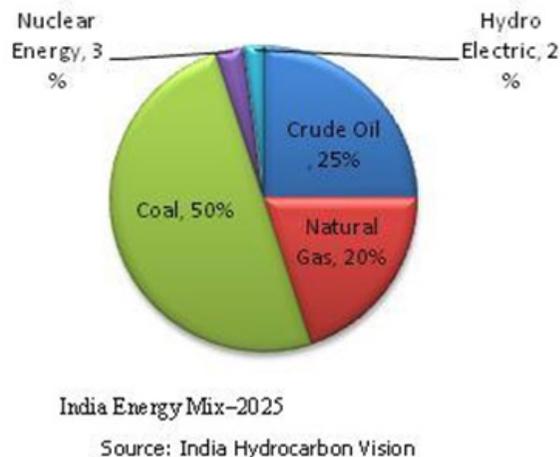
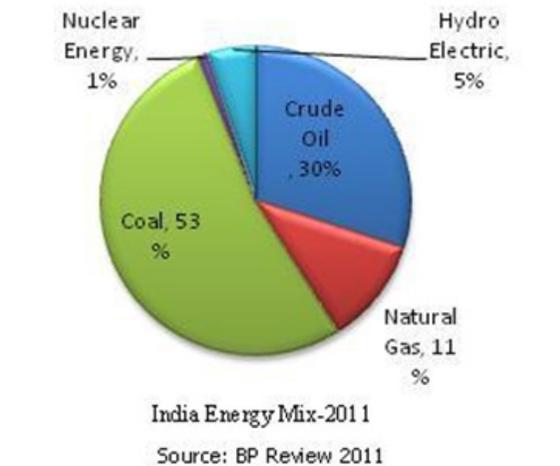
FOSSIL FUELS

Fossil fuels are organic fuel resources found in earth's crust which have been formed in the past through the effect of heat and compression on forest and other organic matter buried underneath due to landslides, earth quakes and lava.

Fossil fuels are of three types

- (a) Solid e.g., coal, lignite.
- (b) Liquid e.g.; Petroleum- diesel Petrol,
- (c) Gases e.g.; natural gases, LPG.

Fossil fuel reserves are limited and can last for another, century if they are properly utilized. 95% of petroleum reserves are found in 20 countries with more than 50% reserves present in Middle East countries. The coal reserve in India is more than 200 billion tones. In 1990 worldwide consumption of different fossil fuels was coal 27.2%, Petroleum 38.6% Natural gas



In India, coal is the chief source of energy. It contributes about 53% of the country's commercial needs far ahead than natural gas 11% and crude oil 25%. It is a solid form of plants remains. It consists of carbon, water and traces of Nitrogen and Sulphur. Coals are of four types

- (1) Peat.
- (2) Lignite.
- (3) Bituminous.
- (4) Anthracite.

Anthracite is the main coal with high heat and low Sulphur content.

Environmental Impact: -

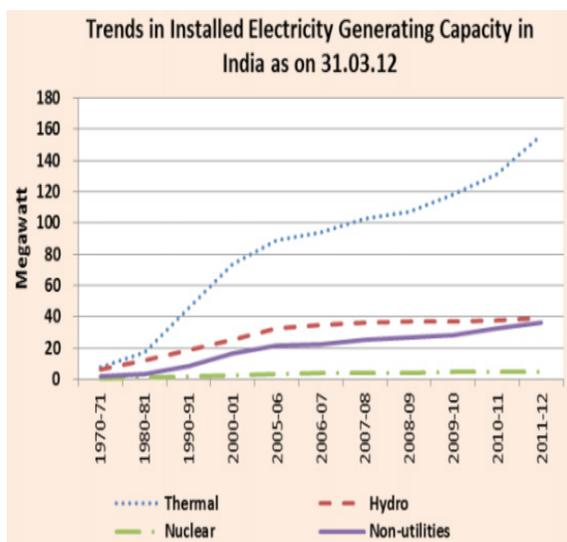
1. Coal mining is a dangerous occupation. During coal mining many cases of deaths and permanent disability have been reported.
2. Coal mineworkers are prone to black lung diseases due to coal dust.
3. Surface mining of coal causes severe land disturbances.
4. Coal mining destroys natural vegetation and habitat of wild life.
5. It causes soil erosion, and soil degradation.
6. Toxic minerals leached from coalmines pollute the water bodies and contaminate ground water resulting in death of aquatic flora and fauna.
7. Burning of coal causes air pollution, which produces Carbon dioxide, Sulphur dioxide, Nitrogen oxide, which damages forests and aquatic ecosystem.

CONSERVATION OF COAL

1. Coal mines are fire prone which can last for several days hence a lot of precautions should be taken.
2. Wastage during refining and washing is huge. Hence, efforts should be made to minimize the waste.
3. Wastage during extraction should be reduced by adopting new techniques e.g. shield-mining system improve extraction from 35 to 70%.
4. Better containers should be used to reduce the wastage during transportation.
5. Fuel use efficiency of equipment, devices and vehicles should be improved with maximization of combustion.
6. Efforts should be made to develop technology to extract fossil fuel from low yields mines.
7. New areas should be surveyed to locate new mines.
8. Solar energy can be utilized in transport system.
9. Use of alternate sources of energy should be preferred e.g. hydroelectric, geo-thermal.

COAL IN ELECTRIC POWER GENERATION

In India thermal power plants are the most dominating source of electricity generation. More than 60% of electricity is generated through thermal power plants. There has been a trend of gradual increase in the generation of electricity since 1971. A survey was conducted in 2012. According to which

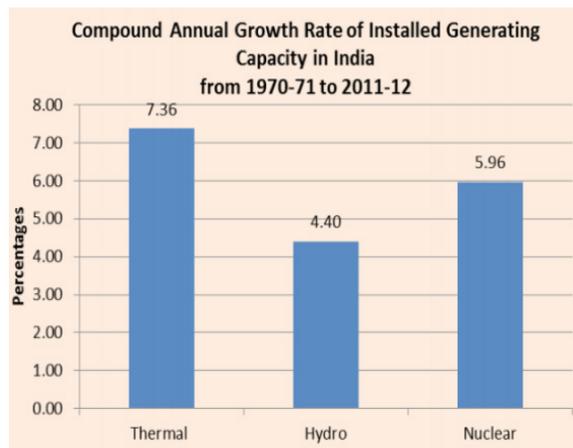


The total installed capacity for electricity generation in our country has increased from 16,271 MW as on 31.03.1971 to

236,387 MW as on 31.03.2012, registering a compound annual growth rate (CAGR) of 6.58%.

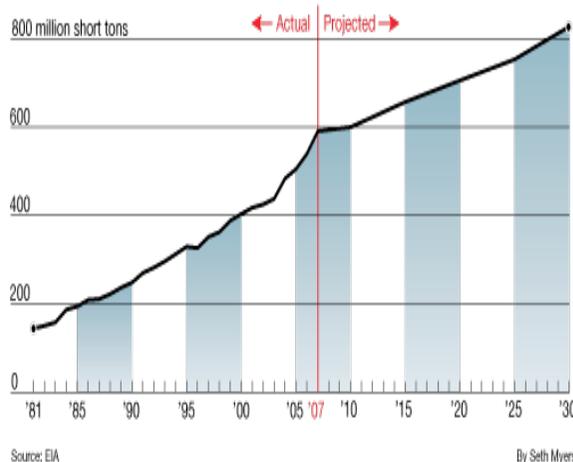
At the end of March 2012, thermal power plants accounted for an overwhelming 66% of the total installed capacity in the country, with an installed capacity of 156,107 MW.

There has been a phenomenal growth in generating electrical capacity not just in thermal power plants but in hydro and nuclear too.



At present 54.09% of total electricity production in India is from Coal Based Thermal Power Station. A coal based thermal power plant converts the chemical energy of the coal into electrical energy.

India's historic and projected coal consumption



CONCLUSION & FUTURE SCOPE

Coal is a non-renewableresource, which may not last for more than a century. But our daily lives are indirectly quite dependent on it. More than 50% of thermal power plants use coal as their resource in India. Moreover coal extraction or mining also causes a lot of environmental problems such as disturbing flora and fauna and causing other hazardous problems to the environment. Also it is quite unsafe for the labor working at coalmines because these mines are quite prone to fire and can cause manmade disaster. So either a substitute of coal or some different source of energy should be used.

According to a survey done in 2007 our coal reserves are only 1% of that of world reserves, which will last for about a century at the present rate of extraction (about 600 Million Tones) and crude oil and natural gas reserves are 0.80 billion tons and 0.73 billion tons respectively, will last for about 20-25 years at the present rate of production (250 Million tons per year).

Due to environment friendly and renewable nature of non-conventional energy resources, they are in great demand e.g. wind, solar, biogas and biomass energy. In future Coal bed (CBM) methane of lower Gondwana will prone to be potential source of energy.

REFERENCE

- [1] http://www.need.org/needpdf/infobook_activities/ElemInfo/CoalE. | [2] Mishra Archana, "Environmental Studies Systems & Solutions". | [3] Khoshoo, T.N, "Environmental Concerns & Strategies". | [4] <http://www.worldcoal.org/resources/coal-statistics>. | [5] <http://www.coal.nic.in>. | [6] Stanley P. Schweinfurth, Robert Barry Finkelman, "Coal-a complex natural resource". | [7] John V. Walther, "Earth's Natural Resources". |