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For economists, the study of energy has involved the immediate sources of energy of human needs: industry, transportation, agriculture, and domestic activities. The ecologist has started with sunlight artd photosynthesis; the economists with coal mine, the oil well, the power plant, or the nuclear reactor. The coal, oil and lignite are the fossil fuels which contain stored solar energy and are non-renewable energy resources. The energy utilization of human populations has increased steadily in the progression from hunter-gatherer to agricultural and industrial societies.

For example, early agricultural societies depended entirely on the energy of sunlight to grow food, and the energy of physical labour for its cultivation and harvest. Domestic anima’s introduced later, converted food energy into fats, fibres and proteins and provided greater physical strength to draw ploughs, pull carts and turn water wheels. The invention of electric motor and the internal combustion engine in the nineteenth century changed this orientation completely. These machines boosted the production by enabling a man to do far more work and to cultivate and harvest greater acreage, and they also replaced draft animals with the result that modern agricultural operations became dependent on petroleum and electricity. Energy utilization, thus, has become the modern key to human progress. At the present time, modern nations differ markedly in their energy consumption, with industrialized nations such as Europe, United States, Japan, Hong Kong and Singapore, typically using 10 to 50 times as much energy per capita as agricultural and developing nations such as India, Bangladesh, Indonesia and Ethiopia (Southwick, 1976). Higher energy consumption is often associated with higher gross national production and personal income per capita, but it

is also associated with higher levels of industrial pollution. Human populations have become predominantly dependent upon fossil fuels, but this will have to change in the next 100 years.

Reserves of petroleum, the major source of energy utilized at present, are dwindling. Vast coal reserves still exist, hut both the mining and the combustion of coal involve serious environmental hazards. For example, underground coal mining leads to the occupational hazards of black lung disease in miners and the accidental dangers of mine fires or collapse. The strip-mining of coal destroys vegetation, alters topography, upsets watersheds, increase erosion, contributes to water pollution and devastates the landscape.

Coal combustion is a major source of sulphur dioxides, soot, and fly ash; all of which contribute air and water pollution. However, recently a technique has been evolved which would permit expanded use of coal in industries without any pollution. It is the development of clean fuels by means of coal gasification. Humidified air is introduced under pressure at the base of a column of pulverized coal with a grannular size of 5 to 15 millimetres. Under controlled temperature and oxygen conditions, various industrial gases are released and can be collected for later combustion.

These gases are primarily mixtures of methane, carbon monoxide, hydrogen, and nitrogen. Liquid fuels arid gasoline can also be obtained from coal gasification and will provide cleaner fuels than the direct combustion of coal A number of countries such as Germany, Great Britain, Turkey, India, South Africa, Morocco, Korea and Yugoslavia already use coal gasification to

produce industrial fuel. Coal has also been, used more efficiently in magneto hydrodynamic (MHD) generators which convert heat from combustion gases directly into electricity. MHD generators require less fuel, produce less thermal pollution and generate fewer oxides of sulphur and nitrogen than convent onal coal combustion. Further, many nations of the world made their primary commitment to the development of nuclear energy to replace fossil fuels.

Due to inherent danger of nuclear energy in terms of isotope production and transportation, waste disposal, accidental potential, and the threat of nuclear proliferation, black mail, and terrorism, the heavy investments in nuclear may prove to have been shortsighted and even tragic in the long run (Southwick, 1976). Alternative energy sources, including solar, tidal, wind, waste incineration and hydroelectric have assumed importance in local areas, hut they have not been developed adequately on a national or global basis. All of them have high potential; if properly developed. However, greatest potential of all lies in solar energy, for it is an unlimited and essentially non-polluting source of energy. Currently Indian scientists are trying hard to tap certain new non- polluting and cheap sources of energy like biogas, solar energy, hydro-electricity, tidal power and wind power and are getting substantial success in their efforts.