THE PRESENT WORLD ENERGY SITUATION

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ABSTRACT

The energy resources of the world consist of contemporary solar radiation; the fossil fuels: coal, oil and gas, tar sands and oil shales; and nuclear energy from the fissionable elements uranium and thorium, and from the fusion of the light element deuterium. The fossil fuels represent stored solar energy accumulated during the past 500 million years. According to current geological estimates, the initial supplies of the various kinds of fossil fuels, prior to human exploitation, which are producible by present methods, were approximately the quantities shown in Table 1.

Table 1
INITIAL WORLD SUPPLY OF FOSSIL FUELS EXTRACTABLE BY PRESENT METHODS

Fuel	Quantity	Energy Content (kw-hr. of heat)	Percent
Coal	2600×10^{9} met. tons	18.6×10^{15}	71.8
Liquid Petroleum	1250×10^{9} bbl.	2.2×10^{15}	8.5
Natural Gas	3850×10^{12} ft.^{3}	1.1×10^{15}	4.3
Tar Sands	800×10^{9} bbl.	1.4×10^{15}	5.4
Oil Shale	1500×10^{9} bbl.	2.6×10^{15}	10.0
Total	.....	25.9×10^{15}	100.0

From this it will be seen that nearly three-quarters of the fossil fuels is represented by coal and the remaining one-quarter by petroleum and natural gas, and tar sands and oil shales. About 4 percent of the coal and 10 percent of the oil and gas have been consumed already.

The curve of production rate versus time for any fossil fuel must start at zero and ultimately, when the fuel is exhausted, must return to zero. The area under this curve is proportional to the cumulative production, which cannot exceed the amount of the fuel present initially. From the data in Table 1, and the production curves up to the present, it is possible to set limits within which future production must lie. Curves plotted subject to these restrictions indicate that world production of coal would probably not reach a peak sooner than about 200 years hence, but world production of crude oil and natura gas should reach their peaks about 40 years from now. Similar curves plotted for the United States indicate likewise that coal production should not peak before about 200 years, but that the peak for natura gas production should occur in about 15 years and that for crude oi within the next 6 to 8 years.

From these considerations it is clear that although it has taker some 500 million years to produce the fossil fuels, their period o exploitation will be but a few centuries, which is brief even by the standard of human history. As a replacement for the fossil fuels we have the contemporary solar radiation, which is very large in magnitude but diffuse and difficult to accumulate, and the newly developed means of obtaining energy from nuclear sources. The exploitation o energy on an industrial scale from the fissioning of uranium is already an accomplished fact, and energy from the fusion of deuterium is obtainable in the uncontrolled form by the explosion of thermonuclear bombs. Controlled release of deuterium energy for power purposes appears to be a probable development in the comparatively near future. The energy obtainable from the known uranium and thorium deposits is several hundred times as large as that from all the fossil fuels; and, when controlled fusion of deuterium is accomplished, energy equivalent to that of all the fossil fuels can be obtained from only 7.6 cubic kilometers of sea water.

Thus, if humanity could solve its other problems, the outlook for a continuing energy supply would be very bright indeed. Offsetting this however, is the report just released by the United Nations that the present world population of nearly 3 billion people is due to double in about 40 years, and would, at this rate of increase, reach a density of one man per square meter in 600 years. How or whether we shall ever escape from this predicament nobody knows.

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