fects of DDT on living organisms, despite the fact that the compound has been used commercially for more than 20 years. Most ecologists are not demanding complete abstinence from the use of pesticides; these chemicals are absolutely essential to the production of food in quantity by our current agricultural system. What the ecologists are asking is that, where nonpersistent substitutes for DDT are available, they be used. Granted, the cost of these substitutes is usually higher than that of DDT, and this cost would undoubtedly be passed on to the consumer. But I submit that the continued use of chemicals such as DDT is the greatest act of ecological irresponsibility, especially in light of the fact that safer substitutes are available.

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**Energy without Pollution**

I strongly concur with John N. Nassikas, chairman of the Federal Power Commission, who was quoted in "Energy crisis: Environmental issue exacerbates power supply problem" (26 June, p. 1554) about the need for a comprehensive energy policy to effect balanced objectives of efficient utilization of our energy resources in harmony with the environment. I do not confine this concern to the United States either.

The amount spent on research and development for electrical power generation utilizing fossil fuels is pitifully small. We must increase our efficiencies in conversion to electrical energy, as well as to utilize the thermal energy presently being rejected. Although the article was concerned mainly with electrical energy (about ⅓ of the energy utilized in the United States), the conclusions are applicable to all forms of energy: we need better utilization of all energy resources—for example, a transit system more energy-efficient than the present individual automobile. . . .

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. . . Boffey in his article briefly alludes to what may prove to be the only truly successful long-term solution—the development of controlled thermonuclear power. In view of pollution problems


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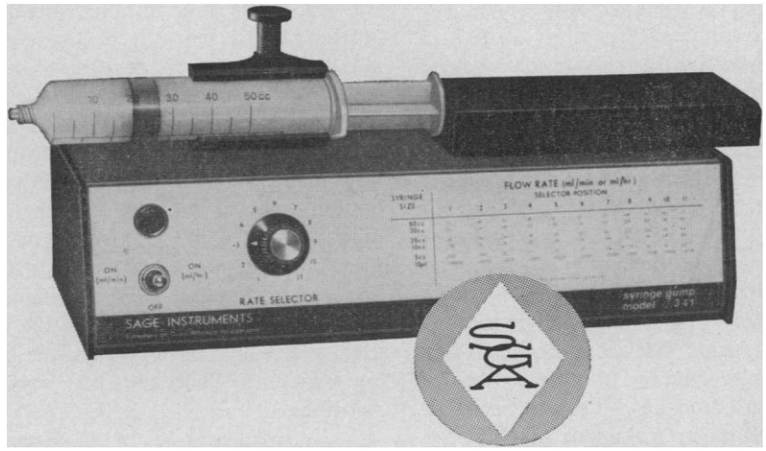


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(chemical, thermal, and radiological), it seems appropriate to list some of the obvious advantages of such power sources as they are envisioned. The fuel supply is essentially limitless. Air pollution problems are eliminated. Compared to fission power plants, radiological hazards are reduced by many orders of magnitude. Direct conversion systems might be upward of 90 percent efficient, thus drastically reducing thermal pollution. With such characteristics, generating plants could be located much nearer the cities they serve, improving reliability and efficiency and reducing the number of unsightly cross-country high voltage transmission lines.

As Boffey states, suitable thermonuclear fusion has not yet been produced. Nevertheless, there is cause for optimism based on the recent successes of the Russian Tokamak machines in which plasma confinement times of 20 milliseconds at densities of $5 \times 10^{13}$ have been achieved and in the less publicized success of the Lawrence Radiation Laboratory 2X machine which has attained comparable densities at less times but at higher temperatures. The successor to 2X, called 2XII, will be operational about October of this year and is expected to produce plasmas of higher energy density than any created before. The operating regime approaches fusion reactor conditions.

Engineering studies have been underway for some time to take advantage of the plasma when it becomes available. These studies deal with power stations using both conventional and direct conversion schemes. Present funding of the controlled fusion effort in the United States amounts to only $30 million per year, much less than the premium we pay for white sidewall tires on our new cars. A 15 percent increase in funding per year could be used without waste, but for the new fiscal year which began 1 July, the funding was cut. What a dismal sense of priorities.

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The calculation of the Committee for Environmental Information that "in the year 2000 . . . power plants of all kinds will produce roughly enough heat to raise by twenty degrees the total volume of water which runs over the surface of the United States" is based on steam power plants, which will be obsolete well before the year 2000. Closed-cycle, nuclear-powered gas turbines, developed by the Swiss and already in production, need only a small amount of heat to be extracted from the gas, and the gas can be cooled by air. The amount of heat rejected to the atmosphere is negligible compared to heating by solar radiation, even if the power production increases tenfold—and there is no contamination of the atmosphere.

Breeder reactors will be ready to use in a few years and they can be combined with methods of energy-conversion other than using steam. Also underground transmission lines are not a novelty—high-voltage direct-current lines are in operation in Europe. Thermal and atmospheric pollution as well as other environmental problems caused by energy production can be solved by the actual state of art, but we must act now.

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