the charged particles would be converted into a directional stream. This expansion process is similar to that occurring in the expansion of hot gases in a rocket nozzle. Electrons escaping with the ions would then be separated electromagnetically from the positive ions, and the electrons would flow to the "ground" of the electrical system. The positive-ion stream, carrying most of the energy of the fusion reaction and consisting of particles of differing energies (or voltages), would be caught by a series of electrostatic collectors. Each collector would be kept at a different potential, the first ones being at voltages less than the average of the particles and later ones at voltages equal to or higher than the average. Suitable voltage transformers would convert all these voltages to a common potential, from which useful power could be obtained in the form of high-voltage direct current. I should point out that most of the particles would be at energies near the average potential. Only about 30% of the energy would have to be subjected to voltage transformation.

No intermediate conversion to heat is required in this type of system; the kinetic energy of the positive ions is converted directly into electricity. Since there are virtually no thermodynamic limitations, the efficiency of this process could be very high, of the order of 90%. The equipment appears to be simple to construct. Very low capital costs for the direct conversion equipment, possibly as low as $10 to $15 per kilowatt, appear obtainable for 1000 MW(e) units. Please understand that this direct conversion concept is as yet untested. Although preliminary small-scale tests of the concept will begin in fiscal year 1971, we have no plans as yet to build full-scale units. In other words, direct conversion from fusion is not just around the corner. However, it could become an important element in future fusion power systems.

In conclusion let me spend a moment discussing a potential application of controlled fusion that has a special fascination and is receiving considerable attention these days even though its realization also may be many decades away. That potential application has been termed the "fusion torch" by the two young AEC scientists who conceived it: Dr. Bernard J. Eastlund and Dr. William C. Gough. Briefly the concept of the fusion torch involves using the ultrahigh-temperature plasma of a thermonuclear reactor to convert any material to its basic elements or to produce large amounts of ultraviolet radiation.

In a world in which we are rapidly depleting many of our natural resources and in which we are unable to handle our waste adequately, this concept seems like the answer to both the conservationists' and