F. USE OF WASTE HEAT AND FUEL

The area is assigned our fourth (or lowest) priority, not out of lack of potential benefit (See discussion below.) but out of lack of demand for great amounts of resources. In general, the systems are small in capacity (10 MW or less) and thus inexpensive in comparison with 1000 MW powerplants.

The country at present is wasting more energy than it is using and it will not be possible to supply this energy from indigenous fuels if the rate of increase of energy consumption is not moderated. Thus the thrust of energy conversion technology is to make use of a greater fraction of the energy consumed. This can be done in two ways,

(1) to increase the efficiency of energy conversion (i.e., increase the efficiency of central electric plants from the present approximately 33% delivered to the customer to 50-60%) and (2) to make use of the waste heat (i.e., if the electricity is made where it is used, then the otherwised wasted heat may be utilized in heating residential and commercial buildings and in industrial precesses.

If in the year 2000, half our heat for buildings and industrial processes could be supplied in this way, this heat supplied would have an economic value of about \$25 billion a year. Concurrently, these power systems could supply half our electric power, a product having an economic value of \$40 billion a year (at 1 cent per kWh). The fuel saved would be the equivalent of 1 billion tons of coal or 25,000 tons of uranium per year.

Power systems permitting this use of waste heat are thus of enormous economic value. These power systems are required to have the following characteristics. They should be suitable for decentralization in order that the production of waste heat might be near the site at which the heat is needed. The fluid transporting the heat should also be heated to 300-400°F and the power system should have high efficiency over a range of power in order that the wasted heat might be minimized at times of low heat demand. The closed-cycle gas turbine and the fuel cell are admirably suited to this task.

The plan for implementation is to introduce the closed-cycle gas turbine through HUD's program on Integrated Utility Systems. Such a system can achieve a power-producing efficiency of 35-40 percent from perhaps 15-100 percent os rated power. The fuel might be a combination of clean gas made from coal and organic municipal wastes. This gas turbine could be used commercially in about 1979.

In the meantime, the technology of fuel cells would be under investigation. The key features of fuel cells for this application are its potential for high efficiency (50-60 percent) and its ability to achieve these efficiencies at low as well as high power (a few kW or greater). When the life and cost of fuel cells are good enough, they are expected to replace gas turbines in this service.