

ENERGY INSIDER

The right way to use coal—MHD

This nation does need to use coal to meet a growth rate in energy of at least 6 percent a year, the minimum required to return the U.S. economy to a period of real growth. But it doesn't need costly coal synthetics boondoggles.

On the way to an energy system based on the cheap and virtually inexhaustible nuclear fusion process, there are a number of energy technologies that can be commercialized and are being commercialized in countries whose energy policymaking is not dominated by the likes of James Schlesinger. Technologies like fission breeders and fusion-fission hybrids can dramatically lower the cost of electric power, the prerequisite for economic survival for this country and the rest of the world.

Among these new technologies is one that could make coal a vital part of an expanding U.S. economy — magnetohydrodynamics (MHD), which uses advanced plasma techniques for extremely efficient energy production.

Coal can be used to produce electricity in three basic ways: burning coal for heat to produce steam to turn turbines, liquefying coal to be used as a combustion fuel like oil to produce heat to create steam to turn a turbine, and converting the energy in the coal fuel, which has been used to create plasma, directly into useable electrical power. This latter process—the MHD process—eliminates the steam turbine cycle altogether and is capable of producing conver-

sion efficiencies of up to 60 percent or about double the current conventional efficiency and many times that of coal synthetics. MHD is a process that takes advantage of the fact that a plasma, or ionized gas, propelled through a magnetic field can produce an electric current directly. The magnetic field separates the positive and negatively charged particles and electrodes on the sides of the channel through which the plasma is traveling can be connected right into a power transmission system.

The MHD plasma in a coal-burning system is created by burning the coal at a temperature of about 4,000 degrees Fahrenheit and adding a seed material, usually potassium, which also chemically bonds with sulfur, to help ionize the coal gas. The plasma is then propelled through a channel which is surrounded by a magnet, most likely a superconducting magnet in commercial MHD systems. The capital cost, therefore, is basically for three nonmoving pieces of equipment—the coal combuster, the plasma channel and the magnet system. The total capital cost for one 1,000 megawatt power plant in 1975 dollars is estimated at \$250 million.

By comparison, the total capital cost for conventional coal conversion processes is \$540 million, and for synthetic coal liquids, \$960 million (again in 1975 dollars).

Direct conversion MHD technology can be used with any fossil fuel. Its development now for

near-term commercial application is also critical for second-generation advanced fuel fusion power plants where the plasma from the fusion process will provide the charged particles for direct conversion to electricity.

Where is this technology being developed? Largely in the Soviet Union. The Soviet's experimental U-25 MHD generator at the Institute for High Temperature in Moscow has proven the scientific feasibility and provided the engineering experience to begin plans for a 500-megawatt demonstration plant by 1985.

How not to use coal

President Jimmy Carter and Energy Secretary James Schlesinger have been trying to convince the American public that synthetic fuels from coal gasification is the coal technology of the future. The truth is that it has already been tried and found to be wanting: Nazi Germany used the fuel during its invasion of the Soviet Union and during the severe Russian winters discovered belatedly that their synthetic fuel product decomposed into two jello-like liquids. Albert Speer, Adolf Hitler's Minister for Armaments, has described how this property of synthetic fuels led to the Nazi defeat in the Soviet Union in his book, *Inside the Third Reich*. Speer's coal gasification scientists, who operated Auschwitz and other concentration camp coal gasification centers, were unprepared when their "super weapon" froze solid in Nazi fuel tanks all across the Russian front in the winter as well as down the supply lines. The only fuel that moved the Nazis anywhere in Russia during the winter was natural gas from either Romania or from looted European stockpiles.