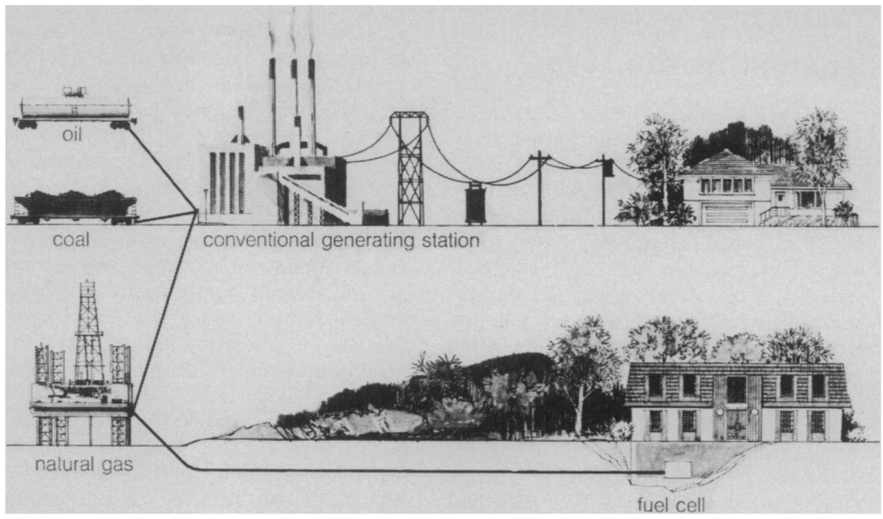
Is there a fuel cell in every home's future?

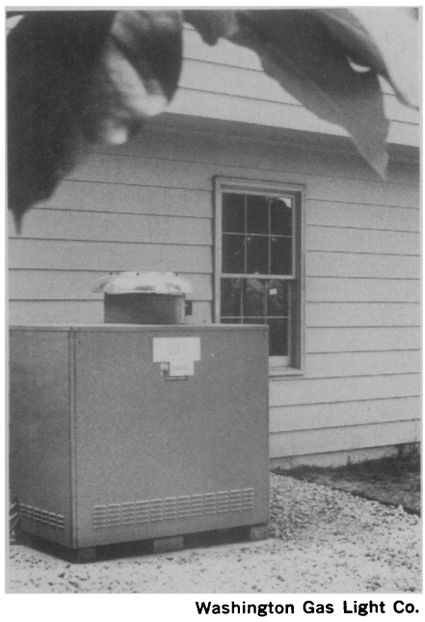
A consortium is testing individual generating units in 20 states



Engineers are stepping up the search for a more efficient, less polluting method of producing electricity. Besides their emissions of sulfur dioxide, nitrogen oxides and particulates, conventional generating plants waste large amounts of scarce fuel resources. Many exotic power-generating techniques have been proposed to overcome these liabilities, but cost factors have hindered many of them.

Now an engineering and construction firm in Flint, Mich., will become the eighteenth facility to test a fuel cell—a device, first demonstrated in 1839, that converts hydrogen and oxygen into electricity. It appears that the use of fuel cells as power-generating units for individual homes and businesses may become economic.

The Michigan company is one field test site, part of an experimental program conducted by TARGET—Team to Advance Research for Gas Energy Transformation, Inc. The team consists of 33 gas companies scattered across the United States and Canada, and Pratt and Whitney Aircraft Division of United Aircraft Corp., which produces the fuel cells.



Washington Gas Light Co.

Fuel cell for model home in Maryland.

Since 1967 the members have invested approximately $50 million in the project. Installations of test units began a year ago and by January 1973, the completion date for the field tests, about 60 units will have been tested in 20 states in 35 applications ranging from apartment houses to office buildings to private homes.

The electrochemical process is simple and involves few moving parts. The fuel-cell apparatus, about the size of an air conditioning unit, contains a reformer (which processes natural gas for the fuel cell), the fuel cell, and an inverter to convert direct current to alternating current. The process is the reverse of electrolysis. Natural gas is fed to the home or business through the gas line. Conversion to electricity takes place at the site. The reformer takes in the natural gas and through a chemical process in the presence of steam and a catalytic medium dissociates the carbon and hydrogen elements. The fuel cell has an anode, cathode and an ionic conductor, the electrolyte. A mixture of hydrogen and carbon dioxide is fed from the reformer to the fuel anode where hydrogen ions are formed, releasing a flow of electrons to the cathode. The cathode takes oxygen from the atmosphere and transforms it into ions. The oxygen-bearing ions are released into the electrolyte and go to the anode where the circuit is complete. The only by-products are carbon dioxide and water vapor.

When electricity is produced at power plants, the chemical energy must first be converted to heat to produce steam that drives the turbines that produce the electricity. By the time the electricity is generated there has already been about a 60 percent loss of efficiency. An additional ten percent is lost in transmission to the substation, transformer and then to the individual user.

Use of the cell has improved energy use by 33 percent. Engineers headed by William H. Podolny at Pratt and Whitney are experimenting with other types of fuel such as butane, propane and methane.

TARGET has several objectives in the current field tests. Investors would like to know the effects of varying climatic conditions on the fuel consumption and conversion process. The tests are also examining the effects of varying load requirements on the units. And equally important is the durability of the equipment.

But the main concern is economy: to produce a competitive method for today's market. "The cost is still the question mark," say Robert Suttle of Dallas, president of TARGET. "We don't know what the cost per kilowatt will be in 1977 even by conventional methods. We do know that we will have to be competitive in price and equally reliable in service with conventional power."

One factor on the plus side—in addition to the pollution one—is esthetics. Power needs will increase and with them, power lines. According to Suttle, the cost of putting power lines underground is four to five times more expensive than putting gas lines. Reliability is another factor: Underground pipes are not as vulnerable to storms. Suttle is hopeful: "We don't see any roadblocks to economic commercial use in 1977."

Pratt and Whitney announced this year the production of fuel-cell units by 1974 that will be competitive with diesel generators used in remote areas.

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