West Germany's Unterveser reactor was in fifth place, followed by France's Bugey 1 and the USA's Nine Mile Point-1.

Fusion

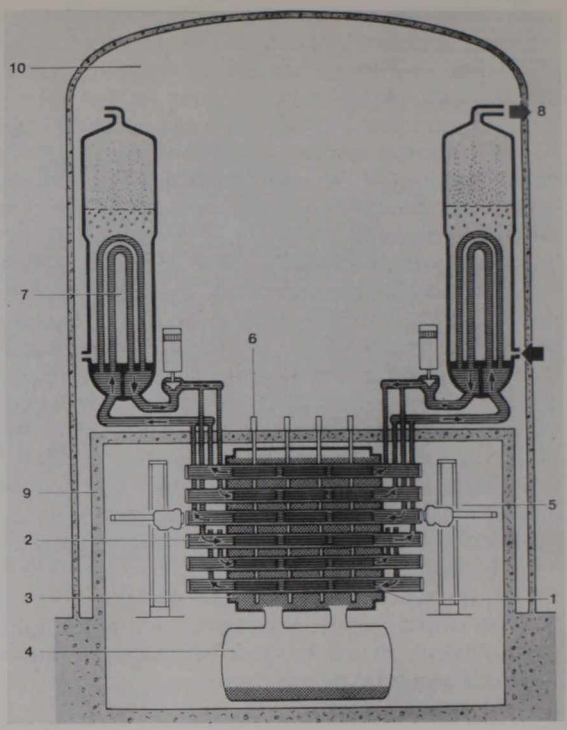
Nuclear power can be produced by fission—as in present reactors—or by fusion.

Fusion of atoms has significant advantages: its principal fuel, hydrogen isotopes, is inexhaustible and easily accessible. It would apparently produce fewer problems of waste disposal.

It is, however, extraordinarily difficult to achieve and sustain—the process requires temperatures of about 100,000,000 degrees Centigrade.

Research in the United States, particularly at the Princeton Plasma Laboratory, has focused on the use of magnetic fields. Temperatures of over 70 million degrees were achieved in 1978, and since then unprecedented yields of fusion have been obtained.

Canada is pursuing research in certain areas with vigour. The National Research Council will spend $37.9 million in a five-year program, which will rely heavily on international collaboration and will include experiments in both magnetic and laser beam control systems and in the development of construction materials and engineering skills.



A CANDU reactor

1 – *Uranium fuel bundles*
2 – *Horizontal pressure and calandria tubes*
3 – *Heavy water moderator within the calandria*
4 – *Moderator dump tank*
5 – *Fueling machine*
6 – *Reactor shutoff rods*
7 – *Steam generator or boiler*
8 – *Steam line to the generator turbines*
9 – *Concrete containment of the reactor vault*
10 – *Containment building*

Hydrogen—The Ultimate Fuel

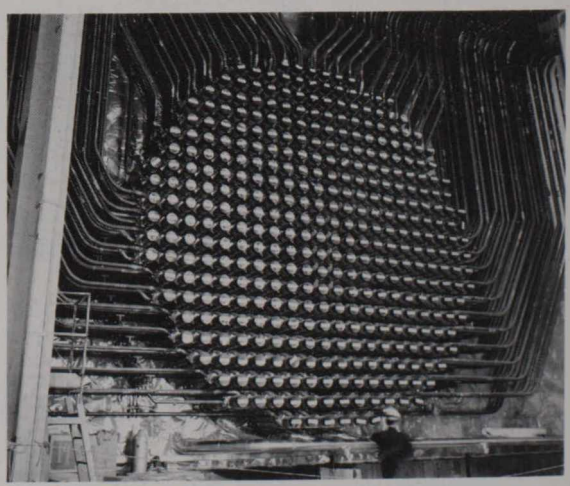
Hydrogen gas is almost universally available. Water can be split and the hydrogen that results can be burned in internal combustion engines.

How close are we to practical use? Maybe pretty close.

Hydrogen-powered test vehicles have been tested successfully and hydrogen aircraft are planned. Although hydrogen has had an unfortunate reputation since the German dirigible *Hindenburg* caught fire in New Jersey some five decades ago, it is actually a safer fuel than natural gas, gasoline or diesel fuel.

In Canada large industrial organizations, including Ontario Hydro and Hydro-Québec, are interested in the development of hydrogen technology. The principal drawback today is cost—natural gas is cheaper. Dr. Martin Hammerli, of Atomic Energy of Canada Ltd., says, "It is competitive in certain circumstances today, when power (for the electrolysis of water) is available at special rates in off-peak load periods, but considerable development work must be done. There's no question about the future of hydrogen. That's why the big boys all over the world are suddenly interested." Large research projects are underway in the U.S., France, West Germany, Switzerland, Japan and Canada.

Professor David Scott, head of the University of Toronto's Mechanical Engineering Department, where much of Canada's research is centred, says the world-wide use of hydrogen energy is "inevitable." He sees the combination of CANDU nuclear reactors and hydrogen as a prime way to replace energy systems using fossil fuels.



One of four Ontario Hydro reactors at Pickering B.