quantities of plutonium are formed inside fuel bundles. In the CANDU design, much of this plutonium is consumed while still in the reactor, thus adding significantly to the energy produced by a single fuel bundle. What remains after the fuel is removed can be stored, sold for reprocessing or recycled through Canadian reactors.

Atomic Energy of Canada has sold spent fuel containing plutonium to France for use in experimental reactors. This by-product, worth up to $30 a gram, will be a bonus for Ontario Hydro which by 1981 could have a "plutonium mine" of 8,000 kilograms.

In addition to producing electricity economically, a station such as Pickering will provide radioactive cobalt for use in agriculture, medicine and industry, as for example, in Canadian-made cancer therapy machines sold around the world.

A federal government energy analysis, tabled in the House of Commons in Ottawa last summer, forecasts that by the century's end, nuclear power will replace hydro-electric power as Canada's prime source of electrical energy. Then, in what some visionaries describe as the "electrical society" of the 21st century, nuclear energy will supply up to 90 per cent of energy needs compared with the present 25 per cent.

One of the most novel features of the CANDU system may not be demonstrated for several decades to come. In most other countries, it is envisaged that in the 1980s or 1990s the "fast breeder" reactor will take pre-eminence because of its much greater efficiency in using the energy locked in uranium. For every pound of fuel consumed, the fast breeder produces an additional pound or more of new fuel – an idea so unusual as to seem almost magical! Unfortunately a great many difficult technological problems remain to be solved before a full-scale commercial station can be designed; British experts, who are among the world leaders in this new field, are now heavily engaged in seeking solutions. Canadian studies indicate the possibility that these difficult problems may be avoidable by an ingenious adaptation of the CANDU design which would operate with a combination of thorium and uranium, producing only a little less than a pound of new fuel for every pound consumed – almost as magical as the fast breeder. Many of the latter's difficult technological problems – such as the use of molten sodium metal as coolant – would be avoided, and because thorium is so abundant in the earth's crust, the world's electric energy needs would be satisfied for many years, or even centuries, to come.

Energy

Sales drive on for CANDU plant

Canada is conducting an international sales drive to follow up the success of its CANDU nuclear reactor system.

A sales seminar has been held in Iran and others are planned in Israel and Turkey to explain Canadian nuclear know-how and highlight the performance of the generating station at Pickering.

Four technical experts are demonstrating what Canada has to offer. Although the sales pitch is likely to be couched in superlatives, one problem for the salesmen is to convince international opinion that Canada is producing economically competitive commercial power from reactors that use natural rather than enriched uranium.

"We're playing in the nuclear big league and it's hard to persuade people that a country with a small population like Canada may have found the best answers," said one Canadian nuclear expert.

The international seminars follow the sales breakthrough Canada achieved last spring when Argentina agreed to buy a 600-megawatt CANDU reactor worth C$220 million (about £90 million). This was the first commercial export sale for Atomic Energy of Canada Ltd., the crown company which runs the Canadian programme.

Argentina was said to have regarded CANDU's use of natural uranium as a big selling point. Of its four possible choices, three involved reactors using enriched uranium, for which the United States is almost the only source. Argentina has its own uranium reserves. (Canada for its part has one-quarter of the world's known reserves).

The sale to Argentina was made in conjunction with Italimpianti, an Italian engineering company which will build the conventional section of the plant. The Canadian share of the contract – to build the plant itself – is worth about C$100 million.

Italiampianti is also involved with AECL in a bid to sell a 975,000-kilowatt nuclear plant in Italy. Two rival groups are offering enriched uranium reactors on the U.S. pattern. A decision is expected by the end of this year.

Canadian nuclear technology is also involved in Pakistan, India, and Taiwan.

Canada's first offshore nuclear power project was RAPP (Rajasthan Atomic Power Project) in northwest India, about 325 miles from New Delhi. Canada provided loans to cover non-Indian content in the plant. The association between the two countries goes back to the 1950s when Canada built a duplicate of its NRX research reactor for India; the Canada-India Reactor (CIRUS) began operation in 1961. The first reactor in RAPP started operation in 1972. India is also building a CANDU station near Madras. The concept is Canadian, the design and most of the content Indian.

In Pakistan, a Canadian private company, in agreement with the Pakistan Atomic Energy Commission, built KANUPP (Karachi Nuclear Power Project) at Paradise Point just outside Karachi, as part of Canada's international development assistance programme. It is Pakistan's first nuclear power station.

In Taiwan, an up-to-date version of Canada's first large research reactor, NRX, has been built for the Taiwan Atomic Energy Commission, which will use it for fundamental and applied research. Canada is supplying the 40-megawatt high-flux reactor.

Although Britain has concentrated on graphite-moderated reactors, she is no stranger to the heavy-water system, having operated the SGHWR (Steam-Generating Heavy Water Reactor) at Winfrith for several years. Before building it, the U.K Atomic Energy Authority purchased certain technology and know-how from AECL to aid in its design and construction. The SGHWR is one of the designs in the running for Britain's next generation of nuclear power stations, and is similar to the Gentilly station in Canada.

Canadian authorities have made an open-ended offer of co-operative development to Britain should the British government decide to choose heavy water reactors in future, and there has been talk of a joint effort to develop export markets. But further talks await Britain's decision.