

By STEVE HECKBERT

A nuclear generating station is under construction at Point Lepreau, an outcropping of land on the Fundy shore 20 miles west of Saint John. It will begin producing electricity late in 1980, we hope.

The plant will use a heavy-water reactor of the CANDU type, a Canadian design quite different from its British, French, American and Russian competitors. The decision of the Hatfield government to go ahead with the project is a landmark step in the development of New Brunswick, one which will shape the lives of us all.

In Canada in 1975 there were 5 power reactors operating. At that time the federal Ministry of Energy, Mines and Resources expected there would be 300 on the go by the year 2000. Though no nuclear physicist, I'll try to sketch the mechanics of the CANDU system.

WHAT HAPPENS

The fuel CANDU uses is uranium pre-processed into UO₂ pellets. Both isotopes, U-235 and U-238, are present in their naturally-occurring proportions. The pellets are enclosed in this zirconium alloy sheaths or 'pencils', which in turn are moulded together to make fuel 'bundles'. These are to be manufactured in the fabrication plant nearing completion in Moncton.

Before the reaction is started, fuel bundles are inserted by remote control into 380 individual channels in the 'calandria', a cylindrical vessel, perhaps ten meters in diameter and about the same distance in length, which houses the reaction.

One of the unique features of CANDU is 'on-power fuelling' - spent fuel bundles can be removed and fresh ones inserted without shutting down the reaction. By contrast, American lightwater reactors must be shut down every 12-18 months, at great expense, in order to be re-fuelled.

Uranium-235, less common than the relatively stable U-238, is highly fissionable; its atoms are unstable. They can be split, releasing the tremendous energy that normally holds them together. The heat derivative from the fission of a pound of U-235 has been equated with that produced by burning 300,000 gallons of fuel oil, or 2,800,000 pounds of coal.

The reaction is moderated by heavy water (deuterium) circulating around and among the fuel channels. A second body of deuterium, the coolant, is brought into close proximity with the moderator and transfers the heat generated by sub-atomic collisions to boilers containing ordinary water. At this point the process becomes identical to other thermal modes for making electricity, namely combusting oil, coal, peat or wood. Steam is produced and forced through narrow openings to drive turbines and generators.

WOOD, NOT ATOMS

The New Brunswick Electric Power Commission (NBEP) document *Nuclear Power Plant and Heavy Water complex for New Brunswick*, published in 1973, states: "Studies in depth on the effect of rapidly rising fuel costs on future power rates within our province clearly indicate that nuclear generation is vitally necessary to sustain and develop the quality of life in this region of Canada." Terry Thompson, public relations wizard who speaks for the nuclear hawks inside the power commission, continues to insist that CANDU is harmonious with 'our way of life', a notion whose sense I find elusive.

The coming disappearance of cheap oil does not lead straight to the need for nuclear generation. It could just as easily, and a good deal more intelligently, open the door for the tidal power plans for the Bay of Fundy (should the attendant problems prove surmountable), the substantial inland hydroelectric resource awaiting development, or steam-turbine plants burning domestic coal, peat or wood.

The last of these is particularly promising. Wood-fired generating stations, like hydroelectric dams, produce electricity from a

resource which is renewable. The state of Vermont is presently pursuing the construction of facilities in the 25-50 megawatt range.

Whatever else might be said about the use of non-renewable energy sources such as coal, oil and uranium, this much is clear: it can't last. Somewhere along the line, the sooner the better, our energy usage patterns are going to have to be shifted onto a renewable footing.

This will mean different things in different places. Iceland has an abundance of geothermal sources suitable for residential heating; Switzerland powers its trains with electricity from the melting snows of the Alps. In New Brunswick, as elsewhere in the Maritimes and Canada, we have a lot of wood, which will perform all the combustion tasks we now demand of oil.

It will fuel the furnaces of our houses and commercial buildings. It will drive the thermal power plants which are necessary to smooth over the key drawback of hydroelectricity in the province, namely its seasonal highs and lows. And methanol, distillable from wood, can replace gasoline and diesel fuel in the transport sector.

The advantages of going this way have been missed or neglected by the powers that be. Research and development in tree genetics, innovation in the techniques and equipment for handling wood, planting, culling and harvesting the forests add up to an economic boon capable of reversing chronic unemployment in the Maritimes and restoring the region to a place of dignity within the confederation. Our difficulties with the spruce budworm, which are simply insoluble so long as our current wood-use practices persist, would be eased with the cultivation of alternative species.

HISTORY OF CANDU

Canada's nuclear power program had its origin in the 1940's, spurred initially by the war efforts of British and American scientists to weaponise the power of the atom. C.D. Howe and his associates foresaw a bounteous future for the peaceful use of nuclear energy, and wished Canada to have a paying hand in it from the beginning. They were men of position, and their wish has been largely fulfilled.

CANDU is an Ontario property. With no oil or gas, little coal and not enough hydroelectricity to satisfy itself, our most populous province was a ready buyer for the budding nuclear technology, and is now busily selling the Faustian bargain to others, including us, who'd be better off without it. For the ironclad commitments which nuclear power implies are not of the sort to make one sleep easier at night.

Ontario Hydro, one of the largest electrical utilities in the world, supplies the expertise at Point Lepreau. Most of the high-paying jobs, in this great job-creating project in our jobless province, have gone to outsiders. The general contractor for the cooling tunnels is Ferrara-Resco of Detroit.

For an historical outline of the development of CANDU in Ontario, the serious student is referred to the Fall 1977 issue of *Alternatives* magazine.

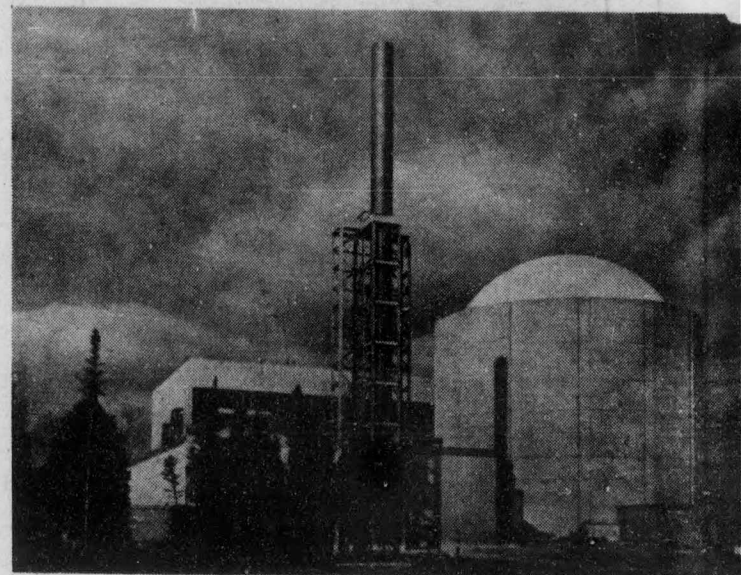
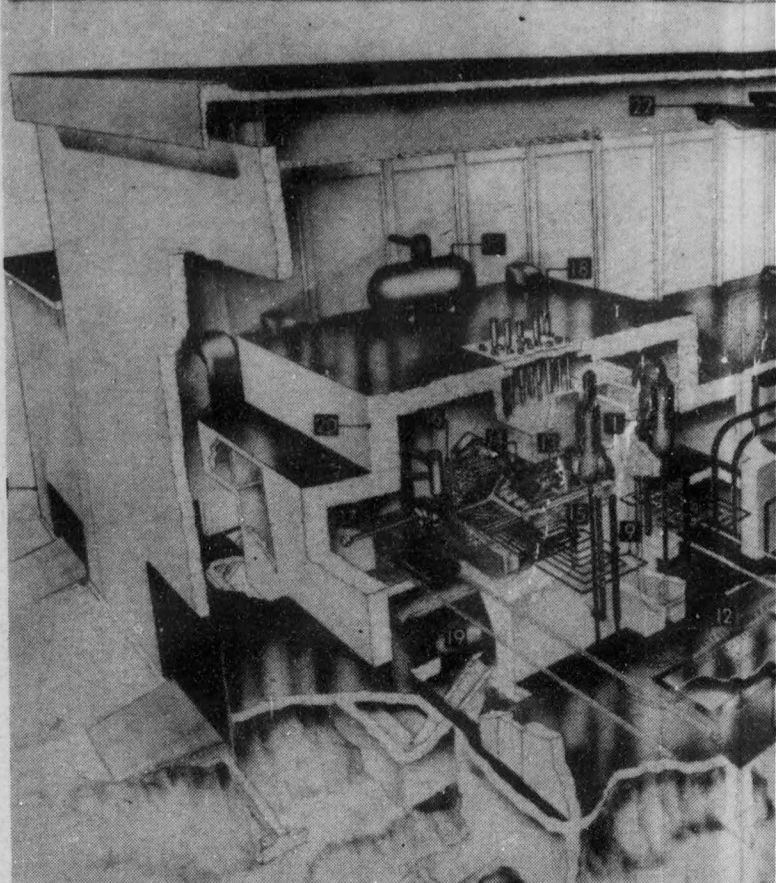
THE CAPITAL EXPENSE

The NBEP is a self-administered Crown corporation, represented in the provincial cabinet. To it is entrusted an unrelenting task which I'm sure is made no easier by the freezing rains of our winter. The men who do the actual work of the power commission execute as well as anyone a delicate and demanding responsibility. Alas, I fear the mandarins at their head have erred, and I am bound to speak against them.

The money angle is less than reassuring. One learns from the commission's annual reports that it borrowed \$30,419,463 and \$49,561,064 respectively in 1976 and 1977

Nuclear Energy

450 MW. ONCE-THROUGH POWER REACTOR



from Atomic Energy Corporation Limited (AECL), the Crown corporation responsible for administering the operation of reactors in Canada. With more than 20 bond issues outstanding, the NBEP owes well over a billion dollars; the net debt of the province of New Brunswick is about one-third of that amount.

But the distinction between the power commission and the province as financially independent bodies is valid only up to a certain point. For the province guarantees the commission's borrowings, in order to secure a low interest rate, and thus is ultimately responsible for the latter's debt. We foot the bill firstly as rate-payers, secondly as taxpayers. There is some question whether our small economy is strong enough to bail out the NBEP should the Point Lepreau station fail.

Financial doubts of this sort have inspired, in Ontario, the creation of the Porter Commission on Electric Power Planning. The problem there is the same, notwithstanding the difference in scale, as in New Brunswick. In each case, development programs of the provincial utility are threatening to saddle the public with bottomless debt.

The original estimation of the bottom line at Point Lepreau was less than 400 million dollars. The figure \$466 million was banded