Energy

More heavy water is on the way

Canadian officials are confidently anticipating an increase within the next year or so in the available supplies of heavy water, one of the critical and distinctive elements in the Canadian nuclear reactor system.

Heavy water, technically known as deuterium oxide, occurs naturally as one part in 7,000 in ordinary water. It is separated from ordinary water in a complex manner and costs about C$20 a pound more – currently as much as C$39 from foreign sources.

Canadian reactors use natural uranium with heavy water as the indispensable moderator. Ordinary water (sometimes incorrectly called "light water") would absorb too many neutrons to sustain a chain reaction. Heavy water looks and tastes like ordinary water but contains heavy hydrogen or deuterium atoms which are twice as heavy as ordinary hydrogen atoms. Neutron speed is reduced by collisions with deuterium atoms, like a ball richocheting against others on a snooker table.

Heavy water is the most efficient moderating substance available. It slows down the speed of neutrons necessary for the fission process without capturing them. It is the use of heavy water, plus correct design and materials, that enables the efficient use of natural uranium fuel. Graphite works too, as a moderator of natural uranium, but not so efficiently as heavy water. And the Canadian-style reactor can, of course, use enriched uranium as fuel as well.

In the early years of the Canadian system, after the decision to use heavy water – despite some criticism at the time – production difficulties arose in the first plant, designed and constructed by an outside company. Industry leaders had hoped and expected to see a heavy water industry established in Canada by 1966, in time to meet the requirements of the station at Pickering.

But success proved elusive at first. "Had all gone as planned," President J. L. Gray of Atomic Energy of Canada Ltd., said in a speech in March 1972, "by now there would be two 400-ton-a-year plants operating at full capacity in Canada; instead there is only one . . ."

The result, he added, was that "we have had to scrounge all over the world for heavy water and have had to pay a lot more than we would have for Canadian production. And we still have not been able to get all we need. Heavy water is in short supply and will be for about another two years, until the output of Canadian plants begins to match the demand."

The improved situation Mr. Gray forecast in 1972 is being realised today and there are now three heavy water plants operating or about to operate in Canada. The one at Port Hawkesbury in Nova Scotia has a production capacity of 400 tons a year, The Bruce Heavy Water Plant in Ontario 800 tons a year, and the rehabilitated first plant at Glace Bay, Nova Scotia, 200 tons a year.

Dr. Lew Kowarski of France, one of those who participated in the first demonstration of nuclear chain reaction, along with Frederic Joliot-Curie and Hans Halban, has described the Canadian system of generating electricity through natural uranium moderated by heavy water as the world's simplest method, "providing you can get your heavy water production problem solved."

"The fast breeder will always be more complicated and the thermonuclear reactor will be more complicated still," said Dr. Kowarski, in a speech at Chalk River, Ontario. He forecast that heavy water, now an expensive rarity, would show its inherent cheapness when produced in large quantities. He also said that except for thermal effects, the "Canadian way still seems the safest for the environment."

It followed, he said, that the Canadian effort was extremely important for the future of nuclear energy, and should be continued, but not in Canada alone. "It would be more fruitful if some other big industrial country joined; at present, unfortunately, hardly any signs of the prospect are in sight."

Klondike Bard honoured

A miner's cabin in the Yukon, thrown together out of crude materials by men with gold on their minds, has now been turned into a permanent memorial to Robert Service, the poet of the Klondike Gold Rush.

It was Service who wrote the haunting lines,

> "There are strange things done in the midnight sun
> By the men who moil for gold."

He immortalized the heroes and villains of the Gold Rush days in ballads like *Dangerous Dan McGrew* and *The Cremation of Sam McGee*, legends of heroic proportions which were in fact largely invented by the old sourdough story-tellers who remained behind after the end of that extraordinary era.

Service was not himself involved in the Gold Rush. An English-born Scot who arrived in North America as a young man, he led an adventurous life wandering up and down the west coast of Mexico, the United States and Canada, working at odd jobs like potato digging, gardening and dishwashing. He arrived in the Yukon after the Gold Rush was over and his imagination was fired by the legends and imagery of the old story-tellers who poured their tales into his ready ear.

He was working as a bank clerk when some of his best writing was done, but in 1909 he decided to give up clerking and settled down to "write seriously". It was then that he rented the old miner's cabin, where he wrote a novel, *The Trail of '98*, and his third volume of verse, *Rhymes of a Rolling Stone*. Later, the same cabin became a place of annual pilgrimage and reunion for old sourdough Klondikers. Thus its preservation serves a dual purpose: to commemorate both the poet and the way of life he immortalized.

It is now open to the public, furnished with the "monastic simplicity" which was the poet's lifestyle: a bed, a desk made from crates, a stove, a small table and chairs, wallpaper to write on, a bookcase and a roller typewriter circa 1896. The aim is to give the impression that just as one enters the front door, Robert Service has ducked out the back.

The cabin forms part of Klondike Gold Rush International Park, simultaneously announced by Canada and the United States in 1969.