

THE belief that Canada is rich in natural resources is generally accepted by Canadians as well as others, and is certainly widely held by their neighbours south of the border. It is, in fact, one basis of the USA's wish for joint control of North American resources.

It is thus interesting to hear from a professor of geology at Carleton University, F. Kenneth North, that this idea is largely illusory. "Canada," Dr North told a recent Conference on Technology and Canadian Foreign Relations at this university in Ottawa, "is the only energy-deficient nation in the world which believes itself to be energy-abundant and behaves accordingly."

Dr North has a habit of making flat, uncompromising statements, and he has been making quite a few of them regarding Canada's energy supplies in recent months. The kind of thing he told the Carleton conference was just what he has been telling federal authorities, although there is not much evidence that they have been listening.

Perhaps this is because they do not want to believe him. His message is that energy supplies—particularly oil—have been vastly overestimated and that, regardless of what action is taken, Canada faces a severe energy crisis before the end of the 1970s.

"No matter how carefully we establish our priorities, no matter how expeditiously that conversion to other energy forms can be brought about, no matter how successful our conservation measures may become, social and economic disruptions on a vast scale are inevitable", he says. "The United States will be a much less affluent and comfortable place than it has been. Canadians should be wondering whether large parts of their country might not have to be evacuated."

That is pretty strong stuff, and the recourse of some who hear it is simply to recoil into their natural optimism. Philip H. Tresize, another delegate to the Carleton conference (organised by the Norman Paterson School of International Affairs), did just that. Now a senior fellow at the Brookings Institute and a former US ambassador to the OECD, Mr Tresize replied: "I am not impressed with the idea we're running out of resources . . . I can't challenge Dr North, but the world is made up of little else than raw materials, and our history has been that we've consistently found new resources, and I have no reason to believe this will not continue to the end of time."

Dr North had more facts than that at his disposal. Canada has always been regarded by her American neighbours as "some kind of resource cornucopia," he said. "But Canada is not remarkably rich in primary resources in proportion to its size. The number of really large mines in Canada can be counted on the

Is Canada an energy-deficient nation?

from David Spurgeon, Ottawa

fingers of one hand, and we have no very large oil or gas fields. There are individual copper mines in Chile and Africa capable of producing more new copper than all Canadian mines put together. Many of the richest gold and silver camps are in the western Cordillera of the Americas.

"Though we have 7% of the Earth's land area, and more than 7% of its area of continental crust, we have less than 2% of its conventional oil," said Dr North. "Even our vast reservoirs of fresh water are easily misrepresented. Far too much of it lies on the surface in easily polluted lakes; for a land of Canada's size, we are short of good subsurface aquifers because so much of our territory is either Precambrian shield or impermeable igneous rock.

"Canada owes her outstanding mineral production to her geographic and economic relationship to the United States. We have allowed them to establish our country as their resource hinterland. Canada's gross mineral production constitutes 7% of our gross national product. Ninety per cent of it is exported. Of all Canadian exports, of all materials to all trading partners, nearly one-sixth is of minerals and fossil fuels to the United States."

Canada's total known remaining oil reserves represent less than 15 months of present North American consumption, Dr North said. The proven tar sands reserves represent for North America an extension of four years in the life of its reserves—not hundreds as many imagine. Canada's total known natural gas reserves, including those in the Arctic, which may never be made available, constitute a supply of about 30 months at present North American rates of consumption. And the reserves of gas so far known in the Mackenzie Delta, after nine years of drilling, would keep the proposed 48-inch pipeline filled for 4½ years.

North's pessimism extends beyond Canada, however. Outside the Communist world, the rate of finding oil has shown a perceptible decline since 1963, he says, and outside the Persian Gulf, the heyday of which is now past, the "free-world" has found only four basins having recoverable reserves of oil large enough to satisfy a single year's global demand.

The only new basins capable of yielding prolifically are in remote or unreliable regions, chiefly offshore, and statistical probability studies show that the Earth's crust is "very unlikely to possess more than a handful of prolific basins still to be discovered. Even

if each of these is presumed to be as rich as the Alberta basin, or the North Sea, we are looking at a quantity of new oil, from new regions, very much smaller than the quantity we have already produced and consumed."

This leads Dr North to predict that the level of world oil production will start to decline in about 1985, not halfway through the 21st century, as many authorities maintain.

Similarly, he says it is statistically unlikely that North America can possess more than one or two potentially prolific basins that are still undiscovered. Canada's rate of production must start to decline in a year or less, because reserves have already been declining for five years and the rate of addition to reserves has been declining for 10 years.

"Starting next year, our capacity to provide domestic oil will decline at an average rate of 110,000 barrels a day per year. Unless all demand growth can be curbed, therefore, even a new tar-sand plant every year would be incapable of maintaining Canadian self-sufficiency in oil. By 1981, our deficit will reach 1 million barrels a day . . . It is unlikely—almost inconceivable, in fact—that tar-sand production will reach even half that amount by then."

Such doom-saying did not impress Mr Tresize. If we run out of one resource, he said, human experience teaches us that we can have confidence we will find substitutes that will do just as well. □



A hundred years ago

DR FOREL, of Lausanne, has for several years been investigating what are known as the *Seiches* of the Lake of Geneva. *Seiche* is applied locally to certain oscillatory movements which are occasionally seen to occur on the surface of the lake. The phenomenon had been investigated by previous observers, among others by Saussure and Vaucher, who attributed the phenomenon to variations in atmospheric pressure; in this, Forel, who has most minutely investigated the phenomenon, agrees with them. The phenomenon is found to occur on other Swiss lakes, and Forel believes it will be found in all large bodies of water. Indeed, he recognises in the *Seiche* probably the most considerable and the grandest oscillatory movement which can be studied on the surface of the globe.

from *Nature*, 12, 134; June 17, 1875