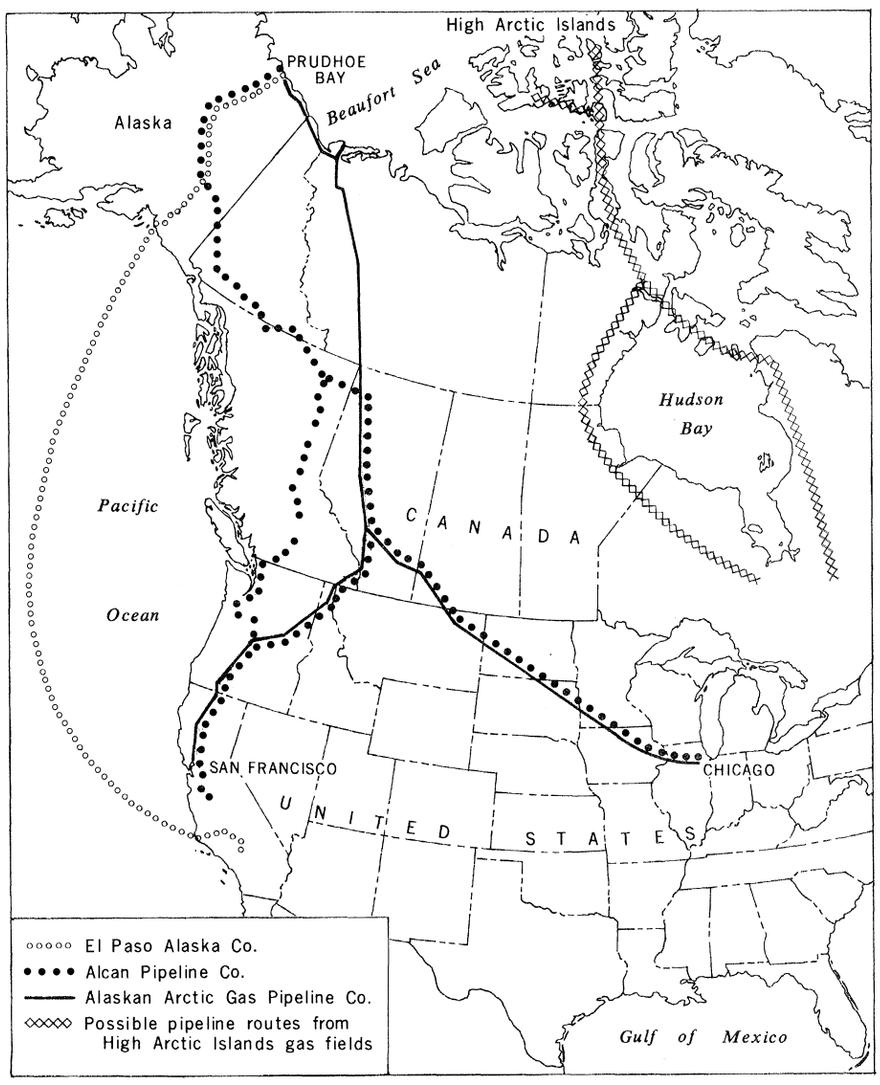
ment should or should not assume the full burden at West Valley.

In an article to be published in the May issue of *Technology Review*, Richard K. Lester and David J. Rose, both of the Nuclear Engineering Department at the Massachusetts Institute of Technology, caution that "there is a specific job to be done at West Valley" and that it should not be lost sight of in a debate over who should bear the cost of disposing of the NFS wastes or over the broader issue of what role the federal government should play in the nuclear fuel cycle. They suggest that Congress immediately authorize ERDA to develop a set of management options for the West Valley wastes, that the NRC decide which options are to be pursued, and that Congress then appropriate the money for ERDA to act on the options selected. While this is going on, the authors say, the question of who is to pay can be resolved, either in the courts or elsewhere.—LUTHER J. CARTER

Alaskan Gas: Impact of Pipeline on Canadian North Stirs a Debate

Since 1968 public attention has focused on the 8 billion barrels of oil estimated to lie in Alaska's Prudhoe Bay reserves. But this winter's harsh weather has turned the attention of government and energy industry officials to the 26 trillion cubic feet of natural gas projected to be associated with the oil. While this gas—equal to about 10 percent of the proved reserves in the United States—is not enough to overcome the country's gas problems, it could ease some projected shortages.



Map by Eleanor Warner

At an estimated cost of from $10-to-20 billion, a Prudhoe Bay gas transportation system will be even more expensive than the Alaska oil pipeline-tanker system. But even at the current highest interstate price of about $1.50 per cubic foot, the gas is worth about $40 billion.

A congressional battle somewhat reminiscent of the trans-Alaska (oil) pipeline debate of 1973 is shaping up over gas transportation routes and technology. But this time there is an important difference—instead of playing a peripheral role in the process, Canada will have a major, if not deciding, role in choosing the route. And the route could be the single most important factor in delivery time and cost of the gas.

Three companies are competing for the right to build a gas delivery system:

▶ Arctic Gas, a consortium of 16 U.S. and Canadian gas and oil companies, wants to build a pipeline east from Prudhoe across the Arctic National Wildlife Range to Canadian gas fields in the Mackenzie delta, then south through the Mackenzie valley to southern Canada and the United States (see map). Arctic says that by combining U.S. and Canadian gas in one pipeline, consumers in both countries can share costs and keep prices down.

▶ Alcan Pipeline Co., a subsidiary of Northwest Energy, has proposed a line parallel to the trans-Alaska pipeline south of Fairbanks, Alaska, where it would turn east and follow the route of the Alcan Highway through Alaska and Canada. Supporters, including the conservation community, say this route would deliver the gas to the Midwest, where it is needed, without violating the Arctic Wildlife Range, the only stretch of Arctic coast in the United States not yet committed to hydrocarbon development.

▶ El Paso Natural Gas wants to build a trans-Alaska gas pipeline to Prince William Sound, where the gas would be liquefied and shipped aboard cryogenic tankers to California. This plan avoids Canada, is supported by the state of

Alaska and organized labor, and avoids the wildlife range, staying within established corridors for all but 40 miles. Critics ask whether the gas will go where it is needed and whether the liquefied natural gas (LNG) technology is both safe enough and efficient enough.

A Federal Power Commission administrative law judge, after more than a year of hearings, recently declared the Arctic Gas plan "superior in almost every significant respect" to its competitors. Canada, he said, presented no serious obstacles to the quick approval of Arctic's proposal. But some observers wonder whether the judge was not too quick to buy the Arctic Gas view of the Canadian energy situation.

Canadians are locked in a major national debate over northern resource and energy development. Until recently, it was assumed that large new gas reserves would be discovered in the Mackenzie delta area and transported south through the Arctic Gas pipeline also carrying Alaskan gas. But gas discoveries in the delta have been disappointing. The president of Canadian Arctic Gas, V. L. Horte, has indicated that Mackenzie reserves are now adequate to provide only about half the flow of Canadian gas originally anticipated.

At the same time, though, prospectors for Panarctic oils, a consortium of private companies and the Canadian government, have discovered important gas reserves in the high Arctic islands northwest of Hudson Bay, far to the east and north of the Mackenzie delta. Proved reserves so far are at least 15 trillion cubic feet, almost three times the Mackenzie reserves. A pipeline serving the high Arctic islands gas fields would pass hundreds of miles to the east of the Mackenzie delta region.

While gas exploration in the delta has failed to pan out, opposition has grown among native people—Indians and Eskimos—to early large-scale energy development in the region. A substantial body of Canadian opinion appears to be in sympathy with the natives.

"It used to be 'Bob's your uncle' [an English expression for go right ahead] to Arctic Gas," says a senior energy official. "Now there is at least something of a feeling that we should take another look."

Canadian energy planners are aware that their decision-making schedule must mesh with the one in the United States. Two years ago they feared that if they were "out of synch" they would lose "the Arctic Gas option." Now they fear that the option for an Alcan pipeline—which would intrude far less on the life of the natives—may be lost to them instead.

During a state visit from 21 to 23 February, Canadian Prime Minister Pierre Elliot Trudeau demonstrated a complete grasp of the U.S. timetable established by Congress last year. He said the Canadian National Energy Board, similar to the Federal Power Commission, and a Royal Commission studying human and environmental impacts of a pipeline down the Mackenzie valley would report to him before June.

"We realize that we have to give a final answer before the end of the year," Trudeau said. "We realize that no answer really is an answer." He also noted Canada's interest in helping get "American gas to American consumers." The

Demise of Military Med School Likely

As part of his effort to reduce the military budget, President Jimmy Carter has taken dead aim at the infant Uniformed Services University of the Health Sciences (USUHS). Barely a year old, the school was planning to locate on the Bethesda, Maryland, campus of the National Naval Medical Center once its buildings are completed. The school's purpose is to supply the military with doctors now that the doctor draft has ended. However, Carter and Defense Secretary Harold Brown have a different idea. In one of the few instances of zero-based budgeting in the President's revisions of the Ford budget for fiscal year (FY) 1978, they have zeroed the medical school right out of business. They are not likely to encounter strong opposition from the Congress.

The school, which has been dubbed the B-1 of medical education after the B-1 bomber with its staggering "cost overruns," has been controversial since the day it first was proposed by former Louisiana Congressman F. Edward Hébert, who wielded enormous power as chairman of the House Armed Services Committee. Hébert was determined that the military have a medical school of its very own—some say he saw it as a monument to himself—despite opposition to the idea on two grounds: one, that there already is an adequate number of medical schools in the country and, two, that the new school would be extremely costly. Just how costly it would be to educate a doctor at USUHS is, however, a matter of some controversy with estimates ranging from a high of $190,000 per student for 4 years to a low of $21,000. Naturally, higher figures are given out by the school's opponents and, frankly, it is difficult to ascertain who is correct. In any case, it is fact that virtually every civilian and military organization that testified on the issue of establishing the school, including the Department of Defense, was cool to the idea. Today, its greatest supporters are the faculty members who were recruited from medical schools nationwide to get the USUHS off to a good start. Naturally, this unanticipated move to scrap the school altogether does not exactly please them.

The fact that the first batch of students is in place and the building more than half completed obviously did not persuade Secretary Brown that the school should stay. "Physician needs of the military services can be satisfied more economically over the long run by direct recruitment," he said in a budget statement. Nor does he buy the view that it would be a waste of money to stop now that the school is so far along. Said Brown, "I look on this not as wasting the money that has already been spent . . . but saving the money that would otherwise be spent to carry out complete construction."

The school's supporters, on the other hand, quite naturally think that Brown's decision is all wrong. Former Deputy Secretary of Defense David Packard, chairman of the school's board of regents, terms the proposed shutdown a "disaster" and is appealing to the armed services committees of the House and Senate to come to its rescue. Technically, the way that Carter and Brown went about scrapping the school was simply to delete from the FY 1978 budget any request for money to support it. According to this game plan, the school is dead unless the Congress decides to put the money back in its own budget proposal which must be ready by 15 April. At this writing, no one has emerged as a committed champion of the school. The armed services committees, with more important fights with the President in store, apparently do not want to take a hard line here.—B.J.C.

Berger Commission Brings the North to the South

On 21 March 1974 Prime Minister Pierre Trudeau asked Justice Berger to take leave from the British Columbia Supreme Court to head a Royal Commission to look into the "social, economic and environmental" impacts of the Mackenzie valley pipeline. Much to his own surprise, he insists, and almost certainly to the surprise of the government, Berger's Mackenzie valley pipeline inquiry became a popular success.

Royal commissions in Canada, like blue-ribbon panels in the United States, are often used by the government to neutralize potentially explosive issues by taking them out of the public eye for "study." But Berger's inquiry refused to fade away. Instead it caught the Canadian imagination and became a national cultural event.

At a preliminary meeting in Yellowknife, George Erasmus, a young Athabascan Indian leader, urged Berger to hold hearings in local communities "where the people will be comfortable in stating their feelings and not formal legalistic procedures."

Ultimately the inquiry did visit every village and settlement in the Northwest Territories and the Yukon that might be affected by the pipeline. Flying in rickety chartered DC-3's, the inquiry staff, press, and lawyers for the parties logged thousands of miles over the Arctic. The planes swooped down on dirt-surfaced "bush" airstrips, the judge and his entourage trooped out—often carrying sleeping bags and tents—and the hearings were convened. Dozens of Indian and Eskimo men and women described their lives for the inquiry, usually in their native language, with a translator. Nearly every presentation ended with the translator turning to Berger and saying "he says he doesn't want the pipeline to go through this land," or a variant on that theme.

There was another face to the inquiry as well. In the sterile Arctic-modern Katamavik Room of the Explorer Hotel in Yellowknife, lawyers and scientific consultants sparred with one another exactly as they would in Toronto or New York, oblivious to the Arctic just outside. One inquiry staff member, struck by the surrealistic scene of high-powered corporate lawyers battling over billion-dollar pipelines without ever leaving the hotel, dubbed the Yellowknife hearings "spaceship Berger."

But in addition to simply holding northern hearings, Berger took two other important steps.

▶ He cajoled government officials into funding native and conservation groups that opposed the pipeline, as well as chamber of commerce and other business groups that favored it, so all could "participate on an equal footing" with the oil companies sponsoring the project. This adversary funding became a cornerstone of the inquiry's success.

▶ He took the inquiry "south" to Canada's ten largest cities from Vancouver, British Columbia, to Charlottetown, Prince Edward Island. These sessions took 17 days, and 375 Canadians with something to say about the pipeline or northern development were heard. The hearings were televised, recorded, and reported daily in the press. A mostly native Canadian Broadcasting Corporation crew broadcast nightly wrap-ups of the hearings to the north in several native languages and English. These broadcasters literally brought the north to many Canadians for the first time. They became an attraction in their own right.

The hearings transcript, covering thousands of pages, may be the most complete record of northern life, ecology, and technology in existence. The transcript of the community hearings alone represents an oral history of native life in the north that spans at least four generations.

On a freezing March day a year ago, a group of Holman Island hunters gathered in their village community center to tell about their lives and describe why they feared pipeline construction. A man named Hologak said his people used to roam freely, hunting seals and polar bears with bone-pointed harpoons. The first white man he met, he said, was the explorer Vilhjalmur Stefansson, who trekked up the Mackenzie River in the early 1900's. In 1961, Hologak said, the Canadian government brought the Holman Islanders together in the village. "The people used to live where there was good hunting and they were happy. That has now changed," he said. Others said the pipeline would make already trying conditions worse by further undermining the natives' traditional life-style and increasing their dependence.

In Yellowknife, lawyers for Eskimos and Indians said their clients could not accept pipeline construction before a native claims settlement was completed. Both Indians and Eskimos have said they want millions of acres of land. But in contrast to the Alaska Native Claims Settlement, which erased native claims to the portions of the state not given to the natives, the Canadian natives are seeking continuing political control. "What we really want is a province," says an Eskimo leader.

A lawyer for the Northwest Territories Indian Brotherhood used the rhetoric of "third world struggles for national liberation" to describe his clients' situation and desires.

Recommendations prepared by the inquiry staff call for a hiatus of about 15 years between any claims settlement and the onset of large-scale development in the region. A staff lawyer called this a "breathing space" to prepare for development.

Lawyers for the native groups will not speculate for the record on the amount of time necessary to hammer out a settlement acceptable to their clients. Privately, they say it is up to the government to decide whether it will be months or years. But they are caught in a dilemma of their own. It is largely the pressure to build the pipeline that has impelled the government to the negotiating table with the natives. If the natives succeed in diverting the pipeline elsewhere, they may also reduce their chances of getting any settlement at all in the foreseeable future. Like their adversaries in the government, the native leaders and lawyers must do a delicate balancing act.

No one questions that the government has the power and probably the legal right to force a settlement of some kind on the natives and build a pipeline down the Mackenzie valley. When newspapers carried a photograph of Canadian troops on "counterinsurgency" manuevers in the Arctic, the lawyer for the Indians pointedly asked reporters, "Who do you think the insurgents are?" The question really is whether the government is willing to pay the political price that might have to be paid if a pipeline is imposed on an unwilling native population.

—MARK PANITCH

failure to mention Canadian gas was taken by some diplomatic observers as tacit endorsement of the Alcan plan.

Increasingly, Canadian officials speak of the Alcan proposal as a "land bridge" across Canada that would allow the United States to move gas to the Midwest without forcing Canada into a major development decision. Because the route follows the Alcan Highway corridor, both native claims and environmental problems would be minimized, they say.

The National Energy Board has been in session on the Arctic Gas case for almost 2 years, hearing evidence on reserves, economics, geology, financing, and pipeline construction. The nominally dry hearings became a national cause célèbre when the chairman of the NEB was disqualified for conflict of interest, and the proceedings were forced by the Supreme Court to start all over again. Now under an expedited schedule, the hearings should be completed before May. However, conservationists and other parties argue that two of the companies exploring in the delta will not have time to do adequate reserves estimates before the hearings close. The NEB says it will make a recommendation without that information.

Even so, a senior energy official says that "as of today, Canada does not have enough gas in the delta to fill its part of the pipeline." Canada, he says, would not encourage "speculation" through the pipeline. "We would not commit ourselves to a pipeline for purposes of delineating frontier reserves."

However, the government is caught in a dilemma partially of its own making. Whereas official policy still supports construction of a Mackenzie valley pipeline (presumably the Arctic Gas project), such a pipeline would have a major, and many say a deleterious, impact on the people and the delta region.

The Canadian north—almost all of it Crown land owned by the government—stretches from the lower provinces to the North Pole. In the past, the natives who inhabit this vast wilderness, numbering only several tens of thousands, have had little political voice. Most Canadians live along the U.S. border and, so to speak, face south. That there should be a growing interest among Canadians in their Arctic region and northern people was unexpected by most Canadian leaders.

One person who may have anticipated the surge of interest in the north, though, is Thomas Rodney Berger, a 43-year-old justice of the British Columbia Supreme Court. The hearings that he conducted for the government in 1975 and 1976 allowed Canadians to see the northern people as human beings rather than as anthropological curiosities (see box).

The Berger inquiry, for the first time, has humanized both the government's decision-making process and the inhabitants of the north. Rarely in the past has there been such an injection of the human element into an energy decision. Berger's final report is due in the spring, but observers feel that it will add little after the drama of the hearings.

The last time a Liberal Party government lost a national election in Canada was 1956. The issue that carried it to defeat was the charge that it had rammed legislation through Parliament to subsidize construction of the trans-Canada pipeline by American oilmen. The analogy with the current situation is not lost on Liberal Party strategists, whose defeat in the Quebec provincial elections last November makes the party even more vulnerable in national elections planned for next year. With a congressionally mandated deadline of 1 December 1977 for a presidential route decision, Canada may be forced to meet the U.S. timetable and make a decision before election time.

Backers of both the Alcan project and the El Paso LNG proposal see the steadily building, and increasingly contradictory, pressures on the Canadian government working to their benefit. "If I were a bureaucrat looking into that Arctic Gas project I'd just throw up my hands and run," says an El Paso executive. "There are just too many other things they can do that are less risky and less expensive."

But Arctic Gas officials are optimistic, saying that they have the best organized, best designed project that will move the most gas for the least cost.

An official in the Canadian embassy in Washington says, in a masterpiece of understatement, "things aren't as simple as they once were."—MARK PANITCH

The author is Washington correspondent for four newspapers in Alaska. He covered some of the Berger hearings in the Canadian Northwest Territories.

Nuclear Power Plants: Why Do Some Work Better than Others?

A snow-covered two-lane road, winding through the gray-green Connecticut countryside, ends in a parking lot before a cluster of trim white buildings dominated by a gleaming dome and a huge barnlike building. The building is a power plant complex surrounded by a chain link fence; to enter it, a visitor is first shown through a metal detector and subjected to a baggage search by uniformed Pinkerton guards. Once inside the fence, it is a short way to the offices of the power plant and that of the plant supervisor, which look out over the blue-white Connecticut River, a portion of whose waters enter the power plant through an intake channel directly below.

This, the Connecticut Yankee plant in Haddam, Connecticut, which is operated by Northeast Utilities, Inc., looks like many other nuclear power generating stations in the country. But Connecticut Yankee is distinctive: since it began operating in 1968, the 630-megawatt plant has been one of the most reliable performers in the nuclear industry.

Richard H. Graves, the 43-year-old plant superintendent, proudly tells his guest that the plant holds the world's record for the number of kilowatt-hours generated from a single reactor and that, at that very moment, the plant is breaking its previous record of having run for 143 days without a shutdown. It has won several industrial safety awards. In 1975, for example, it was one of four nuclear plants to win the industry's Edison Award for "distinguished contribution to the development of electric light and power." Although it has occasionally been shutdown for maintenance, repair, and minor mishaps, Connecticut Yankee has operated very safely.

Plants like Connecticut Yankee are getting more and more attention these days from people engaged in the nuclear controversy. Critics are asking why most plants are not operating 80 percent of the