

Inc., (RFF) in Washington. A non-profit think-tank funded mainly by the Ford Foundation, RFF supports a broad range of resource management studies, but does no lobbying.

Cicchetti and Krutilla have analyzed Interior's estimates of the extent to which North Slope oil might alleviate the nation's balance of payments problems and its dependence on Middle Eastern oil imports. Drawing on a variety of government documents and statements by Interior officials, they conclude that the authors of the pipeline report seriously overestimated the future U.S. demand for imported oil; that the Interior statement failed to account for means of increasing domestic supplies of oil from the "lower 48" states; and that it exaggerated the benefits of North Slope oil to the balance of payments by at least an order of magnitude.

What's more, the two economists calculate that piping the oil south to Valdez and then shipping it to West Coast markets—the presumed destination for North Slope oil—is economically the "least attractive" of several alternatives. They contend that it would be slightly more economical to import an amount of oil equal to 1 year of North Slope production—about 730 million barrels in 1980—and store it in underground salt domes in the lower 48 states. This scheme, they say, would offer insurance for national security while avoiding the ecological risks of piping and shipping North Slope oil out of Alaska. But if oil must flow from the North Slope, they go on to say, it could be moved more profitably through Canada's MacKenzie Valley and south to Alberta—a route the Canadian government has already proposed for a natural gas pipeline of its own.

A Key Assumption

In urging that the project proceed, the Interior Department report cited a "compelling need" for Alaskan oil based partly on a "key" assumption that U.S. petroleum demands would grow by 4 percent a year through 1985. The report forecast that by 1980 the nation would need 22 million barrels of oil a day, 23 percent of which would have to come from the Middle East—a situation the report said was "inconsistent with our national security interests." It claimed that North Slope oil could reduce this dependence to 14 percent.

Cicchetti and Krutilla, however, dipped into the records of hearings be-

fore the House Interior and Insular Affairs Committee about a year ago and came up with a very different set of projections. Figures supplied by fuel industry leaders and Interior officials suggested the nation's appetite for oil is growing at an annual rate of about 2.7 percent, not 4 percent. Interior's own experts, the two authors say, set the nation's oil demand in 1980 at about 18 million barrels a day, not 22 million, and further estimated that only 4 to 10 percent of it would have to come from the Middle East.

"Accordingly," Cicchetti and Krutilla conclude, "the size of the national security benefits estimated in the impact statement is due more to inappropriate data than to reality."

The Interior report also predicted that Alaskan oil production would reduce dollar drains to pay for foreign oil by \$470 million to \$680 million a year. Cicchetti and Krutilla estimate this balance of payment benefit would be closer to \$36.5 million a year.

When Interior's impact report finally arrived at the subject of alternatives to the pipeline, its authors displayed an odd set of priorities, devoting far more space to discussion of nuclear-powered submarine tankers than to the Alaskan route's leading competitor, the proposed trans-Canada pipeline. This route would convey the oil 400 miles east to the MacKenzie Delta, then 1300 miles south to Edmonton, Alberta. From there the oil would be distributed through existing lines to the United States. In recent weeks several Canadian officials have made warm overtures encouraging U.S. consideration of an international Arctic pipeline system along this route. The impact report observed, however, that such a scheme would merely "shift the location of ecological problems rather than cure them."

Since Interior offered no quantitative assessment of a Canadian route, Cicchetti and Krutilla supply their own; they calculate that oil sold to mid-western and eastern U.S. markets via Canada would bring an additional profit of about 10 cents a barrel over oil shipped through Alaska and carried by tanker to West Coast markets.

Their arithmetic raises an interesting question of why oil companies are so diligently pressing for a trans-Alaska pipeline. One common supposition is that the industry plans to sell a considerable fraction of Alaskan oil to Japan. Valdez would make a convenient loading point for supertankers bound in that direction.

Litigation will probably stall the project for at least another year. And last week, William D. Ruckelshaus, chief of the New Environmental Protection Agency, asked Interior not to grant right-of-way permits for the Alaskan line until it has studied the trans-Canadian route in detail. Ruckelshaus said in a letter to Interior Secretary Rogers C. B. Morton that this route would avoid the "general adverse effects of tanker traffic" between Valdez and West Coast ports, a point raised recently by several members of the Canadian Parliament concerned about the likelihood of oil spills along the Pacific Coast. Adoption of the MacKenzie Valley route, however, is likely to raise objections by conservationists on the grounds that it would slice through Alaskan and Canadian arctic wildlife refuges. Although Secretary Morton has said the Canadian route would be seriously considered, along with other alternatives, such magnanimity may serve to place him at odds with President Nixon, who is said to favor the trans-Alaskan pipeline.

The Courts' Responsibility

Meanwhile there remains the problem of ensuring more satisfactory evaluation of the environmental impact of major public works. Observers of the Environmental Quality Council's workings feel that in the longer run it may be up to the courts to oblige agencies such as Interior to produce detailed and objective impact reports.

It is worth noting that one of two injunctions against the project was granted in part because Interior failed to file a proper environmental impact statement. There is good reason to believe the present report won't do the job either. The Alaska district of the Corps of Engineers has also observed that Interior's summary consideration of alternatives "may not be legally sufficient" to satisfy the Environmental Protection Act. Certainly the Corps should know: last month a Federal district judge issued a permanent injunction barring the Corps from finishing a dam on the Cossatot River in Arkansas. The court acted on the grounds that the Corps had prepared a poor evaluation of the dam's environmental impact.

—ROBERT GILLETTE

Erratum: In the report "Sex attractant in a brown alga: Chemical structure" by D. G. Müller *et al.* [171, 815 (1971)], *allo-cis-1-(cycloheptadien-2',5'-yl)-butene-1* in line 2 of the abstract and in line 4 of column 3, page 815 should read *all-cis-1-(cycloheptadien-2',5'-yl)-butene-1*.