Western Coal: Does the Debate Follow Irreversible Commitment?

We've run out of time for debate and delay. Don't you agree?—Exxon newspaper ad, 17 October 1973

If the long, angry, and apparently futile fight to stop the trans-Alaska pipeline has left any residue of lasting value, it is an expanded body of environmental law and a heightened awareness in government that the Alaskan wilderness, for all its legendary vastness, is both finite and fragile. The problem, of course, was that this realization dawned a bit late in the game. Environmental and economic analysis of the pipeline project began in earnest only after oil leases on the North Slope had been sold, and only after oil companies had committed themselves to build the line, laid out its route, and stockpiled miles of pipeline in Alaska. Thus any new sensitivity to the fragility of the Arctic wilderness will probably achieve no more than to ensure that the pipeline, when it is built, will be less destructive than it might have been.

In much the same 11th hour context, in which the rush of events may already have foreclosed some plausible options and alternatives, debate in government now appears fully under way concerning the future of another, perhaps equally fragile region—the 128 million acres of arid and semiarid land in the western United States underlain by coal.

In recent weeks environmental groups have begun preliminary thrusts of delaying litigation, the National Academy of Sciences (NAS) has released a report on the subject, and Congress has made some progress toward strip-mining control. Whether interest has been aroused in time to effectively govern the momentum of energy development in the West is another question entirely, though. Huge tonnages of strippable coal under public and private lands have long since been leased for mining, industry has snapped up options on water supplies it needs to convert the coal to power, and plans for generating and gasification plants themselves are maturing quickly. The outlook is for another protracted post facto confrontation between the interests of conservation and resource development.

Although a strip-mining control bill drawn up by House Democrats in July is still lodged in committee, the Senate, having considered similar legislation off and on during the last 2 years, on 9 October passed a reclamation measure that is widely regarded as fairly tough. Approved by a vote of 82 to 8, the Senate measure would require state governments to regulate strip mine operators through a bond and permit system, and to enforce at least minimum federal standards (outlined in some detail in the bill) in prospecting, mining, and reclaiming the land.

The center of action now shifts to the House, where the Interior subcommittees on environment and mining have been wrestling since midsummer with a bill more or less compatible with the Senate's, and in some respects —dealing with citizen participation and enforcement—possibly even more stringent. The two subcommittees, however, have had a hard time rounding up a quorum lately, a difficulty thought by some of the bill's backers to be part of a deliberate strategy of delay encouraged by utilities and the mining industry. By this analysis, industry expects to hold the bill in committee until late this winter (perhaps until March), by which time nationwide irritation over oil shortages will have softened up the environmentalists for a compromise. To the extent that the decision of Arab nations to cut back oil production exacerbates these predicted shortages, the Middle East war is likely to work to the political advantage of the trans-Alaskan pipeline project and Western coal development, although neither can possibly strengthen the nation's self-sufficiency in fossil fuels in the immediate future.

Delays can, and have, also worked to the conservationists' advantage, however, by allowing time for the injection of issues not previously considered. In a noteworthy departure from strip-mining legislation discussed by the Senate last year, the bill passed in October takes explicit cognizance of the special difficulties of rehabilitating arid and semiarid land—and of the likelihood that careless stripping could severely impair surrounding supplies of ground and surface water in ways unique to the Western coal fields.

Water, in fact, is rapidly emerging as a principal subject of contention in the debate on Western coal development, partly as a result of a new NAS study* of the rehabilitation of arid mined land. More or less by coincidence the academy released the panel's report on 15 October, 6 days after the Senate vote, although copies had already been made available to the Interior committees of both the House and Senate, and skeletal summaries had appeared in news reports (*Science*, 10 August).

The academy report's most far-reaching conclusion was that, while enough water exists in the Western coal fields to fill the relatively meager needs of strip mining itself (and in most cases, rehabilitation of the land), there simply is not enough water in the Western coal states to permit the enormous congregations of coal-fired generating, gasification, and liquefaction plants envisioned in recent years by utilities and oil companies. Indeed, the panel said it believes any large-scale commitment of water to on-the-spot consumption of coal would lock states such as Montana, Wyoming, and the Dakotas into a coal-based economy that they hadn't bargained for. This, in turn, would bring environmental and social changes to the West, the panel said, that would vastly exceed the impact of coal mining itself. The effect of the academy report is to challenge the optimistic assertion of the Interior Department's Bureau of Reclamation that sufficient water is available in the West for huge "mine-mouth" generating complexes.

* Study Committee on the Potential for Rehabilitating Lands Surface Mined for Coal in the Western United States. The members are: Thadis W. Box, Utah State University, chairman; C. Wayne Cook, Colorado State University; Richard S. Davidson, Battelle Memorial Institute; Richard F. Hadley, U.S. Geological Survey; Arthur D. Hasler, University of Wisconsin; Richard L. Hodder, Montana State University; Edward A. Johnson, U.S. Forest Service; Walter B. Langbein, U.S. Geological Survey; Luna B. Leopold, University of California, Berkeley; Harold E. Malde, U.S. Geological Survey; Richard A. Schmidt, Stanford Research Institute; Eric G. Walther, Colorado Plateau Environmental Advisory Council, Flagstaff, Arizona; and M. Gordon Wolman, Johns Hopkins University.

Aerial photograph of strip mining at Colstrip in eastern Montana. [U.S. Geological Survey]

In telling utilities to take their coal and burn it somewhere else, the panel cast a pall over some of the energy industry's grandest designs.

The importance of water to coal development, stressed repeatedly by the panel, seems to have taken some members of the House and Senate Interior committees by surprise. To one House staffer deeply involved in strip-mining legislation, the unexpected emphasis on water problems points up an urgent need by Congress for a functioning Office of Technology Assessment. "Here we've gone all through the issue of strip mining," he observes, "and all of a sudden we find that water, perhaps the most significant aspect of the issue, has had very little analysis. This should have happened at the beginning of the debate, not the end."

Water, as the academy panel makes plain, insinuates itself into the issue of Western coal development in a number of ways. Among the panel's main findings and recommendations:

► Successful rehabilitation of mined arid lands depends critically on soil conditions, the amount of moisture available, and the techniques used for stripping, storing, and replacing the overburden of soil at each specific site. On the basis of a rather thin body of research, areas receiving more than 10 inches of rain a year (typically ponderosa pine lands and mixed-grass prairies) seem to have a "high potential" for rehabilitation, given the best possible management. These areas encompass about 60 percent of the strippable Western coal lands.

But areas receiving less than 10 inches of rain, or with unusually high rates of evaporation and transpiration (mostly deserts and foothill shrub growth), stand an "extremely low" chance of recovery even with help from man; without years of careful management, "revegetation" of mined over desert lands "may not occur for centuries." From an esthetic point of view, the panel said, surface mining of desert lands "amounts to sacrificing such values permanently for an economic reward."

For these most intractable lands—covering about 11 percent of the coal region, mainly in the Four Corners area—the panel sees only two alternatives to rehabilitation, neither of which is likely to win universal acclaim: "nondevelopment" or the simple declaration of ravaged deserts as "National Sacrifice Areas."

In any case, the report continues, *restoration* of stripped landscapes, in the sense of recreating former conditions and biological communities, "is not possible anywhere." All that is possible is rehabilitation of the land, a term defined somewhat tortuously as the returning of mined lands to a "stable ecological state that does not contribute substantially to environmental destruction and is consistent with surrounding esthetic values."

► In most Western coal fields, unlike those in the East, near-surface coal seams are also groundwater aquifers serving livestock and domestic wells. Mining operations that cut into such coal-seam aquifers may reduce the flow of water to some distant wells and "dewater" others altogether. Around Gillette, Wyoming, for example, the academy panel said several hundred wells could be impaired by stripping operations some miles away. The panel said it knew of no proven method of patching the gaps in a coal-seam aquifer once the coal is removed.

► Similarly, the panel said, stripping operations that destroy the surface drainage features of a mining site may have serious hydrologic repercussions on the surrounding, unmined area. Ephemeral streams—the dry gullies and arroyos that carry water only after thunderstorms or spring snowmelt—are described as a vital feature of the arid bioscape that must be preserved in mining operations. Eradication of old channels, the panel said, forces the run-off of infrequent but often intense desert storms to cut new channels, thus increasing erosion rates that are already among the nation's highest. Moreover, mining operations that deplete regional water tables can trigger a domino-series of damaging effects on surrounding lands. As the water table drops, protective vegetation dies from lack of soil moisture and the land is exposed to more extensive erosion. The end effect, said the panel, could be the destruction of grazing lands in alluvial valleys; this and other off-site side effects are seen as adding potentially major new complications to Western water law.

► "The shortage of water," the panel concludes, "is a major factor in planning for future development of coal reserves in the American West. Although we conclude that enough water is available for mining and rehabilitation at most sites, not enough water exists for large-scale conversion of coal to other energy forms. . . . The potential environmental and social impacts of the use of this water for large-scale energy conversion projects would exceed by far the anticipated impact of mining alone. We recommend that alternative locations be considered for energy conversion facilities. . . ."

The academy panel's concerns had a generally sympathetic hearing from the House and Senate Interior committees, although it was not until mid-September that members or staff of either committee were allowed to read the report. Academy officials felt duty bound not to let it out of their grasp until it had cleared the elaborate NAS review machinery and, until (as specified in the study contract) 50 printed

copies had been delivered to the sponsor, the Ford Foundation's Energy Policy Project. The review was finished by 7 September, but printing delays stretched the veil of secrecy excruciatingly close to the Senate's floor debate on strip mining. Finally, on 14 September, panel chairman Thadis W. Box of Utah State University unilaterally dispatched a Xerox copy to Congress. By agreement with the bill's main authors (Democratic senators Henry Jackson of Washington and Lee Metcalf of Montana), Senator Frank E. Moss (D–Utah) used the report as the basis for a floor amendment aimed at protecting ephemeral streams and coal-seam aquifers.

Of all 128 million acres of coal and lignite in the West, however, only 1.5 million acres are thought to be amenable to stripping. Of this, the NAS panel foresees the actual strip mining for power generation of 92,000 acres or 140 square miles by 1990 and a total of 188,000 acres or 300 square miles by the year 2000. (The full acreage that might be stripped for gasification and liquefaction plants was not estimated.) For comparison, strip mining for coal in the eastern United States has already disturbed 1.3 million acres or nearly 2000 square miles. The disparity between East and West stems from a far greater average thickness of near-surface coal beds in the West, and it helps explain why the academy committee found the prospect of huge energy conversion plants more worrisome than mining itself. Judging from the scale of utility plans, their report said, total acreage disturbed by transmission lines alone might exceed that of mined land.

The awesome magnitude of these plans is illustrated by the North Central Power Study, a remarkable document put out in October 1971 by 25 utilities, at the prompting of the Bureau of Reclamation.

The North Central plan proposed the development of water and coal resources over 250,000 square miles of the West, centering on the Gillette-Colstrip area of Wyoming and Montana.

Professing a "very real concern for the environment," the utilities picked 42 sites in five states for coal-fired steam generating plants that would produce 50,000 megawatts by the end of the century. (By comparison, the 39 existing coal plants in the Western states generate 9300 megawatts.) Thousands of miles of 765-kilovolt transmission lines would reach from Medicine Bow, Wyoming, to St. Louis, Missouri. Three new dams and reservoirs in Montana and Wyoming would provide another 3000 megawatts of pumped-storage hydroelectric power. At peak activity the North Central project would consume 855,000 acre-feet of water a year, equal to more than half of New York City's annual consumption; with gasification and liquefaction plants, annual water demands would rise to 2.6 million acre-feet. Over its 35-year life, the project would burn 8 billion tons of coal in electric power plants alone.

No one could dispute that the coal was there, but what about the water? In a follow-up report in April 1972 the Bureau of Reclamation expressed confidence that 3.2 million acre-feet could be diverted from the Yellowstone River and its tributaries in Wyoming and Montana, although doing so would mean committing about one-third the river's average flow to coal conversion. Some 300 miles of large pipeline would be needed to bring the water to mine-mouth plants, in addition to 5 to 8 new dams and reservoirs, one of which, the bureau said, might be built across a stretch of the Yellowstone being considered for inclusion in the nation's Wild and Scenic River system. The academy panel estimated the total price of the Montana-Wyoming Aqueducts Project at $1 billion.

The academy committee seems to have felt the same twinge of horror registered by Western conservationists when the plan was unveiled 2 years ago. The ecological and social implications for the states involved, the panel wrote, were "staggering." The plans, it went on, "seemingly grew without regard for assignment of appropriate interest rates, adequate perception of changing values, public involvement in decision-making, and without evaluation of alternatives."

It had long been assumed that some day the Bureau of Reclamation would parcel out large amounts of unallocated water in the region to a diversity of users—for irrigation, wildlife management, recreation, and such industries as lumber and paper pulp, as well as coal. Now it appeared that most of the surplus water had quietly been tagged for diversion to coal development, without considering the long-range economic consequences, 35 to 50 years hence, when the coal runs out or becomes an obsolete source of energy. "Such a sharp reversal in government policy," said the panel, "came about with little or no public awareness."

Moreover, there is some question as to whether assured supplies of water exist in the enormous quantities contemplated by the coal industry. Along the Bighorn River alone, in Montana and Wyoming, the Bureau of Reclamation's own figures show that the agency has sold to 18 oil and mining companies options on 708,000 acre-feet—about one-third the river's flow—since 1967. Yet in the Yellowstone basin, which includes the Bighorn, the NAS panel says that Montana's share of water appears to have been "completely committed, perhaps overcommitted" and that Wyoming's allotment is nearly all spoken for, mainly by coal companies. A "de facto overcommitment" is said to exist in the Colorado River basin, where expectations of tributary states exceed the supply.

Having already secured rights to much of, if not all the coal and water it wants, the energy industry will not easily be persuaded to reconsider its plans. Several national conservation groups have begun to try, however, with a little leverage from the courts. In a scatter-gun suit based on the National Environmental Policy Act of 1969, the Sierra Club and the National Wildlife Federation are seeking to enjoin three federal departments from any further development of Northern Plains coal pending an environmental impact study covering the entire region. In an independent action, the Environmental Defense Fund and several other groups filed suit against the Bureau of Reclamation on 16 October, charging that the Bureau had "surreptitiously" and illegally allotted to the coal industry water that Congress had intended for irrigation. The suit seeks to prevent the companies from exercising their Bighorn River options and to prevent the government from granting the necessary rights of way for coal-field aqueducts. "We are not against all coal development," EDF attorney James Tripp says. "But a lot could be done to make coal development more sensible."

The North Central Power project and its aqueducts are still a long way from reality—farther in fact than the Alaskan pipeline was when that controversy reached the courts. But if conservationists and the energy industry display the same unbending resistence to each other's demands, the prospect for a bitter replay remains, this time against a backdrop not of tundra, but the sandstone, sage, and prairie wilderness of the Western coal lands.

—ROBERT GILLETTE