



A home on the range for a vast industry

A huge power-generation complex in Wyoming and Montana is under study

USBR photos by Lyle C. Axthelm

by Richard H. Gilluly

Actor John Wayne said recently that there are few places left in the West where old-fashioned horse operas of the kind he performs in can still be made. The problem is that powerline towers, highways and other artifacts of modern civilization are so ubiquitous, even in the vast expanses of the West, that simulating the virgin countryside of pioneer days is increasingly difficult.

One exception is southeastern Montana and northeastern Wyoming, the region near where the Sioux and Cheyenne Indians defeated General Custer and where much of the recent film about the Custer debacle, "Little Big Man," was shot. Here in these vast reaches of prairie, mountains and scrub-pine-covered hills, one can still get a sense of what it must have been like before the white man came.

And this is the reason it seems so incongruous that planners are now looking to this area as the possible site for one of the largest industrial developments in the world. It is also the reason environmentalists are growing increasingly critical of the planners.

A group of 20 electric utilities, including the Interior Department's Bureau of Reclamation (USBR), recently released the "North Central Power Study." (Report of Phase I, Vol. 1, available from USBR, Department of the Interior, Washington.) The study forecasts a possible installed capacity of 53,000 megawatts of coal-fired and

pumped-storage power generation between Gillette, Wyo., and Colstrip, Mont., by the year 2000. In addition, oil companies and other energy enterprises are buying up options or leases on coal and water in the area with a view to making synthetic natural gas and petroleum, and building possible accessory chemical industries.

The reasons for selecting the Gillette-Colstrip area are complicated. A basic one is that the area contains some of the richest coal deposits in the world—seams of pure coal up to 150 feet thick, sometimes with an overburden of only a few feet. The industries based on this coal could turn the area into "the Ruhr Valley of North America," says Tom Bell of the High Country Times, an environmentalist bi-weekly in Lander, Wyo. James E. Parker of the Bureau of Reclamation's power division in Washington admits that the power development alone might be one of the largest in the world.

The new study examines only the power development, mentioning the other possible developments only tangentially. Envisioned are coal-fired power plants in complexes of about 2,000 megawatts each, for a total capacity of 50,000 megawatts, to meet part of the base-load, or constant, power demand of much of the northern Rocky Mountain and Midwest region. Additionally, there would be 3,000 megawatts of nearby pumped-storage

capacity to meet peak loads in the area. (Pumped storage utilizes reversible electric motor-generators. During times of low demand and excess generation from steam plants, the surplus power is used to pump water uphill into reservoirs. Then at times of peak demand, the pumps become hydroelectric generators as the water flows back downhill.) An indication of the immensity of a 53,000-megawatt generating complex can be gained from a comparison with the total installed capacity in the United States today: 340,000 megawatts.

Besides the power developments and coal mines, there would be a large and complex system of aqueducts in the area to carry water from the Bighorn, Yellowstone, Tongue and Powder Rivers to the power plants for cooling. The power generated would be carried to populous Midwestern markets as far away as Missouri over ultra-high-voltage (UHV) transmission lines.

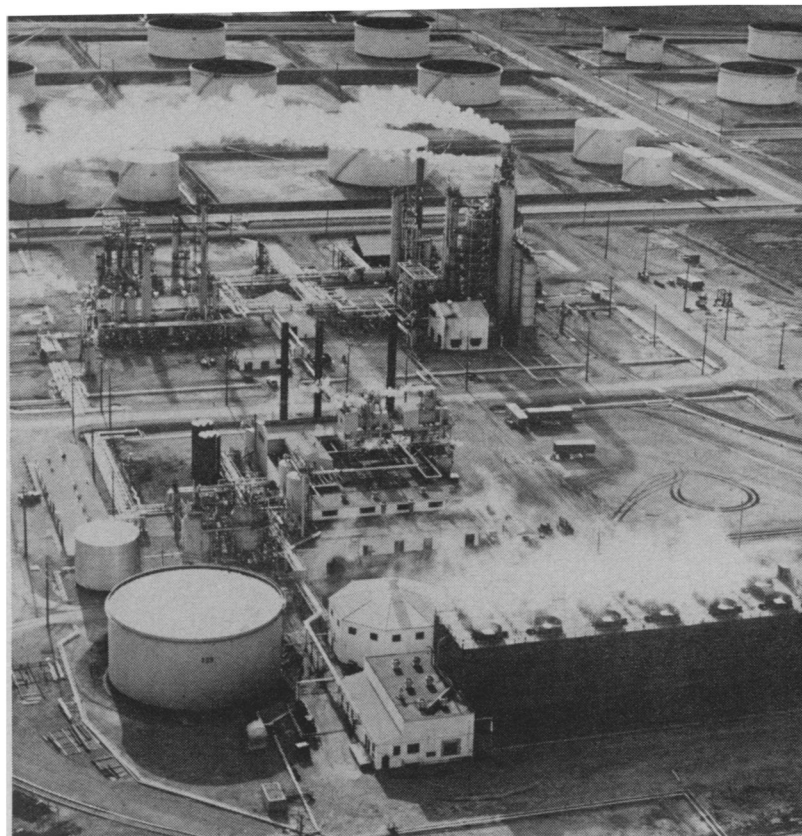
Until recently, power plants for cities were built in or near the cities, with fuel brought to them via rail or ship. In the past few years, however, the concept of "mine-mouth generation" has gained currency among utility officials, and it is the rationale for the Montana-Wyoming plan. There are numerous advantages: As Parker frankly admits, environmental constraints in the thinly populated coal country are still far less severe than in the cities. Addition-

ally, building the mine-mouth plants and accompanying transmission lines can form part of the backbone of a nationwide or region-wide power grid which would produce large benefits in reliability and power exchanges between regions with diverse load characteristics. An earlier Interior Department study indicated, for instance, that such a grid system in the Western two-thirds of the United States could probably pay for itself even without the benefits of the additional generation discussed in the current study.

Another reason for the increasing attractiveness of coal-fired plants is the escalation in nuclear plant costs. A Robert Nathan and Associates study for Interior's Office of Coal Research a few years ago predicted that power from Montana-Wyoming coal transmitted to the Pacific Northwest could be competitive with nuclear power produced in that region in plants along the Columbia River. The current study clearly shows the same to be true for the coal-produced power in the populated portions of the Midwest. With power demands there (and throughout the nation) doubling about every 10 years, power development of the Montana-Wyoming coal fields "is almost a certainty," says the new study.

Oil company development of coal gasification and liquefaction and chemical industries is less certain, but still likely. Southwestern gas utilities are already nearly under way with construction of coal gasification plants in New Mexico (SN: 11/27/71, p. 356), and growing shortages of natural gas na-

Some synthetic petroleum from coal would get final processing for local use in refineries like this one near Mandan, N.D., but bulk of coal oil would go in pipelines to big cities.



tionwide are certain to make the Montana-Wyoming coal attractive for this purpose, especially if demonstration and pilot plants being built under contract to OCR are successful. And although petroleum brought from Alaska or foreign sources is now cheaper in coastal areas, synthetic petroleum from the highly reactive Montana-Wyoming coal may be competitive in inland areas. Quite possible, say OCR officials, are combined electric/synthetic gas and petroleum plants. Left over from the hydrogenation of coal for the synthetics is a carbonaceous material called "char," which can be burned in the power plants.

* * *

"My God, they want us to worry about the lichen," said the utility executive. He was describing an environmental requirement for construction of a new unit for his company's coal-fired power plant, a relatively small one on the prairie near the North Central Power Study area. He was exasperated with an environmental agency's "nit-picking." Yet his consumer-owned company traditionally has been far more environmentally conscious than most electric utilities. His remark points up the tremendous difficulties that surely will ensue as the Montana-Wyoming plans get under way.

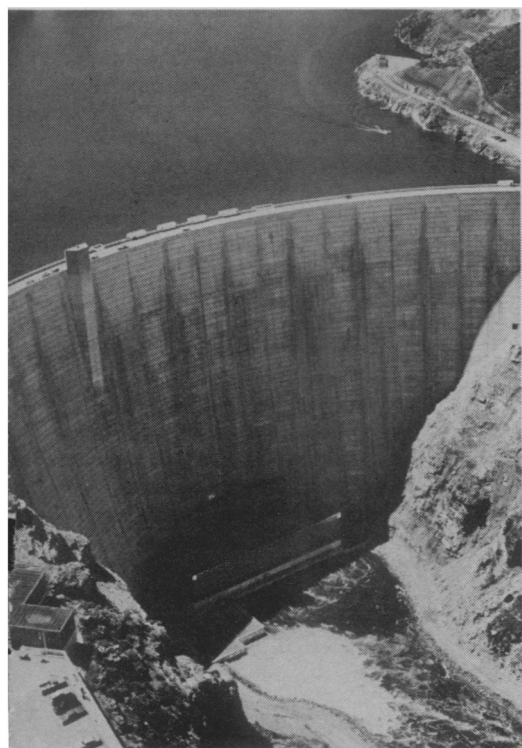
The utility executives view the semi-arid prairie and badlands where the plants would be built as virtual wasteland, good now only for the grazing of a few cattle. Ecologists view it far differently. To them, it is a delicate ecosystem, subject to damage from far smaller stresses than would be imposed

by the construction of the plants and, especially, the annual strip-mining of millions of tons of coal. Residents of the area, including the Crow and Northern Cheyenne Indians, also have a somewhat different view of the country (although one tempered by the promise of coal and water revenue and vast new employment opportunities). To them, it is uniquely beautiful and, in the case of part of the Crow Reservation, sacred.

Don L. Brown, director of the Montana Fish and Game Department, expressed the environmentalist misgivings in a Jan. 27 letter to Montana Sen. Lee Metcalf, who shares some of them. Although Brown recognized the probable impossibility of stopping the developments altogether, he pointed to the "shortsightedness" of moving with existing power-generation technology which has a thermal efficiency of less than 40 percent. He suggested instead waiting for magnetohydrodynamics (MHD), which has a thermal efficiency of about 60 percent and is less polluting than conventional generators in other ways, too. With the higher thermal efficiency, far less coal would have to be strip-mined.

Brown also says that the research and development for restoring strip-mined land is still not adequate to assure safety for the "wildlife crop which this department is responsible for perpetuating." And although the power study insists that environmental impact will be fully considered, Brown wonders.

Of its consideration of environmental statutes, the power study says, "in special cases where it is believed an existing local regulation was impractical, a



Cooling-water supply: Yellowtail Dam.



Acme, Wyo., coal has 9,500 Btu's/pound and only one-half percent sulfur.

reasonable requirement still within the Federal law was used." The problem here, says Brown, is that Montana's antipollution statutes—such as those for sulfur oxides—are stricter than Federal regulations. Because the developments would be on Federal or Indian lands subject to Federal law, there is a question which laws would apply. The utilities preparing the study obviously chose the least stringent. Brown also called attention to a portion of the study that says coal reserves at some of the sites are good for only 35 years of power plant operation. Brown suggests the developments might be a kind of hit-and-run proposition (perhaps designed to fill the gap until breeder or fusion power is available).

This brings up a further objection. It is the view that the mostly urban-based utilities see the area as a kind of underdeveloped country ripe for exploitation. "It is obvious from the report," says Brown, "that Montana possesses an incredibly wealthy natural resource. It is further obvious . . . that both the coal and water resources of eastern Montana are going to be exploited to produce electrical energy to be consumed in Minnesota, Iowa, Missouri, South Dakota and Nebraska. It can be further assumed that the capital to develop these resources, and consequently the profits to be gained, are going to predominantly accrue to interest groups outside the state of Montana."

Brown's arguments are partly countered by the advocates of the plan. Parker points out, for instance, that much of the coal has a sulfur content of about half a percent, far lower than most Eastern or Midwestern coals, and thus the sulfur oxide emissions would be lower. But this advantage could be partly offset by the low British thermal unit value of the coal. For instance, coal from one site in east-central Montana has a thermal value of 7,650 Btu's per pound and a sulfur content of 0.6 percent. Such a coal would have the

sulfur oxide polluting potential of a 15,000-Btu coal with twice the sulfur content. But 15,000-Btu coal is rare, and even 1.2-percent-sulfur coal is still low-sulfur coal.

And not all of the utilities involved are the profit-taking kind. Several are consumer-owned municipal or rural electric cooperative systems. The benefits of scale from the huge power plants and transmission systems would flow to customers of these systems in Montana and Wyoming. But Brown is largely correct. The largest power loads in the region by far are for Northern States Power Co. of Minnesota and Union Electric Co. of St. Louis, both investor-owned utilities.

One point on which Brown is certainly correct is that far more research and development needs to be done. A problem with some low-sulfur coal is that it may make stack gases unamenable to removal of particulate pollution with electrostatic precipitators. Basin Electric Power Cooperative of North Dakota, after a joint R&D project with an equipment supplier, believes this problem is not serious for North Dakota lignite, a coal which may be similar to the Montana-Wyoming coals. But each specific coal will have to be tested at length.

And although OCR is committing more funds to MHD research than in the past, Metcalf and many scientists believe it is still far from enough for a technology with such an important potential. Research into the reclaimability of strip-mined areas is still in its infancy (SN: 5/1/71, p. 297).

Finally, it is difficult to say whether utility executives and engineers will take seriously the kind of environmental constraints Brown says are necessary. One, at least, is still highly cynical about lichen. And Brown asks a basic question that is being asked more and more: Why not, he asks, make an effort to reduce the acceleration of demand for electricity, much of it used for "frivolous" purposes? □

SCIENCE EXPLORING AT SPRUCE MOUNTAIN CAMP FOR BOYS

BRYANT POND, MAINE

New knowledge, new skills, new challenges in 3 major areas—Science Exploring, Outdoor Exploring and Life-time Sports. Boys 10-15. Field, mountain, canoe trips. Outpost at Mt. Katahdin. SAFARI I wilderness program, SAFARI II in Canadian Rockies. Ham radio, photography, plants, animals, weather, geology, ecology, astronomy. Staff inquiries invited. Catalog:

William T. Harty, Director
12 Highland St., W. Medway, Mass. 02053

METRIC THREADS

will no longer be a problem with METRIKIT. Our Model M-1 METRIKIT assortment of over 200 pieces includes hex-headed regular metric pitch cap screws 2.6mm to 10mm diameters, and lengths to 50mm, plus nuts, flat washers and lock washers. All kits packed in sturdy compartmented polypropylene boxes.

METRIKIT M-1 \$9.95 postpaid
(California residents add sales tax.)
Other METRIKITS available. Send for free catalog.
METRIC-AMERICAN, Box 12162, Oakland, Ca. 94604

BOOK ORDER SERVICE

For the convenient purchase of any U.S. book in print you may avail yourself of Science News Book Order Service, 1719 N St., N.W., Washington, D.C. 20036. We pay postage. Send 25¢ handling charge. Regular retail prices on all books.

Fourth International SUMMER SCIENCE INSTITUTE

at the
WEIZMANN INSTITUTE OF SCIENCE

Rehovot, Israel
July 12-August 23, 1972
sponsored by
American Committee for the
Weizmann Institute of Science
in cooperation with the
American Zionist Youth Foundation

Open to Science Oriented High School Students

who will have completed their junior or senior years by June, 1972.

Program


Six week program combining study and touring.

Participation Fee

Fee of \$1075 covers all expenses, including round trip fare New York-Israel and return; accommodation, board, tuition, tours.

For Further Information

Summer Science Institute
c/o Weizmann Institute of Science
515 Park Avenue
New York, New York 10022
Tel. (212) PL 2-1300



HENLEY'S

20th Century Book of 10,000 Recipes, Formulas & Processes

Here is a wealth of practical, accurate and clear information and instruction that can save you thousands, or make you a fortune! Housewives, manufacturers, farmers, handymen, home experimenters, electricians, chemists, people in every walk of life, refer to Henley's daily. In this gold-mine of a book, you too will find formulas and recipes for almost everything used in the home, farm, workshop or industry. Discover the trade secrets of thousands of commercial products—learn new money savings and exciting ways of doing things. As indispensable as a dictionary. Satisfaction guaranteed. 900 pages hard cover-cloth binding. Only \$6.95 postpaid.

EMBASSY SALES, Dept. SN-25
Box 67, East Elmhurst, N.Y. 11369