# Texas Power Companies Converting from Natural Gas to Coal, Lignite

*Dallas*. Rich resources of oil and natural gas made Texas what it is today, but now oil and gas production is declining and the state is embarking on a Texas-sized effort at developing an alternative by generating electric power with coal.

Once again it seems that Texas has the luck of the geologic draw. Very substantial reserves of lignite lie in a belt parallel to the Gulf Coast in East Texas. Mines and lignite-fired power stations are already in operation and major expansion of the use of lignite is in the cards.

Power companies in South and West Texas are looking outside the state for coal supplies and have contracted for more Wyoming and Montana subbituminous coal than utilities in any other state. (There are significant reserves of bituminous coal in North Central Texas, but the sulfur content is too high and general quality too low for it to be attractive for use currently.)

Conversion to coal in Texas is a classic case of Hobson's choice. The state has been a prodigal user of natural gas and the power companies shared the habits formed when gas was abundant and almost ridiculously cheap. As late as 1975, some 90 percent of the electric power generated in the state was made by burning natural gas. As a gas shortage developed in the early 1970's, however, the utilities had to buy gas at intrastate prices, which quadrupled in 4 years to about $2 per million Btu's. The current cost of interstate gas, which is regulated by the Federal Power Commission, is $1.44 per million Btu's.

By 1985, if present plans are realized, about 60 percent of electric power supplied in Texas will be generated in plants burning coal and lignite, roughly half coal and half lignite. Texas, therefore, is confronting the choices and changes imposed by the energy crisis earlier than most other parts of the country. Texas planners and policy-makers are ahead of many others in analyzing the consequences of conversion and appraising the options available, but it must be emphasized that if the Texans are moving faster, they have farther to go because of their heavy reliance on natural gas.

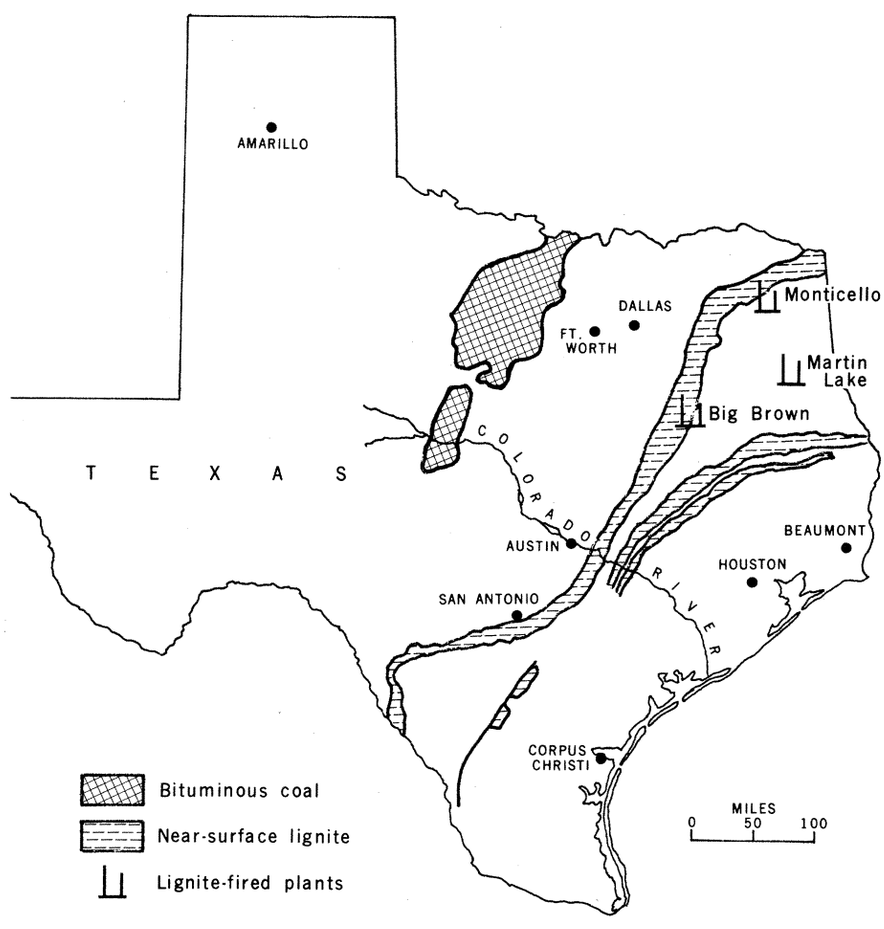
The main legal impetus for conversion came at the end of 1975 when the Texas Railroad Commission, which wields authority over natural gas production, ordered major users of natural gas as a boiler fuel to restrict consumption. No new facilities burning gas were to be built and users of over 3 million cubic feet a day of gas were ordered to cut consumption by 10 percent by 1981 and 25 percent by 1985.

Power companies were the most conspicuous targets for the commission's Docket 600 order. Not only will they have to reduce gas use 25 percent below 1974–75 levels over the decade, but they will also have to add plants using other fuels to meet increased power demand in the period.

One power system with a head start on conversion is the Texas Utilities Company (TU), a holding company based in Dallas. TU owns three power companies which together serve about a third of the state. Its companies, Dallas Power & Light, Texas Power & Light, and Texas Electric Service Company, provide power for about 4 million people in a broad swath across East, North Central, and West Texas.

The TU system pioneered the use of lignite for power in Texas and is making the experience pay off. In the 1920's one of its companies operated a lignite-fired plant about 50 miles south of Dallas. The 40 Mw plant, very sizable for those days, was the first major power plant using pulverized lignite in the world. But increasing use as a boiler fuel of natural gas, which had been regarded as a waste product of oil production and flared at the wellhead, made lignite uneconomic and the plant was closed by 1940.

Even during the days of the virtual glut of gas in the 1940's, however, TU maintained an active interest in lignite. With a persistence that must have seemed eccentric at the time, TU officials pushed ahead with exploration for lignite, steadily increased their holdings of lignite reserves, and sponsored work to improve the technology for lignite utilization. In the early 1950's, TU built a lignite-fired generating plant for Alcoa near Rockland in the lignite fields to provide power for alumina production.




Map by Eleanor Warner

By the late 1960's the imminent rundown of gas and oil supplies was perceived and TU planned and began construction of its Big Brown Steam Electric Station about 90 miles south of Dallas near Fairfield. The first 575 Mw generating unit at Big Brown went into operation in 1971. A second 575 Mw unit went on-line the next year. TU's second lignite station, the Monticello plant near Mt. Pleasant, put two 575 Mw units into operation in 1974 and 1975. A third lignite plant, the Martin Lake station, expected to be the biggest lignite plant in the world, is scheduled to start commercial operation this year.

Other lignite power plants are being built or planned by TU and other Texas utilities. The first non-TU plant scheduled for operation—in 1981—is the San Miguel plant near Jordanton in South Texas, a joint project of the South Texas and Medina Electric Cooperatives' Pool and Texas Municipal Power Pool. By 1984, San Miguel will have two 400 Mw units operating. In 1985, it is contemplated that total lignite plant generating capacity will be 14,556 Mw.

The East Texas lignite now being used by TU comes from an area favorable both for surface mining and the reclamation work prescribed by state and federal law. The terrain is flat or gently rolling and there is no hard-rock geology to contend with. The lignite is "young coal" about 55 million years old, formed in the Eocene period when the area was a big coastal swamp. Huge electric-powered draglines used to expose the coal seams easily shift what, in mining parlance, is called unconsolidated overburden.

In contrast to the requirements of surface mining in the East and Midwest, the Texas topsoil does not have to be segregated from subsoil so that topsoil can be restored during reclamation. The clayey subsoil above the lignite seams is of sufficiently high quality to serve as topsoil after it is broken up by mining operations. Another plus for the Texas lignite is that it lacks the pyrites which cause acid mine drainage which complicates reclamation in the eastern coal regions.

An advantage the Texas lignite fields have over the arid high plains coal region is the relatively ample rainfall—as much as 45 or 50 inches a year in the northern sector of the lignite belt—which aids the growth of cover crops.

Texas Utilities started a comprehen-

# Briefing

## Senate Panel Wants OSTP to Take the Long View

Two duties that would have had the White House Office of Science and Technology (OSTP) systematically taking a long view of policy issues have just been transferred under a presidential reorganization plan to the National Science Foundation—namely, preparation of the annual report on the status of science and technology and the report on the "5-year outlook."

But the Senate subcommittee on science, technology, and space, chaired by Senator Adlai E. Stevenson of Illinois, intends to help the incumbent science adviser, Frank Press, and his staff resist any tendency they may have to be preoccupied with the exigencies of the moment. A few weeks ago, Stevenson wrote Press to say that the subcommittee would be conducting annual oversight hearings in February on the OSTP and "federal R & D priorities and the science and technology effort generally." The letter leaves the clear implication that, even though Press no longer is directly responsible for preparing the aforementioned reports and for certain other things prescribed in the National Science and Policy Act of 1976, the subcommittee will nevertheless expect him to address the substantive questions some of these duties involve.

Actually, Stevenson regretted the transfer of responsibility for the two reports to NSF; he wants long-term policy matters, such as the impact of federal R & D on industrial technology and how the public can play a role in the making of science policy, continuously addressed at the White House. Press, on the other hand, conscious of the fact that his first obligation is to be on call to give the President such advice as he may need, did not want the OSTP burdened with the considerable tasks of preparing the reports.

Besides inviting Press and his top staff to appear at its oversight hearings, the Stevenson subcommittee also wants to hear from other Administration officials with responsibilities for science and technology and from prominent scientists outside government. With the latter aim in mind, the hearings are to be planned for the week of 12 February, when the AAAS will be holding its annual meeting in Washington. The House Committee on Science and Technology has indicated to OSTP that it also will be conducting oversight hearings next year.

## Academics Urged to Join Sun Day Observance

Denis Hayes, the prime mover behind "Sun Day," will be urging members of the academic community to play a major part in its nationwide observance, planned for next 3 May. Now 32, Hayes was fresh out of Stanford University in the spring of 1970, when he coordinated the observance of Earth Day, which consisted of a wide variety of community and campus activities that included lectures, teach-ins, organized litter pickups, bike trips through city parks, and so on.

Sun Day, a "celebration of the sun," is expected to be a more broadly based observance than Earth Day, which took place primarily on campuses and under student leadership. Hayes, who is a researcher with the Worldwatch Institute in Washington, D.C., and the author of *Rays of Hope* (a new book on solar energy), wants Sun Day to include a great diversity of participants—for instance, minority groups, farm organizations, labor unions, parent-teacher associations, civic clubs, and consumer and environmental groups.

But, he says, the involvement of academics will be essential to the success of Sun Day because they and their laboratories are a prime source of ideas, information, and hardware. Accordingly, Hayes and the staff of Solar Action, a Washington-based unit set up to promote and coordinate Sun Day, will be trying to enlist the participation of all the relevant academic disciplines.

These disciplines include—and the list is not exhaustive—mechanical and aeronautical engineering (the latter because of its bearing on windmill technology), architecture, the environmental sciences, urban planning, law (the right of access to sunlight is an emerging issue), and biology and forestry (both of which are important to biomass conversion). Hayes observes that there has long been an abundance of college and university programs in nuclear engineering and disciplines related to the use of fossil fuels; what is needed now, he says, is a flourishing of programs related to solar energy.

sive reclamation program when it began to mine lignite for its new power plants—a program good enough to win compliments from conservation groups. Perhaps even more to the point, farmers and ranchers in the area have been well enough impressed by the restoration of mined land to original use that they are, typically, selling mineral rights to the company rather than opting for outright sale of their land.

The relative ease of mining and reclamation and the placement of power plants in the lignite fields has made use of lignite as a fuel economically attractive. Lignite-fueled plants are more expensive to build than plants using gas or oil as fuel and new requirements for equipment to control emission of pollutants will drive up production costs. However, in 1976 TU put the cost of lignite at 28.8 cents per million Btu's, about 1/7th of the market price of intrastate natural gas.

Although lignite looks more and more attractive in light of the declining supplies and rising prices of oil and gas it is hardly the perfect fuel. In terms of heating value, lignite's place on the coal totem pole is next to the bottom, above peat and below subbituminous coal.

Texas lignites vary considerably both in heating value and ash content. The highest quality deposits, in general, lie north of the Colorado River (not the more famous river of the same name which gouged out the Grand Canyon) where current mining activity is concentrated.

Lignite power plants require scrubbers to control sulfur dioxide emissions and electrostatic precipitators for fly ash. TU resisted scrubbers through a tough court battle, arguing that scrubbers would saddle customers with unwarranted costs. But TU lost and so is installing scrubbers on its big new lignite generating units.

TU lignite comes from north of the Colorado in the so-called Wilcox formation where $SO_2$ and ash content is regarded as moderate. As other lignite deposits are exploited by utilities and industry poorer quality lignite will come into use. In the geologic formations south of the Colorado the lignite is generally of lower quality and rainfall is sparser. Reclamation, therefore, will be a somewhat more demanding and more expensive task. More significant, the southerly lignite not only has a higher

# Briefing

Active campaigning to raise the $150,000 that will be needed for the promotion and coordination of Sun Day was begun only a few weeks ago. Hayes says he is "relatively confident" that the money will be forthcoming, primarily through solication by direct mail. Two Sun Day coordinators, Peter Harnik and Richard Munson, activists who have been associated in the past with Environmental Action, have already been hired.

## CEQ Nominee Learns Judge Not, Lest Ye Be Judged

The Senate Environment and Public Works Committee's rejection on 17 October of the nomination of environmental activist Marion Edey to the Council on Environmental Quality (CEQ) involved an ironical turnabout of roles.

Edey, 32, formerly was chairman of the League of Conservation Voters (LCV), which rates senators and representatives on their voting records with respect to environmental issues and raises money to support—or to defeat—congressional candidates according to its evaluation of their sensitivity to environmental concerns. At the end of the last Congress, members of the Public Works Committee (since renamed the Committee on Environment and Public Works) got a collective rating from the LCV of 40 out of a possible 100.

As it happens, the motion "to postpone indefinitely" the Edey nomination was made by Senator James A. McClure, an Idaho Republican whom the LCV had given a score of 3—only one other senator got a lower rating—and whom it had sought to defeat 5 years ago when McClure, formerly a House member, successfully ran for the Senate.

After the committee action, McClure observed that the LCV "has been irresponsible" and had "injected liberal causes as a test for rating members of Congress." But, while McClure is a staunch conservative, four of the eight senators who voted against Edey (four voted for her) were Democrats on the moderate to liberal end of the spectrum; they included Jennings Randolph of West Virginia, the committee chairman, and even Edmund S. Muskie, chairman of the subcommittee on environmental pollution and a principal sponsor of all the clean air and clean water legislation passed in recent years.

Edey's fate in the committee had in a sense been linked to that of a controversial nominee for the Nuclear Regulatory Commission, Kent F. Hansen, a professor of nuclear engineering at the Massachusetts Institute of Technology whom environmentalists have opposed as being strongly pronuclear. Hansen supporters on the committee had seen to it that the Edey nomination was not voted on until action was taken on their man. But, with Randolph and Muskie joining in the rejection of both Hansen and Edey, the thumbs down given her cannot be explained as simply a retaliatory action.

Muskie, whom the LCV had given a rating of only 67 last year but had endorsed in his 1976 reelection campaign, said Edey was rejected because she had been "an inflexible and undiscriminating opponent of the kind of projects and activities which the council must review."

Yet the LCV's ratings of members of Congress have been derived from their votes on what appear to be pretty much main-line issues. The LCV position was adopted by the Senate in about half of the 31 votes on which Senators were judged for the last Congress, and in all but a few instances at least a fourth to a third or more of the Senate voted "right" as defined by the LCV. Moreover, in its analysis last year of the LCV's performance, the House Republican Research Committee rendered a mixed judgment on the LCV rating system but commended the group for a "respectable effort" at nonpartisanship in making campaign donations.

A largely unspoken but apparently significant factor in Edey's rejection is the objection some senators have to her style and manner. One senator is said to have reacted stiffly after Edey, arriving at his office for a courtesy call, took off her shoes and sat on the floor when faced with a long wait in a chairless room. But Edey has tried not to flout Senate sensibilities. For her confirmation hearings on 18 July, she says, "I curled my hair, made up my face, and wore fancy shoes and a very respectable dress."

Edey's colleagues at CEQ, Charles Warren and Gus Speth, hold her in high regard and value her work on public lands and wildlife issues. In a personal telephone call to Senator Randolph, President Carter, who talked with Edey for half an hour before nominating her last May, has asked the committee to reconsider its action. Some 51 environmental and other groups have done likewise.

Luther J. Carter

*Bermuda grass takes hold on newly reclaimed land in lignite fields in East Texas.*

sulfur and ash content, but also contains trace metals. These include uranium and the prospect of uranium and its fission products appearing in the stack gas of power plants raises health questions for the future.

The size of the Texas lignite reserves is obviously a highly relevant question. The state is fortunate in having a clearer idea of the extent and quality of its lignite reserves than do its neighbors who share the belt of Gulf States lignite stretching across sections of Louisiana, Arkansas, Mississippi, and Alabama. The mapping work done originally by the state's geologic survey has been carried on in recent years by the University of Texas department of economic geology.

Current estimates put Texas lignite reserves at 10 billion tons within 200 feet of the surface—200 feet is regarded as the practical maximum depth for surface mining. The whole 10 billion tons, however, is not economically recoverable by current methods. Estimates of that portion vary between 2.5 billion to 8 billion tons. The ratio of size of seam to depth is the main consideration.

As for the far larger reserves of deep-basin lignite, estimated at over 100 billion tons, there is already active interest in using it through in situ gasification. Air quality considerations make the process of burning the lignite underground and then piping the resulting gas to customers increasingly attractive. Texas Utilities has again taken the initiative. The company negotiated with the Soviets for use of their in situ gasification process and 2 years ago signed an agreement with the Soviet technology export agency, V/O Lincenstorg, to become the sole American licensee for the process. TU is continuing preliminary work on in situ gasification and plans to build a pilot plant on its lignite fields. It is also increasing its deep-basin lignite holdings.

As for nuclear power, which is being relied on in many other areas, not a single nuclear plant is in operation in Texas. Several nuclear plants in the planning stage were postponed in the early 1970's because of escalating costs. Now interest has picked up again. The state's first nuclear plant, located in Matagordo County in South Texas, is scheduled to come on-line in 1980. By 1985 nuclear plants should be in operation at three locations with capacity to supply 7200 Mw of power, about a quarter of the generating capacity planned for lignite and coal plants by then.

Lignite and Western coal can reasonably be counted on as a substitute for a significant portion of the gas and oil now used for generating electricity. It is less clear that other industries will be as successful in converting to coal. The major concern for the future lies in what many see as a contradiction between laws mandating increased utilization of coal and requirements against reducing air quality standards.

The issue is an acute one in Texas. The petrochemical industry, the state's economic bellwether, is a major source of pollution. It is also concentrated along the Gulf Coast so that replacement of natural gas, which is relatively nonpolluting, with coal, which is the reverse, would increase the already heavy stress on the environment in the region. So there is considerable anxiety about the effect conversion will have on the state's economy. A second article will discuss the potential conflicts between the Texas commitment to economic growth and its weaning from natural gas.—JOHN WALSH

# Alaska Wilderness: Congress Debates Resources "Lock Up"

Next year Congress is expected to finally make the decision mandated by a 1971 law on bringing vast new acreages in Alaska into what is called the "four systems"—that is, the national systems of parks, wildlife refuges, national forests, and wild and scenic rivers. Already, the philosophical question of whether some potential hardrock mineral resources—and possibly some significant oil and gas resources—should be "locked up" in environmentally protected areas is posed more starkly than ever before.

Alaska's oil and gas potential has been an old story since the big strike in 1968 on the North Slope at Prudhoe Bay, and many people are aware that further exploration of this state's more than 20 sedimentary basins (of which only about a half-dozen have been explored so far) may lead to discovery of other major fields. While there are no large hardrock mining operations going on in Alaska today, the state is known by geologists as heavily mineralized and a likely place to find rich deposits of molybdenum, nickel, chrome, platinum, and the base metals copper, lead, and zinc. Some significant discoveries have in fact been made already, as for instance in the case of a large molybdenum deposit recently found in the Misty Fiords area in southeast Alaska's Tongass National Forest.