Wind Power Excites Utility Interest

Wind is about to come of age as a power supply for the nation's utilities, saving some oil here and there

Near the intersection of Sagebrush and Cactus roads in the California desert outside Palm Springs, a handful of workmen are busily erecting a harbinger of America's energy future: a 200-foot wind turbine generator designed and constructed entirely without federal assistance. By June, if all goes well, the windmill's three wooden blades will be spinning in the hot summer breezes, generating enough electricity to supply about 1000 homes—enough to save its owner, the Southern California Edison Company (SoCal Ed), nearly 10,000 barrels a year of low-sulfur crude oil. It is the first of that size to be erected by any utility, and it is the first of many in which SoCal Ed and its peers will soon invest.

Wind power, which only a decade ago was greeted with bemused and tolerant smiles, is now attracting the interest and enthusiasm of the nation's hard-nosed utility officials. Some, such as those at SoCal Ed, believe that wind has already proved itself a promising energy source, the first of the so-called soft path sources to be able to make a significant contribution to utility company needs. Federal officials who have nurtured this enthusiasm over the last 6 years say their research and development efforts are bearing fruit, that interest is high among a host of windmill manufacturers and a growing number of utilities. They speak eagerly of the point—said to be fast approaching—when wind will be fully competitive with conventional energy, permitting the government to excuse itself and let the marketplace assume control.

Next month, the Department of Energy (DOE) will award the design contracts for its final large-scale wind demonstration project. Three corporations, General Electric, Boeing, and Hamilton Standard, are competing for two parallel federal contracts, which presumably will set in motion windmill prototypes that in large groups or "wind farms" would compete favorably in costs with an oil-fired power plant. Three other corporations, Alcoa, Bendix, and Westinghouse, have been researching their own designs, and are beginning to fill single orders placed by curious utilities. Federal funds have also gone out to a half-dozen entrepreneurial firms, and more than a dozen are beginning to market small-scale machines on their own.

Alcoa, for example, has sold 17 of its Darrieus vertical axis windmills, often likened to eggbeaters because of their unusual shape and design. Buyers include SoCal Ed and utilities in Oregon, Pennsylvania, and California. Hamilton Standard (a subsidiary of United Technologies) has sold a 4-megawatt wind turbine to the Department of the Interior's power system in Medicine Bow, Wyoming, and also a 3-megawatt model to the Swedish government.* A small Massachusetts firm, U.S. Wind Products, is negotiating with the California Department of Water Resources for the sale of 20 50-kilowatt machines, with the potential for a sale of several hundred if everything goes well. Another in Buffalo, N.Y., W.T.G. Energy Systems, Inc., has sold a 200-kilowatt windmill to the Nova Scotia Power Company. And a family-run outfit in Seattle, Schachle Wind Power Products, sold the 200-foot, 3-megawatt machine to SoCal Ed, but then the Schachle company was snapped up by the Bendix Corporation before construction could be completed.

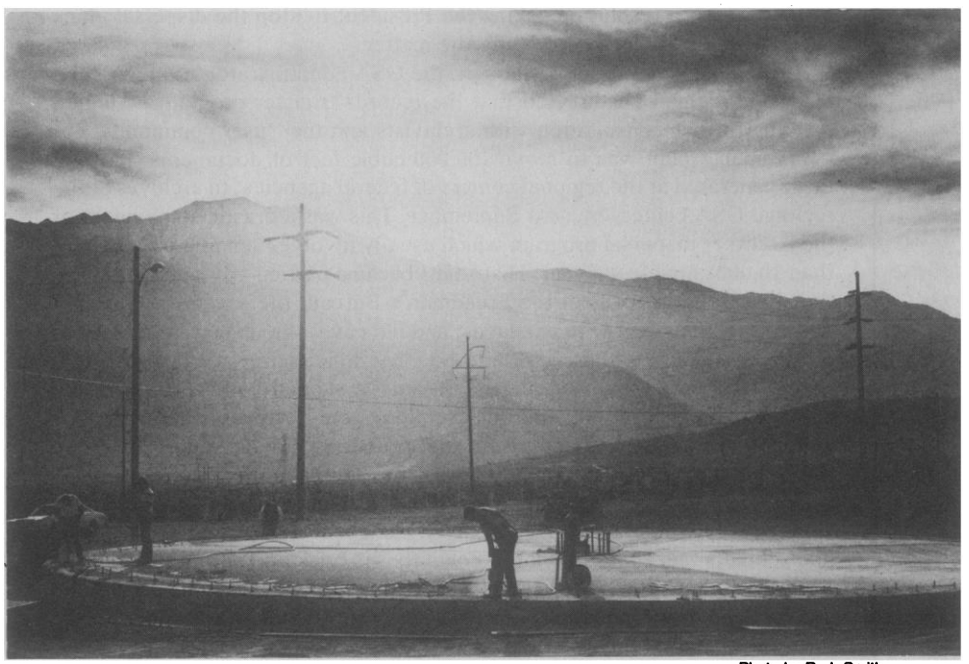

Photo by R. J. Smith

SoCal Ed's windmill will be erected soon at this site near Palm Springs.

Much of this enthusiasm for wind is attributed to the DOE program, which has poured about $200 million into wind turbine research and development. Five prototype machines have been constructed under DOE contracts, including a test machine in Sandusky, Ohio, and three machines rated at 200 kilowatts peak power output in Clayton, N.M., Culebra Island, Puerto Rico, and Block Island, R.I. (a fourth will be erected soon at Oahu, Hawaii). Another machine, rated at 2 megawatts (2000 kilowatts) peak power output, is undergoing initial testing at a site in Boone, N.C. Because each of these is merely a milestone on the road to a marketable product, DOE will soon spend $15 million on a cluster

*For purposes of comparison with conventional energy sources, an average oil-fired power plant generates about 800 megawatts of power, and a nuclear power plant generates about 1000 megawatts. It will require substantial wind farms to achieve equivalent output.

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of three windmills produced by Boeing and rated at 2.5 megawatts each; with a wingspan of 300 feet, they will be the largest ever built and the first to be tested together. Construction will occur on the Oregon-Washington border, with the output fed into the grid of the Bonneville Power Administration. Boeing estimates its machine will be competitive in mass production with the anticipated cost of oil. And DOE says its final demonstration projects will cost 50 percent less than that.

An even more aggressive federal program would be authorized by legislation currently snarled in the House-Senate synfuels conference committee. The Senate-passed energy bill calls for low-interest loans subsidizing the difference in cost between wind and conventional energy through 1986, when costs for wind are expected to be equivalent or better. The House, in a far more ambitious proposal, determines that 800 megawatts of wind energy will be available by 1988, and provides for purchase subsidies of 50 percent or less in order to reach that goal. Subsidies would total $24 million for about 9000 wind machines, and $348 million for about 360 intermediate and large machines—numbers that make the present effort look quite small. Included in the bill is approximately $300 million for additional research.

The idea behind the bill is simply that once a firm can build either 1000 small turbines or 100 large ones, costs will decrease rapidly. According to Louis Divone, director of the wind program at DOE, "The advantage of the bill is that it tells the industry what the minimum market would be between now and 1988, enabling it to raise working capital; it also shows how much better the firms must do in order to stay in business by the time the subsidies end." Congressmen behind the bill say it is less a congratulatory slap on the back for the current program than it is a hard push toward the goal of generating between 2 and 4 percent of the nation's electrical energy needs by the year 2000 through wind (about 40,000 megawatts). Several say they thought DOE was just not moving swiftly enough, and others note industry complaints that only a few firms were benefiting from DOE largess.

Though the proposal was approved overwhelmingly by the House, it will probably be swamped in the technical disputes and political horse trading that surrounds the broader synfuels bill. Representative James Blanchard (D-Mo.), a sponsor of the bill who also serves on the conference committee, explains that "wind is simply not a high priority among the members, with all the other issues we have to argue about. I doubt if the House provisions can prevail as written, so we'll have to try to refashion the Senate proposal into what the House asked for."

Were the bill to be lost entirely in the synfuels dispute, the future of wind energy would probably not unduly suffer, and

Tumult at the Archives

A flap at the National Archives has been stilled, at least temporarily, by suspension of a highly controversial program to send tons of documents, now stored at overstuffed facilities in Washington, to regional centers.

Over the past couple of months, historians and scholars around the country have become increasingly dismayed at what have been perceived as high-handed attempts by the administrator of the General Services Administration (GSA), which runs the Archives, to push ahead with dispersal plans without consulting archivists or scholars. Such was the alarm that historians in January formed an Emergency Committee to Save the National Archives; a delegation was sent to the White House to implore the President to intervene; and some 200 members of the professional staff of the Archives passed a resolution asking the President to stop the dispersal plans and set up a commission to study the matter.

At the height of the furor, though, the GSA administrator Admiral Rowland G. Freeman III directed that the records transfer program be halted pending further consultation with archivists and the "user community."

Freeman's plan was to move 100,000 cubic feet of documents, most of them generated at the regional centers of federal agencies, to archives at the regional GSA centers by next September. This was a drastic stepping-up of the Archives dispersal program which usually involves sending out no more than 10,000 cubic feet a year. Historians became particularly outraged when they heard that records of the Freedmen's Bureau, the Reconstruction-era agency set up to deal with ex-slaves, and old naval ship logs were to be sent out of Washington where it would be very difficult for scholars to get at them. There was much dramatic talk among scholars about "irreparable damage to the institution" and "destruction of the Archives as we know it."

Fears now appear to have been exaggerated, as well as exacerbated by a general lack of communication between the administrator and the users.

But whether friction can be avoided in the long term remains to be seen. For one thing the post of chief archivist has been vacant since last summer and scholars fear that Freeman, known for his brisk and authoritarian management style, will pick an archivist on the basis of management skills at the cost of scholarly credentials. The root concern, though, has to do with the location of the Archives in the federal government. The Archives, established in the 1930's, was put under GSA management in 1949. Historians and archivists believe it should be an independent cultural institution, along the lines of the Smithsonian Institution and the Library of Congress. They have been chafing about this for at least a decade, particularly since 1974 when the then administrator of GSA, Arthur Sampson, gave permission to the about-to-resign President Nixon to take possession of his presidential papers—without consulting the National Archives. To reverse this decision it took an act of Congress that was subsequently ratified by the Supreme Court.

Dissatisfaction with the current arrangement has stayed relatively muted so long as GSA administrators have kept their fingers out of the operations. But Freeman, who was brought in last summer to tighten up management at the scandal-ridden GSA, has, according to critics, intruded to an unprecedented extent into decision-making that they think should be left up to professionals. Now that a vocal constituency has been activated, it is likely that any ill-considered move on Freeman's part will trigger a fresh storm of criticism. One benefit of all the fuss, says an Archives employee, is "it does indicate that a lot of people care" about the hitherto rather anonymous Archives. He adds in reference to Freeman: "it takes a genius to make a political issue out of the National Archives."—CONSTANCE HOLDEN

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this is a measure of the maturity of the industry. A host of private firms have made clear their intention to pursue the technology into the marketplace with or without additional federal help. One venture in particular deserves notice for its ambition: a collection of wealthy investors on the West Coast, including Edward Scarff, former president of the Transamerica Corporation, and Wayne Prim, an independent oil investor, recently formed an enterprise called Windfarms Ltd. and obtained a contract with the Hawaiian Electric Company to supply 80 megawatts of wind energy on the island of Oahu. Capital costs of installing the 30 or so wind machines necessary to deliver that much energy are about $200 million, or approximately as much as the entire DOE wind program has spent over 6 years. Windfarms Ltd. intends to spend that amount within 2 years, presuming it can nail down financing with various investment banks and insurance companies; thus far, it has raised only about $2 million in seed money, some of which will be used to test six Alcoa wind turbines at the Oahu site. Wayne Van Dyck, the president of the firm, says he anticipates revenues of $20 to $30 million a year from sales to Hawaiian Electric, all at a rate pegged just below the prevailing price of oil. It will require 4 to 5 years of spiraling oil prices in order to break even, he anticipates, but fast profits are not important, since most of his investors are in it to shelter their income from taxation. Van Dyck, who formerly was an investment banker, modestly says his current ambition "is to launch the wind energy field." He says similar projects are currently being discussed with four other utilities, whose names he declines to disclose.

Utility officials might find Windfarm's plan attractive for a variety of reasons, not the least of which is the willingness of Van Dyck and his associates to be the permanent owners of the machines, thereby assuming most if not all of the risk. But the price of oil and the increasingly unfavorable economic and political environment for nuclear power also have a great deal to do with the increasing commitment to wind. Hawaiian Electric's oil purchase contract expires in 1981, for example, necessitating renegotiation on the world market for 98 percent of its total energy supply. Similar circumstances exist at SoCal Ed, which apparently uses more oil than any other utility in the United States. SoCal Ed also operates in a state where it is increasingly difficult to obtain operating permits for nuclear power.

In addition, both utilities happen to own windy tracts of land. Trade winds hit Hawaiian Electric's property on Oahu at a fairly steady 15 miles per hour average (10 is considered the minimum necessary for efficient operation). Cool breezes from the ocean around Los Angeles sweep unsteadily through San Gorgonio Pass and into the desert near Palm Springs at an average speed of 17 miles per hour, often gusting up to 40. SoCal Ed has an electrical power substation near the pass, where it has decided to erect the Schachle wind turbine. Upon completion, its rated power at peak output will be greater than any other windmill then in operation: 3 megawatts at a wind speed of 40 miles per hour.

Ron Scheffler, the senior research engineer at SoCal Ed, says that "even though the Schachle prototype will not be profitable, we thought it worthwhile enough to go ahead and build." Reflecting an impatience common among the utility officials who are moving into wind now, Scheffler's associate, Anthony Fung, points to a stack of wind turbine assessments on the floor of his office and says, "What good is it? Studies are only as good as their assumptions: you can put garbage in and get garbage out. We needed hard data from a working machine." Scheffler adds that even though Schachle had little in the way of sophisticated analysis to support his extraordinary claims, "we didn't want a potentially valuable idea to die for lack of support. And we didn't want the competing machines supported with federal funds to be the only eggs in the basket." The utility plunged ahead, and by June it will have its windmill, some preliminary test data, and the experience of working with a small contractor on a novel design in a new energy field.

The reaction of DOE officials to such independence is schizophrenic. On the one hand, they exhibit feelings akin to pride of authorship; on the other, they express open resentment that a utility and a wind entrepreneur believe they can go it alone already. The latter is expressed in the instance of SoCal Ed by open skepticism that the Schachle machine will operate as planned; one employee at the agency even went so far as to pass along the "rumor" that SoCal Ed purposely chose a weak design so it could write off wind power.

"The problem with a small group wanting to build a big windmill is that the complexities generally go unrecognized until it is too late; they think the big machines are just as easy as the small ones," another DOE official says. "To the contrary, a big wind turbine is really more like a fatigue-testing machine that as a sideline produces energy; as such, it presents significant engineering difficulties." Part of the agency's concern, the official explains, is in seeing that no windmill becomes a highly visible failure; an oft-told tale is that the defects of a malconstructed windmill at Grandpa's Knob, Vermont, set the fledgling industry back by at least a decade in the 1950's.

This DOE windmill on Block Island, Rhode Island, is one of four 200-kilowatt prototypes. Operating at wind speeds of 18 to 34 miles per hour, it produces about 10 percent of the island's power supply.

Utility officials take this as proof of DOE's reputed bias toward large corporations. "There is no place in the DOE program for small inventors," says one official, echoing a lament heard frequently among the utility officials pursuing their own wind projects.

At SoCal Ed, the engineers dismiss any concern that the Schachle windmill will not operate as planned. As with any prototype, they say, the design continues to evolve as it gets closer to final form. "Some improvements will presumably be made by Bendix," Scheffler says. "And we are not so optimistic now that our installed costs will be only $2 million, which is what we anticipated." But it will still be as good as the DOE-sponsored machines, he adds. "We feel the cost expectations on both were a little optimistic." Officials of the Bendix Corporation refused to be interviewed on the subject. A spokesman, David Taylor, said, "The circumstances are such that we don't have in hand everything we want to, to be talking about this right now. Until it's compatible with our

own schedule, we just won't discuss it."

Such are the uncertainties that follow a new technology. The importance of this dispute lies not in its outcome but in the fact that every utility confronting the question of wind must face similar uncertainties and, once a decision to pursue the technology has been made, the possibility of outside criticism. The increasing confidence of the nation's utilities is at present unproved, since none has operated a windmill before; most are operating on the principle that to be unproved is not necessarily to be unfounded.

It is exactly such risk-taking that the government has sought to encourage. The House bill foresees an end to most federal involvement by 1988. Asked if it is realistic to think that the federal program will have all but ended by then, Divone says, "I hope so. I hope to be doing something else by then." Surely this has to be the rarest boast in Washington.

—R. JEFFREY SMITH

OSHA Develops New Cancer Policy

Scientists lose their plea for exemption, but the rules are more flexible than initially proposed.

Exposure to cancer-causing chemicals on the job will come under more earnest regulation under rules proposed on 22 January by the Occupational Safety and Health Administration (OSHA). Chemicals commonly used in research laboratories as reactants and solvents are among those likely to be more swiftly regulated.

The rules follow 2 years of formal hearings, in which numerous government, academic, and industrial experts on carcinogenesis played a part. The agency has termed it potentially "the most important single proceeding OSHA has ever had or will ever conduct in the future in this area."

The rules do not specifically regulate any workplace carcinogen, but establish instead a streamlined set of procedures and scientific assumptions under which all future workplace carcinogens will be controlled. As such, the proposal reflects the agency's desire to act more quickly on an estimated 500 carcinogens to which workers are exposed annually, by placing itself on firmer legal ground. In the past the agency's regulations have been repeatedly snarled in time-consuming lawsuits from affected industries, resulting in the regulation of only 18 workplace carcinogens in the 9 years OSHA has been in existence. OSHA administrator Eula Bingham predicts, albeit hesitatingly, that the new policy will enable the agency to increase its annual average from two to ten.

Bingham, a toxicologist, explains that "one of the major factors inhibiting the issuance of regulations . . . has been the need to cover the same ground in each and every rulemaking proceeding. We found ourselves debating the same questions of appropriate testing and interpretation for each carcinogen we investigated." The purpose of setting a carcinogen policy, then, was to define in a legal setting precisely where the scientific consensus on carcinogen detection and control lies. "This is an effort not to argue about certain scientific issues every day, unless there are new scientific discoveries," Bingham says.

The principles incorporated in the agency's rules are similar to but more explicit than those which guide other federal health regulators. The rules presume, for example, the predictive validity of animal tests and high test dosages; they take as evidence of potential carcinogenicity positive epidemiological data in humans, or positive test results in a single animal species plus additional corroborating evidence (such as suggestive data in another species, a short-term bioassay, and evidence of tumors at the injection or implantation site). Test results are considered positive if there is an increase in benign or malignant tumors, or a substantial decrease in the normal latency period.

Chemicals meeting this qualification will be regulated at the "lowest feasible level," a term that manifestly includes the economic costs of compliance; if substitutes exist, the substance might be banned. Suspected carcinogens that fall short of this qualification may still be regulated, but less stringently.

The rules differ significantly from OSHA's initial proposal in 1977. Then, the agency planned that classification as a potential carcinogen would trigger specific regulatory actions within a set timetable, including a specific combination of engineering controls and work practices designed to reduce exposure (*Science*, 3

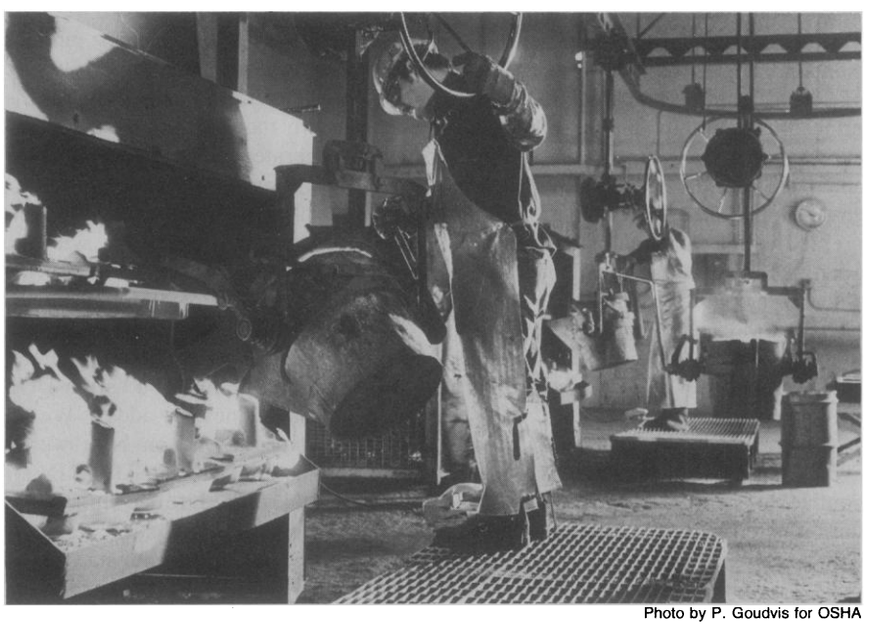

Photo by P. Goudvis for OSHA

Foundry workers are among those who may be exposed to toxic or carcinogenic fumes.

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