The Environmental Bi-Weekly

High Country News

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Return of the Windmill

by Wilson Clark

Windmills may seem spindly, even silly things to suggest when the engines of civilization appear to be running out of fuel. But when you compare the wind to a pile of dead plants, which seems more reliable? For the moving force of our modern, "high-energy" civilization is the massive — but finite — numbers of plants that decayed several hundred million years ago into great organic storage pools in certain regions of the earth.

Ninety-six percent of the energy of the United States is now provided by the fossil fuels — oil, coal and natural gas — and each year we are using up what took nature one million years to produce. The real energy crisis for our civilization is one of survival: We cannot begin to replenish the stored energy of the earth quickly enough to meet future energy use levels.

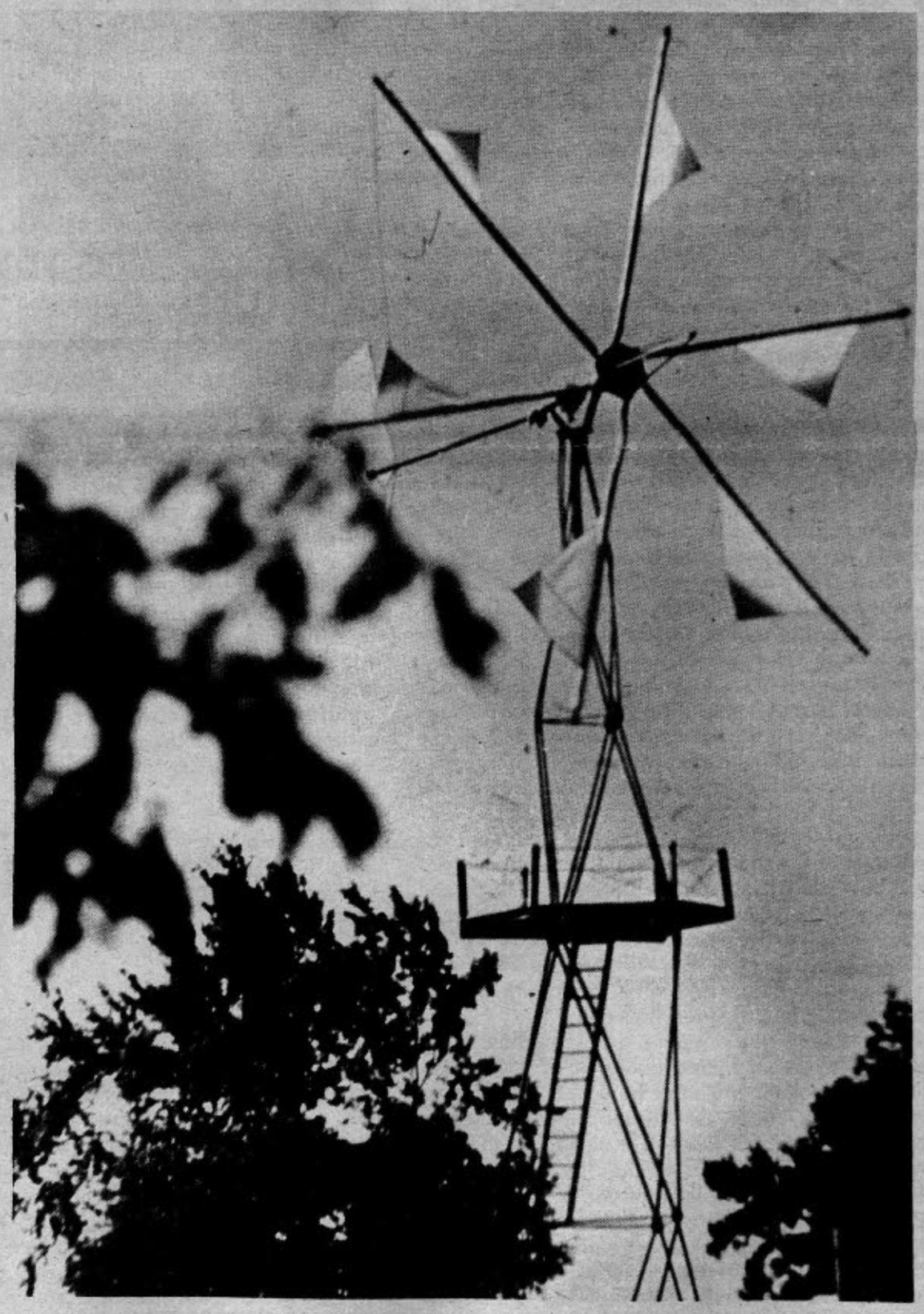
High-technology alternatives, such as nuclear fusion, are far from proved and, even if they were available today, they would only extend the dependence of civilization on **nonrenewable** energy stocks.

A growing number of scientists seek to harness the constant, dependable renewable energy of the sun, to heat and cool buildings as well as to produce electricity. And one concentrated by-product of solar energy is the wind.

A committee appointed jointly by the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA) has suggested that by the year 2000, less than three decades away, a major American development program in wind power could result in an annual yield of 1.5 trillion kilowatt-hours of electricity. That is equal to the total electricity consumed in the United States in 1970.

There is nothing new about tapping this great supply of energy. The oldest and most widespread application of wind power was to drive sailing vessels. With the advent of cheap and abundant fossil fuels in the 19th century, however, the great sailing ships were soon replaced by faster, more dependable coal- and oil-burning vessels. But Basil Greenhill, the director of Great Britain's National Maritime Museum, believes that a bold era is now in store for sail. At the School for Naval Architecture at the University of Hamburg in West Germany, a fleet of "Dyna-Ships" — modernized four-masted clipper ships — is on the drawing board. Credit for the design belongs to 72-year-old Naval engineer and former Shell Oil Company designer Wilhelm Prölss. The sails on the square-rigger extend from the center of the 200-foot masts on curved steel yardarms; they

(Continued on page 4)



Windworks developed this windmill in co-operation with Buckminister Fuller and the Brace Research Institute for use in less developed countries. The sails measure 25 feet across and sit atop a 42 foot tower. The sails are dacron. Power is transmitted through a Ford auto rear end. The tower is made of steel tubing. Without the sails, materials for this windmill cost about $500. Sails can be bought from a professional sailmaker for $350 or made at home with muslin or canvas for considerably less. The low rotational speed of the mill makes it well suited for mechanical applications. It produces about one horsepower in a 10 m.p.h. wind. The sails are reefed manually in high winds.

HIGH COUNTRY

By Tom Bell

The energy industry is subjecting the American public to a propaganda blitz unprecedented in history. And they add insult to injury by charging the whole thing back to the consuming public.

It works like this: a full-page ad by the American Electric Power System tells us among other things to — burn more coal to generate more electricity, to modify the Clean Air Act so we can burn more of that coal, and to "release the vast reserves of U.S. Government owned low-sulfur coal in the West." Similar full page ads are run by oil companies telling us why we must build the Alaska pipeline, drill for oil offshore, and bear with a grin higher fuel prices while the companies draw higher profits. Then the companies deduct the cost of the ads from their taxes. That is explained by Rep. Pat Schroeder of Colorado: "The companies list the ads as a tax deductible expense so the consumer is paying for the advertising as well as paying double taxes to counter taxes not paid because the deductions are taken."

That's not the only criticism that can be made of utility and oil company advertising. Enough of the advertising is false or misleading to be unconscionable. A Mobil Oil Corp. ad was so flagrant it was challenged. Mobil said only one in 60 oil wells drilled ever paid off. The American Petroleum Institute, when asked for figures, showed the industry average was 36 times better.

The problem is acute enough to prompt the Federal Trade Commission to look into the matter. One official of FTC said, "We are interested in the accuracy or inaccuracy of some of the advertising that the oil companies are currently running. We are also interested in the disclosure of facts so far as energy consumption is concerned."

Tax deductions and propagandizing advertisements are coming under increasing congressional scrutiny. A Senate Commerce Committee survey recently revealed that oil and utility companies are claiming millions of dollars in questionable tax deductions for the cost of advertisements aimed at influencing national energy policy. (Naturally, the influencing is toward industry.)

Recently, 16 members of the House asked the nation's 7,000 broadcasters to carry commercials countering the multi-million dollar industry advertising campaign. Rep. Benjamin Rosenthal of New York cited the "Fairness Doctrine" and said, "The average consumer — the average American — simply has not been afforded an equal opportunity to hear the other side." He added, "We must combat the gross imbalance created by the industry's advertising blitz if the public is to make intelligent and well-informed decisions about the current situation and future national energy policy."

Testimony before the Senate Commerce Committee puts the estimate for the annual cost of energy industry advertising at between $30 and $70 million. A recent General Accounting Office study found six of the country's largest oil companies spent over $425 million for advertising from 1970 to 1972. At the same time, the companies had spent only $795 million on research — research which could have helped alleviate the energy crisis.

Utility company policy follows the same line. While millions were spent on promoting increased sales of electrical appliances and all-electric homes, a pittance was spent on research. Today, the utilities decry the need for stringent clean air regulations — a situation which probably could have been avoided had they put as much emphasis on cleaning up stack emissions as they did on marketing their product.

Now, they are fighting back saying that legal or legislative attempts to curb such advertising would hamper the utilities' freedom to advertise. This they say is a step toward nationalization and a violation of the First Amendment, guaranteeing freedom of speech. One spokesman said there was a trend to discredit utilities by forcing them to substantiate positions made in advertisements!

At the present time, the public has no recourse but to flood their congressmen with protests against the advertising. It will help if you send copies of your letters to the National Advertising Review Board, 845 Third Ave., New York, NY 10022.

Letters

THE ANSWER IS BLOWING IN THE WIND

Editor:

The guest editorial in the May 10th issue certainly made a good point. If minerals belong to everyone in this country certainly the air and water does too. Perhaps another point can be made to Mr. Reim and various other representatives of the energy companies. If the resources belong to two hundred million people why should a few companies make a profit out of them. One might make a case for a government owned company doing any mining and the profits reverting to the two hundred million people who supposedly own the resource. Under those conditions I wonder whether Mr. Reim and others would take the position that these resources are owned by all of the people of this country.

Yours sincerely,
Malvin Cole, M.D.
Casper, WY

Editor:

I certainly appreciated the sage grouse center photos by Charlie Smith in the April 12 issue of **High Country News.** Strutting will soon be over for this spring and only a handful of people will have actually witnessed this outstanding performance of the "cock-of-the-plains." With Mr. Smith's fine pictures and the editorial concern shown by **High Country News,** a far greater number of people have seen part of this great show. I hope it will be enough to keep their concern afire for these mighty sage chickens. **High Country News** says it often, but I wonder if it can be said often enough, the greatest threat to these fine birds is man's unconcern for this species, and many others, which can be easily displaced by exploitive land management.

Best regards,
Duane Pyrah
Lewistown, MT

"The United States is going to face an economic Pearl Harbor if we don't start moving to conserve our energy resources.... We're in real trouble, but at the moment we're being told by the President and his energy czar that we can go back to our Cadillacs, take long vacations and go back to business as usual.... We're talking independence energywise and we're racing back into the arms of the Arabs."

Stuart Udall
former Secretary of Interior

The average U.S. citizen uses seven times as much energy as the average Japanese, four times as much as the average German and three times as much as the average Englishman. The average American will use as much energy in the next seven days as the average citizen of the world will use in the next year.

Jim Bishop
Newsweek

HIGH COUNTRY NEWS

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Editorial

AEP: Lacking in Scruples

Recent conduct of the American Electric Power Co. is nothing short of criminal. At a time when the country is faced with more energy demands than it can meet, conservation measures of the most stringent kind are called for. So, too, are continuing measures to safeguard the nation's air and thereby the nation's health.

AEP doesn't believe so. A wave of full-page ads have appeared across the country. They are in not only the major newspapers, but also in such nationally distributed magazines as **Time** and **U.S. News and World Report.** They pooh-pooh such measures as energy conservation and the Clean Air Act. They are not only condescending but insulting. And they must have cost many millions of dollars — a cost which the company levies against its customers.

The wave began back in February when a large,bold cartoon of two Arab sheiks appeared with the caption, "We have more coal than they have oil. Let's use it." Later ads carried other themes, with the two sheiks in smaller versions at the lower right.

One of the ads which appeared late in March had the theme "Generate less Energy." And the caption said, "Sure. And generate galloping unemployment!" This one drew the ire of Russell Peterson. The former governor of Delaware and now Chairman of the Council on Environmental Quality wrote a stinging letter to AEP president George Patterson. Peterson said, "On March 26th, your corporation purchased a full-page ad in the Wall Street Journal, the New York Times, and the Washington Post implying that energy conservation causes 'galloping unemployment,' is 'nonsense,' and could reduce America to the 'bad life.' Of all the millions of dollars of advertisements purchased by the energy industry over recent months, I must confess to finding this conception the least comprehending of our energy problem and the most subversive of the public interest." Peterson told AEP that recent growth rates in energy cannot be sustained, and energy conservation is an imperative. (See excerpts this page.)

Donald Cook, chairman of the board of AEP, took exception to Peterson's remarks. In a letter to President Nixon, he called them "scurrilous." Cook asked the President to investigate both the "official and clandestine activities of Mr. Peterson in the conduct of his office." Cook said Peterson's letter was an "unconscionable attack without warrant" on AEP. He said it was "incredible that any responsible official of the U.S. government would engage in such vituperative and oppressive conduct."

Mr. Cook, Mr. Patterson, and the Madison Avenue agents of AEP seemingly express a naivete beyond comprehension. Mr. Peterson has correctly translated the feelings of many Americans, and transmitted the informed opinions of energy experts. AEP is engaging in the worst kind of demagoguery — added to deliberate obfuscation of some very serious problems.

The AEP's pitch to burn more coal to generate more electricity, while advocating the dismantling of the Clean Air Act, is truly the unconscionable act. AEP's officers must not have been around when the president of the American Public Health Assn. said, "Policy developed in time of uncertainty could very well aggravate the situation and adversely affect the health of the American public." Dr. Lorin Kerr said a switch of the nation's existing power plants from burning other fuels to coal would cause an increase in expected mortality from respiratory diseases of eight percent. Respiratory disease attacks would be expected to increase by 45 percent. A recent study points to powerplants as contributing to 23 percent of the excess attacks of respiratory disease.

Such utility advertising as that being indulged in by AEP should be prohibited by law. Sen. Frank Moss of Utah has introduced such a bill. His would allow only advertising on energy conservation — no more than that. The bill should receive the widest support possible from the public. Write your congressman and tell him so.

—TB

Excerpts:
PETERSON LETTER

The implied message of your ad is that persons who support energy conservation are pushing America into a recession. This, if I may say so, can truly be labeled nonsense. Reducing waste in energy use simply makes our scarce energy resources more productive. Any reasonably knowledgeable analyst of our energy situation knows that we cannot continue our recent growth rate in energy consumption into the future.

If recent growth rates were to continue to the end of the century, the U.S. would require more than 200 quadrillion BTUs of energy in the year 2000. Even with maximum feasible production of coal and all other domestic energy sources, the U.S. could only meet 50-60 percent of this need. That would have us dependent on foreign sources for the remainder. The experience of the last year has taught us that this scenario is neither feasible nor desirable. If we are to achieve reasonable self-sufficiency in energy, we must reduce our recent rate of growth in energy consumption. This means that energy conservation is an imperative — an imperative which I had assumed was understood by the energy industry.

(Peterson explained the Half and Half Plan of CEQ.) The Half and Half Plan would continue our historic growth rate of an annual 1.4 percent increase in net energy per capita, but it would do so by securing half of this growth (or 0.7 percent per year) through improved efficiency and elimination of waste. The Half and Half Plan is a proposal to improve, not endanger our quality of life, but to do so in a way compatible with the realities of our nation's energy dilemma.

This is not the time to use scare tactics in promoting an illusion, particularly one which will make the difficult task before your industry all the harder. The energy industry has a responsibility to be truthful about the energy problems before our nation. I hope that you will henceforth choose to live up to that responsibility.

Windmills. . .

(Continued from page 1)

are to be trimmed by remote control from the bridge.

Tests at the University have shown that winds in the North Atlantic would propel the ship at speeds up to 20 knots 72% of the time. Auxiliary engines would be used for windless stretches of ocean and for maneuvering in harbors: A fully automated 17,000 ton Dyna-Ship would consume only five percent of the fuel required by the standard contemporary freighter. Rudolf Zirn, wealthy Bavarian lawyer and environmental activist, has recently commissioned the construction of the first Dyna-Ship.

Back in 1915, 3,000 windmills helped light up the country of Denmark. America could generate electricity in the same charming way. . . . A great idea, till the wind dies down.
Excerpted from an Atlantic Richfield television ad.

WHAT TO DO WHEN THE WIND STOPS

On land, the interception of wind energy by the blades of a windmill has served as a basic source of mechanical power for centuries. By 1850, the use of windmills in America represented about 1.4 billion horsepower-hours of work, the equivalent energy produced by burning 11.8 million tons of coal. But by 1870 the amount of power produced by the windmills had been cut in half. The steam engine, driven by fossil fuels, had come to stay in America.

The American windmill industry remained a thriving business, however, into the early 20th century. In the 1920s companies began to develop wind-powered electric generators, but in the 1930s the death knell was sounded for wind machines of both the water-pumping and the electricity-generating variety when the Rural Electrification Administration was established by President Franklin D. Roosevelt. The picturesque prairie windmills began to fall into disuse.

A question about wind power asked by Depression-ridden farmers in the Thirties is the same one asked now on TV commercials by a large oil company: What do you do when the wind stops blowing? How do you store the wind? Today's wind generator enthusiasts have several answers.

In a home-sized wind power plant producing direct current (DC) power, storage is accomplished by charging batteries. In a large system designed to feed electricity into the power lines of an electric utility, energy can be stored mechanically (or hydraulically) by pumping water or air into a reservoir, then releasing it at a later time to drive an engine operating an electric generator.

Another storage device is a flywheel, similar in principle to the familiar spinning top or toy gyroscope. Like a gyroscope, the flywheel can be spun by the input of energy (in this case, wind-generated electrical power) and storage is in kinetic energy — that is, motion. In a system designed by Florida engineer John Roesel Jr., the blades of a wind generator turning a shaft at 120 revolutions per minute might be stepped up to 24,000 rpm to spin a flywheel. While spinning, the flywheel stores energy that could later be tapped as it "runs down" after the wind stops.

A properly designed flywheel, made perhaps of pressed bamboo and enclosed in a vacuum chamber to minimize friction (the main energy loss in the system) is not only much more efficient than battery storage, but is potentially cheaper. Compared with lead-acid batteries which store only 8-10 watt-hours of electricity per pound of material, the envisioned bamboo flywheel would store more than 20 watt-hours per pound. Such a wind-power system for a home would be capable of storing enough energy to provide electrical power for a week of windless days.

Yet another "storage" technique is the production of a synthetic fuel — hydrogen. Hydrogen has many of the fuel properties of natural gas and can be produced by the electrolysis of ordinary water. A wind generator could furnish the electrolyzer with electricity to break the water molecules down into their constituent parts — hydrogen and oxygen. The hydrogen would then be compressed and stored for later use as high-grade fuel.

This "modernistic" approach to the energy storage problem was first applied in connection with wind power before the turn of the 20th century. In the 1890s Danish professor and wind-power pioneer Poul La Cour produced hydrogen and oxygen fuel by using wind-generated electricity to electrolyze an aqueous solution of sodium hydroxide. The local high school at Askov, Denmark, where La Cour taught, was illuminated by "Drummond Light," which was an oxygen-hydrogen flame directed on a zirconium element, causing it to emit a brilliant light.

HOOK THEM IN

In addition to these proposals and methods for various forms of wind-energy storage, a number of researchers have suggested the direct coupling of wind plants into a regional utilities grid to avoid the necessity of storage altogether.

The Smith-Putnam wind turbine atop 2,000 foot Grandpa's Knob near Rutland, Vt. Each eight ton blade rotated at a maximum speed of 29 revolutions per minute to produce up to 1500 kilowatts of alternating current. This wind turbine was the largest one ever constructed and was the first one to feed power routinely into commercial power lines. Structural cracks in one blade caused it to fly off on March 26, 1945. The blade sailed 750 feet down the mountain and the machine was never repaired. The project was abandoned as a $1,250,000 experiment.

Windmills are much, much more than relics. They are symbols of sanity in a world that is increasingly hooked on machines with an inordinate hunger for fuel and a prodigious capacity to pollute. Ecologically, the windmill is one of the few perfect devices. It harnesses a completely free resource to pump water or generate electricity under conditions that respect the laws and limits of nature.
Former Sec. of Interior
Stewart L. Udall

Ernst Cohn, manager of Solar Chemical Power Systems for NASA has summarized the arguments for this approach:

"Pick the areas in the U.S. where they have the right kind of wind velocity, and the right kind of wind durability, and put your windmills up and feed their power into a grid. You use them as base power, with no storage. . . . On a day when you have no wind — which will probably not happen for all windmills anyway . . . you use conventional fossil fuel power if you need to." Such a system, Cohn predicted, "would prove competitive today."

There have been schemes for large-scale use of wind power in the past. During World War II, a massive 1,250-kilowatt wind electrical station was operated at "Grandpa's Knob" in the mountains of central Vermont. Things went smoothly for about 16 months, until a main bearing in the generator failed in February 1943. Because of wartime shortages, the company was unable to replace the bearings for more than two years, during which time the blades were locked in place and subjected to continuous buffeting of the wind, with accompanying stress on the machinery and blades. After the bearing was finally replaced, the wind station operated for less than a month. On the morning of March 26, 1945, cracks widened in the spars of one of the machine's eight-ton blades which suddenly gave way and was hurled 750 feet through the air, landing on its tip. It was never repaired, and the nation's first experiment with wind-generated commercial electricity was ended.

Interest in the large-scale production of wind power in America was renewed in 1970 by William E. Heronemus, professor of civil engineering at the University of Massachusetts. Over the past three years, he has proposed wide-ranging networks of huge wind generators in numerous U.S. locations to provide virtually all the nation's electricity.

For example, Heronemus proposed a wind system as a substitute for the nuclear power plant now scheduled for construction in Shoreham, New York. The first of two networks of floating wind-power stations would be emplaced off Long Island, beginning in 1975. The wind stations would be mounted either on towers planted in the relatively shallow shoal waters, or on 500-foot by 200-foot semisubmersible platforms. Each station would support three wind towers, each of which would in turn house two 200-foot diameter wind turbines. The two-blade turbines are based on the Grandpa's Knob model, as refined by a study performed after World War II by New York University. Six hundred and forty of these wind stations would be linked together along 16 north-south lines. The wind generators would produce electric current for powering electrolyzers, machines which convert water to hydrogen and oxygen. The oxygen might be released to the atmosphere, while the hydrogen gas would be pumped into underwater tanks and stored for later use.

Heronemus believes that power from the offshore system would be economically competitive with future conventional electric power costs in New England. He also points out that

due to the decentralized nature of wind technology, the loss of a single wind turbine would not cripple the electric service area with a huge blackout. For example, the April 1973 blackout affecting 150 miles of Florida's "Gold Coast" — from Fort Pierce down into the Florida Keys — was caused by a single nuclear plant failure. "One wind station disabled would mean one-thirteen thousandths of the system capacity would be lost," Heronemus says, as opposed to the complete system loss that can be precipitated by a nuclear station failure.

There are other efforts under way. Scientists at the NASA Lewis Research Center in Cleveland, Ohio, hope to build a 100-kilowatt wind machine there in 1975. A later version of the generator may be emplaced on the Island of Culebra off Puerto Rico under a contract with the National Science Foundation.

NASA officials believe that with mass production, electricity generated by wind power will be available at capital costs which a decade from now will be competitive with nuclear plants. Dr. Joseph Savino, technical director of the NASA Lewis Wind Energy Program, contends that "there's enough energy in the winds to supply all our electrical needs. If the Danes could get 200,000 kilowatts of electricity from the winds back in 1908, we should be able to get the power we need right now."

Another way to get power we need from the wind may be to think small. Availability of wind power in local areas has historically been a factor in the location of homes and buildings because architecture was based to a large degree on the relationship of buildings to the winds. Only the last few decades of massive exploitation of fossil fuels have caused the window to become essentially a repository for air conditioners rather than a device for opening the interior of structures to the cooling winds. As the availability of cheap fossil fuels decrease, perhaps windows will once more assume a functional meaning.

An important asset of wind energy is its free distribution over the seas and continents. The energy which currently powers our country is transmitted as liquid fuel or as electricity in pipelines and power lines, which are costly transport systems. The small-scale use of wind power would eliminate the costs of transmitting electricity from central facilities.

Scientists at the Brace Research Institute at McGill University in Montreal, a leading international center for research into natural energy sources, have worked with wind generators for small-scale use in agricultural areas and low-energy societies. The Brace windmills have a variety of uses, from water pumping to electricity production. One unique design is the Savonius rotor, named after Finnish engineer S. J. Savonius, who designed wind plants in the 1920s. The Brace version calls for cutting two 45-gallon oil drums in half lengthwise and welding them to form troughs that scoop up the wind and keep the rotor turning.

An enterprising group of young communards in Wisconsin, calling themselves "Windworks," have built a number of small electric wind generators, including a unit designed for Buckminster Fuller, who has provided some financial support for their Spartan efforts. Led by graduate aeronautical engineer Hans Meyer, the group has designed several innovative wind plants which can be built cheaply with easily attainable materials. One can be built for less than $200.

Someone — I wish I could remember who — once said that at the brink of an abyss, the only progressive step is a backward one. Just think of the socio-technical revolution that might overtake us if we started looking backward — not only to windmills, but also solar heaters, steam and electric cars, passenger trains, houses built with more regard for climate than for architectural fashion, products designed for use rather than for throwing away.
Gary Soucie
"Pulling Power Out of Thin Air"
Audubon Magazine, May 1974

A FULL RANGE OF APPLIANCES

Near Albuquerque, New Mexico, Robert Reines and the Integrated Life Support Systems Laboratories built the world's first dome structure powered totally by wind and solar power.

Their first wind generator was installed in February 1972. The remainder of the year was spent rebuilding two other used wind generators and making a solar heat collector for use in heating the dome and for domestic hot water. In all, it cost them more than $12,000 over a ten-month period to plan and build the home, which they named "Prototype I" in anticipation of more sophisticated designs.

Electricity for the dome is supplied by one reconditioned wind generator, the equivalent of more than five kilowatts of installed electrical capacity. (The other two generators supply other equipment.) A bank of 16 heavy-duty batteries store 22,000 watt-hours of current which supplies a full range of appliances, including a hi-fi set, tape recorder, television set, refrigerator, electric fan, pumps, mixers and an electrically operated chemical toilet. Reines is convinced that solar-heated, wind-powered domes can be produced for $15,000-$20,000 each.

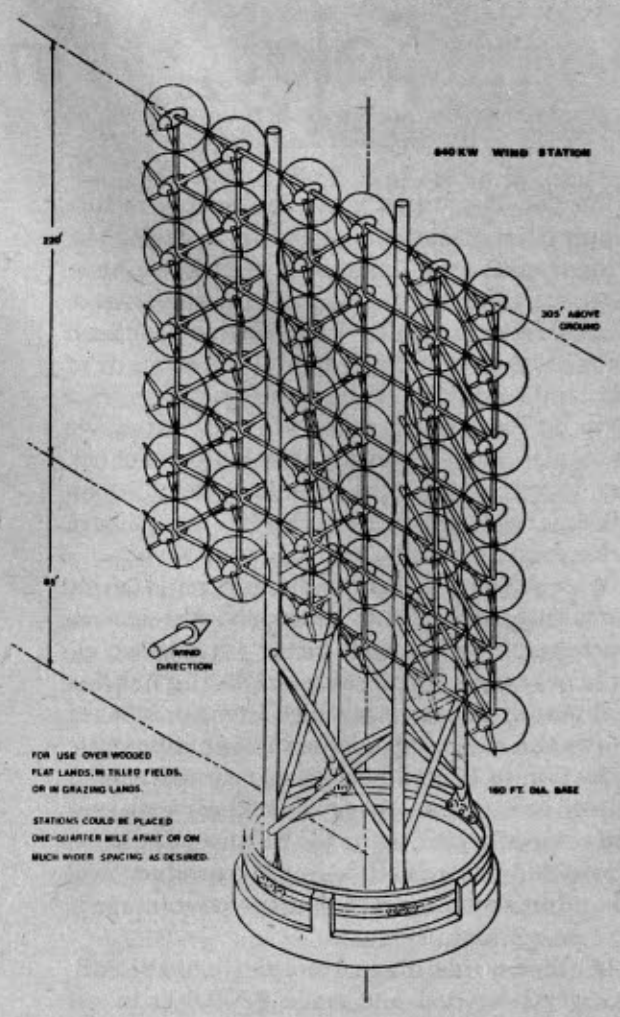
The only commercial distributor of home-sized electric wind generators in the United States is the Solar Wind Company of East Holden, Maine, which sells Swiss and Australian wind generators. Henry Clews founded the company when he attempted to purchase a wind generator for his home in Maine but found that he had to import a machine all the way from Australia.

Yet another approach is the use of medium-sized wind generators of 15 to 20 kilowatt capacity (perhaps as high as 100 kilowatts). These would produce electrical power in favorable locations for small communities. As the needed generating units increase in size, costs decline somewhat, so that the projected investment per person in such a scheme might drop to 20-50 percent less than the costs of individual house generating units. The central drawback is the nature of the wind's energy.

Smaller generators would be more expensive per person, but due to the variations in available wind power in most locations, a community network of wind generators might extract more overall power than one large machine.

Such wind stations might operate in combination with solar-energy equipment to fulfill total energy requirements, but the solar equipment in most places would remain on rooftops, not in central facilities. Only in sunny areas with high solar values could solar collecting equipment be centralized for redistribution to individuals in the system.

The technical aspects of building wind generators are remarkably well understood. French engineer Louis Vadot, who chaired the sessions on wind-power generation at the United Nations' 1961 Rome conference on new energy sources, noted that: "... It is now generally agreed that the design of wind-power plants with capacities ranging from the lowest levels to far beyond 100 kilowatts no longer presents any fundamental problems . . . our knowledge is sufficient to be usable in a more or less routine way and without need to be on guard against surprises." Given the potential of wind power as a renewable future energy source with minimum pollution, it is surprising that the federal government and private industry show so little interest in its development. The National Science Foundation intends to spend $1.25 million in 1973-74 to assess the development of wind power. The funds will come out of the administration's request to Congress for $872 million for energy research and development. While the director of the program, Louis Divone, is enthusiastic about the merits of wind power, the sum hardly seems a serious commitment.



An array of windmills designed by William E. Heronemus and his students at the University of Massachusetts. A series of similar wind stations could provide cheap, plentiful, reliable power and could replace conventional fossil fuel and nuclear power plants. The research group has designed stations that can be suspended over highways, floated on the Great Lakes or the oceans or placed on land. This station could be used "over wooded flat lands, in tilled fields, or in grazing lands."

On the other hand, Basil Greenhill of Britain's National Maritime Museum, has described the pitfalls of **not** developing wind power for shipping, and his analysis may well hold true for power plants as well.

Suppose the energy crisis forces a shortage of conventional fuels necessary to build modern wind-powered ships. "Such a situation," Greenhill says, "would mean virtually a return to a man- and animal-powered wood-fired industry. There would not be the resources ashore to build a sophisticated vessel of the type I have described. . . . Perhaps the design and experimental work on the development of modern merchant sailing vessels should be begun soon, before the crisis is actually upon us."

As is the case with wind-driven ships, the penalties for delay in developing wind power and all other natural energy sources are great. The technologically rich nations are right to be alarmed about fuel shortages, but the answer may not lie underground. It may be, as the song says, blowin' in the wind.

Depletion Allowance for Renewable Power?

Solar, Wind Deserve Tax Breaks Too

by Stephen Tarver

For the last thirty years the people in this country have been almost totally ignoring the billions of kilowatt hours of energy which have been going to waste every day in the form of wind blowing across the land. Yet, we have been feverishly stripping the topsoil off of much of our land to dig coal to burn and in the process have polluted much of our air and water. We have also been feverishly developing technology to exploit our precious irreplacable petroleum reserves while we built cars to burn more gasoline.

Why have we done this? The reason is purely economic. About thirty years ago the income tax became an economic factor with which almost everyone making a decent living has had to contend. The laws on which this tax is based allows the coal companies to take an automatic deduction of 10% of their gross income from the sale of coal, before they deduct their expenses and compute their tax on the balance. The same type of deduction is allowed on the production of oil and uranium, except that the percentage is 22% on oil and uranium.

In other words, if a coal company sold $1 million worth of coal and made $200,000 in net profit, they would pay tax on only $100,000. This would amount to $41,500, assuming they were a corporation. Comparatively, a non-mineral producing corporation would pay $48,000 on the other $100,000 or a total tax of $89,500.

The large energy producing companies did not get to be the giants which they are by paying taxes at the same rate at which the vast majority of us have been paying them. They grew that way on tax-free percentage depletion allowances.

It is not really surprising that we have allowed all of the free, clean windpower to go to waste. If a company were to build a windpowered generating plant to generate commercial electricity for sale, they would have to pay tax on their entire profit. The law, as it is written, would not allow any tax advantage comparable to the depletion allowance given the fossil and nuclear fuel producing companies. Thus windpower, although it is theoretically free, could not compete with fossil and nuclear fuels on which this enormous tax advantage is allowed.

This brings us to a blind alley, up which it seems that a great many environmentalist groups are being led. Which is thinking that getting Congress to appropriate large sums of money for research and development of solar power, wind power and waste conversion is the solution to increasing the availability of non-polluting energy. If Congress is merely going to appropriate large sums of money to make research grants to colleges and research organizations, without providing a tax incentive to offset that allowed on nuclear and fossil fuels, it would be economic suicide for a private enterprise to try to produce and sell these alternate types of energy on a large scale.

From a purely realistic standpoint, Congress must repeal the tax incentives on fossil and nuclear fuels or else establish a tax incentive to produce energy from solar power, windpower or waste conversion. Very few companies or individuals are likely to try to produce energy from these sources in competition with the types of energy which Congress does allow an enormous tax advantage to produce. Unless Congress equalizes these tax incentives we may just as well resign ourselves to having our land torn up by strip mining and our air and water polluted along with the many other undesirable aspects of strip mining.

The idea of establishing tax incentives to produce types of energy other than from fossil and nuclear fuels is already being given consideration by Congress. If the environmental groups would unite behind it and push it, it seems very likely that Congress would pass a law establishing such incentives. On what grounds could anyone oppose the idea, especially as long as they continue to allow these incentives on the production of fuels which pollute the environment?

Windpower is available and we could produce the means to convert it to useful work, but without a change in our tax law, it seems unlikely that we will ever make much use of it.

* * *

Editor's note: Mr. Tarver is an accountant and therefore knowledgeable in the taxing system. He lives in Gillette, Wyoming, one of the centers of proposed, large-scale coal development.

Audubon Opts for Wind Power

The winds that blow across Europe, Asia, and North America could be harnessed to produce at least 20 billion kilowatts of electric power — 20 times more than the world's present generating capacity — says the National Audubon Society.

Writing in the May issue of AUDUBON, official magazine of the Society, environmental author Gary Soucie says that windpower, first used in Persia in A.D. 644, could provide a plentiful and cheap source of energy but it is being bypassed in the current craze for nuclear power which is proving to be "neither plentiful nor cheap."

The Audubon Society believes that far more research and development funds must be allocated for alternative sources of power such as solar, geothermal, and winds, which in total could meet a significant part of America's energy needs. Such sources, along with more frugal use of current supplies of coal and oil, can do as much to close the energy gap as environmentally dangerous crash programs for vast strip-mining operations, off-shore oil drilling and nuclear power development, the conservation organization believes.

"We still don't realize how much trouble we are in," says Soucie, "and as the true cost of generating nuclear power becomes so evident that even the 'nuke' nuts stop talking about cutting the cost of electricity in half, windpower and other alternate sources will look more attractive."

In addition to development of new, non-polluting energy sources, the Audubon Society believes an important part of the answer to the Energy Crisis is conservation measures to make existing energy supplies go further. The Society estimates that with more efficient use of transportation, particularly by greater use of mass transit, and by improved building codes requiring better insulation, America's energy consumption could be cut by a third.

" IT WOULD BE A GREAT SOURCE, BUT IT WOULD NEVER PASS THE EPA AIR STANDARDS."

Health Department Warns

Colorado Air Thickens

DENVER — With the development of strip mining, coal gasification and oil shale extraction, residents of western Colorado can look forward to little but a land ravaged by stripping, where replanting will be difficult if not impossible, and the air filled with pollutants as dense as those of Denver or the Four Corners area.

This bleak forecast was made by Dr. Edward G. Dreyfus, executive director of the Colorado Department of Health, in testimony prepared for delivery last week in Washington, D.C., before the Subcommittee on Environmental Pollution of the Senate Committee on Public Works.

He said that population increase and rapidly altered land use are changing Colorado's environment radically.

"Either, by itself, is hard to deal with," Dr. Dreyfus added. "Together they may be disastrous."

He told the subcommittee that no greater threat exists to the Clean Air Act than the energy issue, and urged that the merits of clean air versus energy be debated throughout society as well as in the Congress.

"So far, we have only acted with rather hysterical speed, so that in Colorado we are already under serious pressure to issue permits for oil shale operations," Dr. Dreyfus said. "Now, it is almost certain that these operations will drastically lower the air and water quality of the region. Therefore, I for one do not believe that this should be permitted unless the environmental impact is clearly understood by all concerned. The process is, after all, not reversible."

He urged that citizens be given the opportunity to weigh the costs of energy forms other than fossil fuels and the chance to opt for less energy. For them to be properly informed, Dr. Dreyfus said it is imperative that the federal Environmental Protection Agency (EPA) and the state agencies be sufficiently staffed and funded.

He endorsed the federal Clean Air Act and asked its continuation as a strong measure so that Colorado will not be caught between the EPA and the Federal Energy Office.

On related subjects, Dr. Dreyfus had these comments:

—EPA — state relationships. They are "confusing." EPA often usurps what properly should be the duties of the states, even though, in many cases, states have been progressing at a reasonable pace. Furthermore, EPA appears to be assigning the policing of its enforcement orders to the states.

—Federal timetables. They pose a serious dilemma for both the EPA and state agencies, and there appears to be no resolution to the problem of realistic timetables and maintaining pressure on offending polluters.

—Land use. It is unfortunate that federal land use legislation did not accompany the Clean Air Act. The result has been a void filled to varying degrees by the states. The definition of powers between Colorado's Air Pollution Control Division and the city and county land use authority will lead to confusion at best and to litigation at worst.

—Transportation. Though public attitude toward public transportation is improving, it will not be easy to change the long-standing habits of the American people with regard to the automobile. Dr. Dreyfus expressed deep concern over the federal government's position of encouraging modifications of the internal combustion engine. He urged instead that it require the automotive industry to emphasize research and development activity toward alternate methods of automobile propulsion.

Prairie Schooner Power

A Montana farmer has invented a prairie schooner that makes electrical power from the wind. His idea is now in the hands of researchers at Montana State University. They have a $50,000 grant from the National Science Foundation to work out the details of the system.

The schooner, invented by Fred Davison of Highwood, was inspired by a German sailing vessel, the "dyna-ship." Davison envisions rigging the German ship's rectangular sails to a land ship and sending it sailing around a 22-mile oval railroad track. The vessel's wheels would generate electricity as they turned.

Davison thinks the system could not only generate about as much electricity as a 1,000 megawatt nuclear power plant, but it would "enhance the environment" by acting as a slotted windbreak. The 90 x 180 foot sails would shelter life within the oval. Another advantage of his wind generated power plan, Davison says, is that the source is most powerful during the winter, when power is most needed.

MSU researchers have determined that Davison's system can theoretically generate up to 26% more power than a conventional windmill with the same sail area.

Montana Information Center Needs Help

The Environmental Information Center of Montana is having to turn from digging out data to scraping up funds.

The Center, which was formed last October, coordinated the state environmental lobbying effort and publishes a weekly newsletter for 1,000 people. The center attracted $6,000 worth of support during the legislative session, but now its funds are down to $145.

The center needs help if it is to be able to pay the June rent and work on future planned projects. This summer the Center staff hopes to work for candidates in the June primary election, begin a land use education project, and prepare a position statement on major environmental issues that should be addressed in the next legislature.

If you'd like to help, write Phil and Robin Tawney, Environmental Information Center, P.O. Box 12, Helena, Mont. 59601.

"Ecophony" Fair

Four environmental groups turned down offers of free exhibit space at Expo '74, the world's fair being held at Spokane, Washington. Earlier, environmental groups had criticized the Expo exhibit charges as being beyond what any of them could pay. Expo '74 is billed as the World's Environmental Fair.

Besides costs, environmentalists say Expo is more of a trade fair than an environmental exposition. Dr. Thatcher Hubbard of the Sierra Club's Spokane chapter said, "Most of the environmental groups are opposed to Expo. We call it ecophony."

Ed Reynolds, a spokesman for the Sierra Club, Audubon Society, Washington Environmental Council, and Zero Population Growth, said, "Those responsible for the direction of the fair have not, except as an exercise in tokenism, concerned themselves publicly with clean air and water or with traffic and social problems of the city . . . I personally would urge people not to go to the fair if they're expecting to learn something about the environment."

The WILD WORLD

by Verne Huser

Floating the Middle Fork of Salmon in May is a real wilderness experience, but probably the most poignant aspect of that experience is the sharp contrast between the wild world and the tame, even in the heart of central Idaho's vast realm of mountain and forest and river-cut valley.

We spent three nights camping along the Middle Fork, and for all the summer use the previous year, for all the hunting and fishing parties that used the Idaho wilderness, there was little evidence of man's previous presence. Campsites used virtually every week were relatively clean — no litter, no cans or bottles or flip-top lids.

But the fourth night we camped at Cache Bar on the Main Salmon with an unpaved road running by. No car passed from the time we landed at 6 p.m. until mid-morning the next day so there was obviously little traffic that early in the season. There was litter everywhere:

— a series of broken beer bottles littered the beach as though some idiot had lined them up along the shore and shot at them with a .22;

— flip-top lids and bread-wrapper plastic pinchers and pop- and beer-caps and plastic cups and forks and knives;

— metal cans, both steel (tin) and aluminum, and whiskey bottles and debris from abandoned camping equipment;

— fishline and snelled-hook wrappers and worm boxes and other bits of fisherman paraphernalia.

The same kinds of activities take place on the Middle Fork as on the Main Salmon, but apparently the wilderness nature of the wild river creates a different attitude among users. If you can drive to it — get there without much effort — it can be abused, but if it takes some effort, maybe you have greater respect for the area. I recognize that this analysis is not universially true, but it is obvious that some factor operates to protect the wild world that doesn't function in the tamer parts of Idaho's most valuable asset: its natural wilderness.

In the United States today, "impractical" usually means that something isn't fancy enough to appeal to our ideas of high technology and flamboyant life style. "Inefficient" usually takes on a more scientific and quantifiable meaning that in the last analysis means, "I know how to achieve a higher Carnot or Coulomb efficiency with a different process." The engineer looks for the most efficient process because it is usually the most economic. But if we are seeking pollution-free energy, that guideline is not necessarily the best one to follow. "Uneconomic" means that something cannot compete in the marketplace. Solar energy schemes cannot compete in the marketplace so long as groundwater is a "free good" heat sink for heat engines, so long as our air is a "free good" refuse dump for combustion or fission airborne emissions, and so long as our Earth is a "free good" repository for high-level nuclear wastes.
William E. Heronemus

Wind Powe

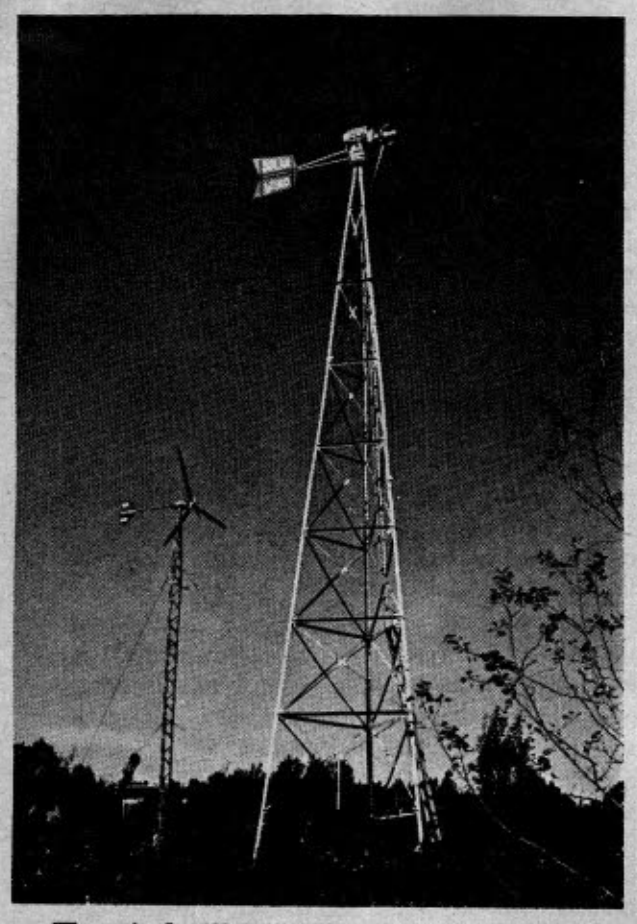
SOLAR WIND COMPANY

Henry Clews, his wife Etta and their two children live eight miles down isolated country roads from East Holden. Maine. When they wanted to install electric power in the home they were building, the Bangor Hydro-Electric Company told Clews it would cost $3,000 to bring power lines in to the property. That's when he started looking into wind generators.

Clews looked around for a wind generator and finally sent off to Australia for a 2,000 watt wind plant. An aeronautical engineer by training, Clews became such a wind power enthusiast that he purchased a second wind generator from Switzerland shortly after. "There is enough wind in Maine to supply all of the power needs of the state without environmental damage," says Clews.

Word of the Clews' wind plants spread and the family became so deluged with inquiries that they formed the Solar Wind Company to handle requests. Solar Wind Company is an agent for Dunlite and Century of Australia, Elektro GmbH of Switzerland, and Dyna Technology and Sencenbaugh Wind Electric of the U.S. The company sells complete wind systems in sizes from 50 to 12,000 watts. Clews has sold about a dozen systems and answered hundreds of letters. Any surplus income from the venture is plowed into further wind power research.

Clews is author of "Electric Power from the Wind," a 29 page publication available for two dollars. The booklet answers many questions and gives details on costs, power output, plant size calculations, the storage system, and power conversion devices. If you still have questions after reading this, Solar Wind Company will be glad to make recommendations on equipment suitable for various applications.



The windmills that power the Solar Wind Company near East Holden, Maine. In the foreground is an Australian Dunlite "brushless wind driven power plant." The system is completely automatic and suitable for unattended operation in areas where wind speeds seldom exceed 80 m.p.h. This system can be expected to produce over 100 kilowatt hours of power per month with 10 m.p.h. average winds. The windmill in the background is a Swiss Elektro wind generator with a monthly output in 10 m.p.h. winds of 300 kilowatt hours. This system is also automatic and can remain unattended in winds up to 120 m.p.h.

The Solar Wind Company can be reached at P.O. Box 7, East Holden, Maine 04429.

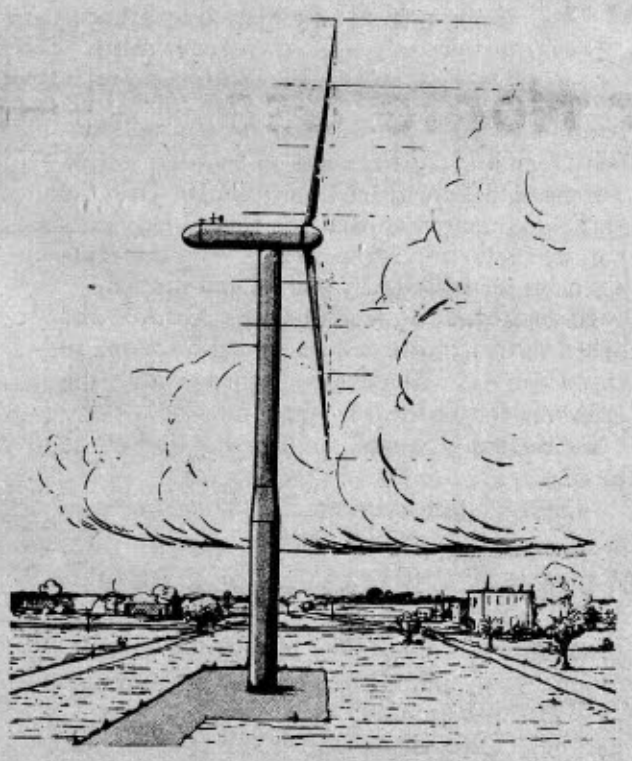
Windmills Suit Foreign Lands

"For the common man in many of the less developed countries, progress depends on getting control of more energy than he now has," says Marshal F. Merriam. In most of these countries supplies of petroleum fuels and central station electricity are remote and costly. These countries must look at locally available energy resources — the sun, the wind, firewood and dung, Merriam says.

In a paper written for the Technology and Development Institute of the East-West Center, Merriam looks at wind energy in terms of the requirements of less developed countries. He examines windmill design, economics, battery storage systems, and marketing.

He concludes that in remote areas where the wind velocity exceeds 12 m.p.h., windmills should be considered. They can be used for pumping water, for operating machines for flour milling or other small industries, and for generating small amounts of electricity to charge storage batteries.

For a copy of Merriam's paper, "Is There a Place for the Windmill in the Less Developed Countries," write to The East-West Center, Honolulu, Hawaii 96822.



A 100 kilowatt windmill, as depicted in this artist's concept, will be built and tested by NASA's Lewis Research Center, Cleveland. The windmill, a forerunner of much larger systems which could supply between 5 to 10 per cent of the country's total electric power needs by the year 2000, is being developed as part of the NASA-National Science Foundation Solar Energy Program.

As presently envisioned, the experimental windmill will have a tower 125 feet tall and rotor blades which span 125 feet tip to tip. The horizontal cylinder at the top will contain the power transmission and controls systems. The windmill will be tested at Lewis' Plum Brook Station near Sandusky, Ohio, beginning in late 1975. Later on, NASA will provide a similar unit to the government of Puerto Rico. It is to be located on the island of Culebra and will supply as many as 50 homes with electricity.

Where to Find a Windmill

Dyna Technology makes 6 and 12 volt "Winchargers." At present this is the only complete unit made in the U.S.
Dyna Technology
P.O. Box 3263
Sioux City, Iowa 51102

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Aerowatt of France builds expensive but reliable wind generators. They have five models, the largest rated at 4.1 kilowatts in a 16 m.p.h. wind. The U.S. distributors are:
Pennwalt Corporation
P.O. Box 18738
Houston, Tex. 77023

Automatic Power Inc.
205 Hutcheson St.
Houston, Tex. 77003

\- - -

Bucknell produces a 600 watt wind generator.
Bucknell Engineering Co., Inc.
10717 East Rush St.
South El Monte, Calif. 91723

\- - -

Independent Power Developers distributes Century storage batteries and Quirk's wind plants from Australia.
Independent Power Developers
P.O. Box 618
Noxon, Mont. 59853

Energy Alternatives, Inc. distributes wind generators made by Winco of Iowa and Dunlite of Australia.
Energy Alternatives, Inc.
P.O. Box 223
Leverett, Mass. 01054

\- - -

A new company with plans to manufacture wind electric equipment.
Environmental Energies, Inc.
11350 Schaefer St.
Detroit, Mich. 48227

\- - -

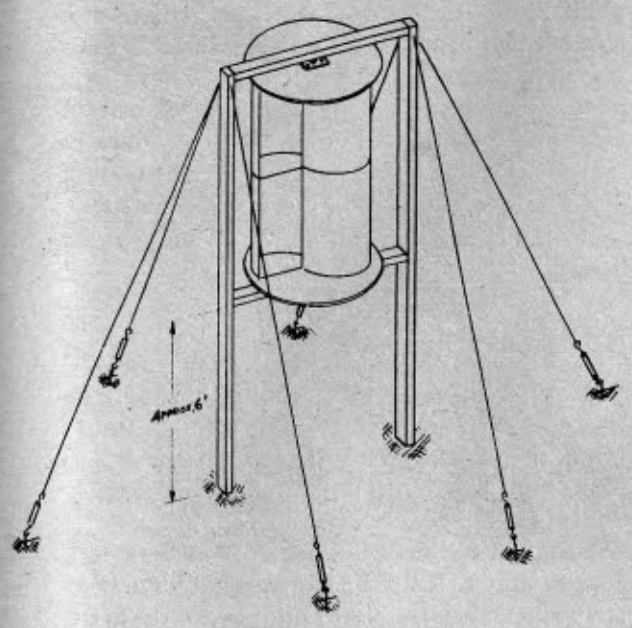
Jim Sencenbaugh has designed a 10 foot diameter wind generator described in issue No. 20 of the **Mother Earth News.** He's also developing kits for sale.
Sencenbaugh Wind Electric
P.O.Box 11174
Palo Alto, Calif. 94306

\- - -

An international list of past and present windmill manufacturers has been compiled by Gerry Smith who is doing research on autonomous housing systems.
Gerry Smith
University of Cambridge
Department of Architecture
1 Scroope Terrace
Cambridge CB2 1 PX
Great Britain

wer Catalog

A Cheap Wind-driven Pump



The beginnings of a cheap wind machine for pumping water are shown above. The drawing is Brace Research Institute's design for a Savonius Rotor mounted in a frame. The next step would be to attach a pumping mechanism. The system will operate sucessfully in areas where the wind is at least 8 m.p.h. and the water is not more than 10 to 15 feet below the ground.

Instructions on how to build a cheap wind machine for pumping water are available from the Brace Research Institute in Quebec, Canada. The pumper is a Savonius Rotor, a vertical shaft wind machine developed by a Finnish engineer in the 1920s.

Brace suggests that the do-it-yourselfer build his own rotor by cutting and welding two 45 gallon oil drums. The result is a device which is "not as efficient as a windmill of comparable size," according to Brace, but it is cheap and easy to build and maintain. To tackle this project all you need are a few tools and access to a welding set.

If you're interested, send 75 cents to Brace Research Institute, MacDonald College of McGill University, Ste. Anne DeBelevue 800, Quebec, Canada. Ask for do-it-yourself leaflet No. L-5.

For a look at the whole range of technical and practical papers offered by Brace on solar power, ask them to send a copy of their publications list. Of their 360 publications, 30 are on wind power. A description of their 32 foot diameter windmill is in "The Design Development and Testing of a Low Cost 10 hp Windmill Prime Mover" by R. E. Chilcott, publication No. MT-7.

Conference

Wind systems which could supply at least 10% of the nation's energy were the primary focus of a conference in June, 1973, sponsored by the National Science Foundation and the National Aeronautics and Space Administration. For a copy of the proceedings and a description of NASA's wind energy program write to NASA, Lewis Research Center, Mail Stop 500-201, Cleveland, Ohio 44135.

If it were possible to install additional generators in dams to use water pumped back into reservoirs by wind power you could use the existing system without building more dams and further endangering the environment. Raising the level of a reservoir by just a few feet could make quite a difference for hydrogeneration.
Dr. E. Wendell Hewson
Professor of Atmospheric Sciences
Oregon State University.

Wind News

Alternative Sources of Energy, a newsletter which has grown rapidly into a magazine, is a rich source of ideas about wind power.

The publication limits itself to decentralized systems. You'll find no schemes to produce enough energy for the entire greedy U.S. here. **A.S.E.** is primarily a forum. Subscribers are encouraged to recount their dreams, their successes and their failures.

For six bi-monthly issues send $5 to **A.S.E.**, Route 2, Box 90A, Milaca, Minn. 56353.

Super Rotor For Home Use

Take three 55 gallon drums, a rod, four car alternators some old batteries and a few other odds and ends, put them together, and what have you got? The Savonius Super Rotor!

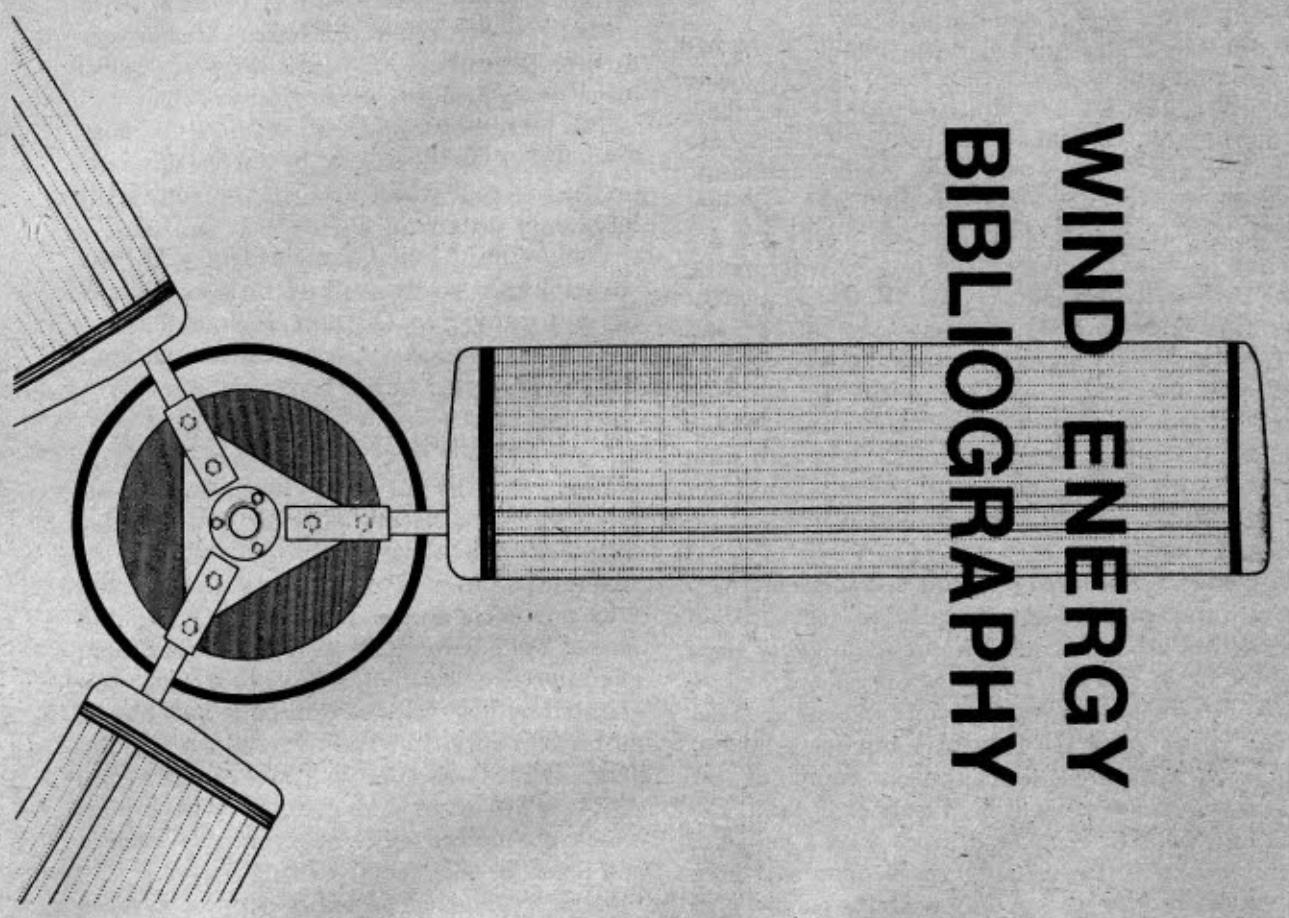
The Savonius Super Rotor is a new arrangement of an old wind generator system. With a peak output of 6,240 watts, the developers claim it can run an electric home. What is most encouraging is the do-it-yourself price tag of about $100. Prefabricated wind plants large enough to run the average household's electrical equipment can cost up to $15,000.

The basic Savonius rotor is a vertical axis windmill that is easily constructed. A cylinder (in this case an oil drum) is split lengthwise and the halves are offset by a distance equal to their radius (see Savonius diagram on page 9). End plates are fastened to the top and bottom and a rod is run through the center of the assembly and secured so it will rotate as the rotor is turned by the wind.

The Super Rotor was developed by a California research team called Earthmind. Earthmind stacked three Savonius rotors on top of each other and turned the cut drums at 60 degrees angles.

Earthmind spokesman Michael Hackleman says the Super Rotor has the following advantages: 1) easy to construct (no airfoils needed), 2) the rotor doesn't need a tail to find the wind;it can use a gust coming from any direction, 3) no adjustments are needed to various wind speeds, 4) the instability of a propeller-tower arrangement is avoided, and 5) the rotor begins to produce power at lower air speeds than a ordinary propeller wind plant.

Further details can be obtained by sending 10 cents and a stamped self-addressed long envelope to The Mother Earth News, in care of The Denver Post, P.O. Box 957, Des Moines, Iowa 50304. Ask for Reprint No. 183, The Savonius Super Rotor.



Windworks has an extensive wind energy bibliography available for three dollars. Subjects covered include wind, windmills, aerodynamics, electrical systems, towers, storage, conversion, hydrogen, catalogs and general readings. The scope is international. Windworks also has prepared plans for two windmills — a 12 foot diameter 3-bladed high speed wind generator with honeycomb blades, and a 25 foot diameter sail windmill. The 12 footer plans are an improved and simplified design of the windmill described in the November 1972 issue of Popular Science. The Popular Science article describes the Windworks paper honeycomb technique of blade construction which allows individuals to construct low-cost, efficient airfoils. Further information on Windworks will be available in a future High Country News article. Windworks can be reached at Box 329, Route 3, Mukwanago, Wis. 53149.

Reckoning from Washington

by Lee Catterall

Political in-fighting nearly caused the draft environmental statement on coal development to be shoved aside and be replaced later on by one proposing less government control over industry.

The statement is about all federal coal leasing, but it mainly is concerned with the vast coal resources in the Montana-Wyoming area.

After two weeks of bureaucratic skirmishing, the draft statement finally was released last week, but with the understanding that it will bear little resemblance to the final statement. The final one, department sources say, will give in somewhat to the "free market" advocates.

The statement was all set for release April 19, when it suddenly was jerked back by Roy Hughes, Asst. Interior Secretary for Program Development and Budget. He soon was joined by William Vogley (until last week Asst. Secretary for Energy and Minerals) in what transpired as a two-week debate with Jack Horton, Asst. Secretary for Land and Water Resources.

Horton, owner of a Powder River Basin dude ranch, in charge of the lease-granting Bureau of Land Management.

The debate stemmed around a plan proposed in the statement for government-controlled leasing. The government has been refusing to grant new leases for federally-owned coal since February, 1973. It wants to open up leasing, and the impact statement was made to comply with a law requiring impact assessments of major federal actions.

The plan calls for a one-year leasing schedule to be set up for a period beginning next Spring or Summer. During that year, a four-year schedule would be drawn up to follow that. People in Horton's office believe that would control development and still satisfy the industry.

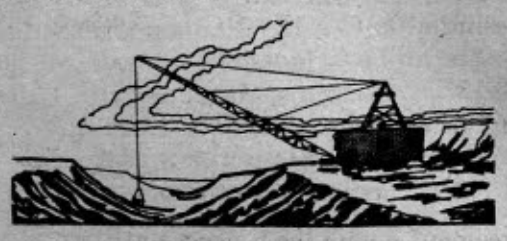
It didn't satisfy Hughes, who apparently hadn't seen the statement until it was ready to be let out to the public. A source who share's Horton's views said Hughes wants to "lease what industry wants." He bitterly described this as a "free market approach" that he regards as being "to the right of Adam Smith."

That approach has been the one used for years, until the current leasing moratorium. The statement says returning to it would cause population boom problems beyond anybody's ability to handle.

Hughes and Vogley won the early rounds of the tussle. It was decided the department would either rewrite the part of the statement dealing with leasing schedules, or do the whole thing over. At any rate, official department spokesmen said it wouldn't be released any time soon.

But news had filtered out that the statement had been completed and was being sat on. Horton fed on that in his rebound. He sent copies to every state director of the Bureau of Land Management, and let other copies get out to Washington interests involved in the issue. After the resulting outside pressure, Hughes finally agreed to let the statement out.

However, the statement is in only draft form. The final one won't be completed until after a period of public comment. Department spokesmen say there will be many changes, not only with the leasing part but with the environmental part, which the different factions agree barely scratches the surface of information that's needed.



Coal Leased and Lost

The Department of Interior's coal leasing program, a keystone of the nation's energy policy has failed to encourage resource development, has failed to provide market value to the public and Indian treasuries, and has saddled the nation with a huge bloc of leased but unmined coal that may well frustrate energy resource planning for decades to come. So concludes a Council on Economic Priorities study, "Leased and Lost."

The Council conducted the first complete survey of 463 federal and 11 Indian coal leases in seven western states, 90% of federal coal leases. Over 15 billion tons of recoverable public coal and 5 billion tons of Indian coal are under lease. That is 35 times the amount of coal produced by the United States in 1973. Although western coal development will have a staggering impact on that region — Arizona, Colorado, Montana, New Mexico, North Dakota, Utah and Wyoming — the Department has not planned for or even considered the environmental, social, cultural or economic effects of its leasing practices.

CONCENTRATION OF HOLDINGS

There is a heavy concentration of lease holdings among corporations. The top 15 of 144 leaseholders control 70% of the land under lease. Five oil companies — Continental, Shell, Sun Oil, Gulf and Arco — are among the top 15. "Consolidation of public coal resources in the hands of a few corporations has not occurred because of any deliberate policy on the part of the Department of Interior, but because of the absence of any policy at all," explained James Cannon, author of the Council study.

SPECULATION

Speculation, or holding public coal unmined until the price goes up, is a common practice. Only 52, or 11% of the 474 leases, are now producing. Three hundred and twenty-one leases have never produced a single ton of coal.

The largest leaseholders speculate the most. Over 93% of the leases held by the top 15 are not producing coal while 85% of the remaining leases are inactive.

Five of the 15 major leaseholders — El Paso Natural Gas, Westmoreland Resources, Shell Oil Company, Sun Oil, and Richard Bass — have never produced a ton of coal from their leases.

LEASE TERMS

The public has never received fair market value for its coal. Every lease has been issued at industry's request rather than as a result of the Interior Department's determination that there was a market demand for coal. Of the 474 leases, 247 have been issued by the Department at competitive lease sales, but 171 of those were granted without competition since only one or no bidders appeared. The average winning bid at these 171 lease sales was only $2.87 an acre. Another 210 leases were granted by the preference right method which returns no revenue to the lessor besides the $10 filing charge.

Rent revenue has probably not even covered bookkeeping costs. Leaseholders, moreover, are now paying a smaller percentage of the value of mined coal in royalties than they did in 1920. The government has collected just $23.4 million in royalties from the production of 186.1 million tons of coal since 1920, or 12.5 cents a ton. The Indians have received $8.9 million since 1938, or 15.8 cents a ton.

"Leasing their coal on fairer terms could provide a solution to the economic depression of the Indians. In some respects the Indians are in a better position than the rest of the American public to obtain more favorable terms for their coal because of stronger and more flexible leasing legislation," stated Cannon. "There is a risk, however, that Indians acting out of economic desperation, under false promises or bad advice of the Bureau of Indian Affairs, will lose this opportunity and much of the value of their coal."

RECLAMATION

Nearly 85% of the coal mined from federal and Indian leases in 1973 was strip mined. The future of strip mined land depends upon its reclamation, but restoration to the original ecosystem is impossible. The U.S. Geological Survey defines reclamation as the restoration of the original contours of the land. This has been done on only half the 6,515 acres that have been strip mined to date. North American Coal is the worst offender with only 10% or 65 acres of land it has stripped reclaimed. Utah International now has the most unreclaimed land, 986 of the 2,119 acres it has mined. Energy Fuels Company has reclaimed the highest percentage of stripped land, 85% of the 540 acres it has mined.

ADMINISTRATION

The present leasing system has operated without any overall long range planning. Public lease terms are adjusted every 20 years. Only then may environmental safeguard clauses and royalty rates consistent with current value be added. Even after these long adjustment intervals, Interior has failed to consistently raise royalty rates to meet current standards, and it has neglected to insert an important environmental safeguard clause in 58 of the 85 leases which have come up for adjustment.

Public coal leases never expire, and the Department has never moved to cancel one for violation of lease terms. The Department of Interior has failed to use the power it has to control the program. The costs of that failure have been transferred to the future.

* * *

Leased and Lost, A Study of Public and Indian Coal Leasing in the West can be ordered from CEP, 84 Fifth Avenue, New York, N.Y. 10011 for $3.00 per copy. Individuals may subscribe to CEP's bi-monthly report for $15.00 per year.

The Council on Economic Priorities is a non-profit public interest organization established to research and disseminate unbiased and detailed information on the practices of U.S. corporations in such major areas as employment practices, environmental quality, military production and consumer practices. The Council publishes this information in **Economic Priorities Reports,** books and in-depth studies.

Whether or not the present energy emergency leads to a recession, depression, or — as the German newsweekly Der Spiegel forecast — the 'end of the Affluent Society,' it has underscored the realism of environmental demands for reordering priorities in the industrial society.

Vic Cox, European correspondent ENVIRONMENT Magazine

Controversy again swirls around the spectacular Hells Canyon of the Snake River. The famous canyon, which forms part of the border between Oregon and Idaho, already has three large dams on its upper reaches. They are the Hells Canyon, Ox Bow and Brownlee. Two Northwest utilities, Pacific Northwest Power Co. and the Washington Public Power Supply System, want to build two more. This spring, they conducted a survey of residents of Idaho and Oregon to determine public attitudes toward more dams. The findings showed increasing sentiment for dams, apparently due to effects of the energy crisis. The question of more dams or no dams still has to be decided by Congress.

Emphasis ENERGY

in the Northern Rockies and Great Plains

A Colorado group called the **Citizens Energy Initiative** is taking over where their elected representatives left off. They hope to place three referenda on the ballot in November. The initiatives would:

1. Impose an 11% severance tax on all oil shale mined in Colorado. The tax would be paid by energy companies to the state government.
2. Restrict and control fossil fuel strip mining "so the Rockies won't look like Appalachia in 20 years."
3. Equalize the rates that residential and industrial consumers pay for natural gas, electricity and water.

Each initiative will require at least 55,000 signatures from eligible voters in the state to be placed on the general election ballot. Organizers say "the foot-dragging evident on the part of our elected representatives at the state and federal levels in dealing with energy related problems is small relief to citizens worried about who will pay and who will benefit from future energy development in Colorado."

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Wyoming's first **oil shale tract** received no bids. The 5,111-acre tract is estimated to contain 354 million tons of oil shale. Lack of interest in the lower-grade Wyoming oil shale is in contrast to the four tracts already offered in Colorado and Utah. The energy industry has committed a total of nearly $450 million to develop those tracts. The Wyoming shale is at some depths and is considered suitable for development only by the in situ method. Such a method has not been perfected on a commercially feasible basis.

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Five of the big energy companies in **Wyoming's Powder River Basin** are jointly backing a study of the potential social and economic impacts of population growth. The growth is expected from coal industry developments in Converse and Campbell Counties. The possibility of a new city will be one of the areas of study.

The **Atomic Energy Commission,** which refused to admit dangers from uranium tailings piles for a number years, is going to conduct a survey in eight western states this summer. Dr. James Liverman, AEC chief of biological research, says there are at least 20 inactive uranium mills in the West which have been considered public health hazards from radiation. Colorado has been requesting help from the AEC since 1965.

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Cameron Engineers of Denver and **Marathon Oil Co.** have proposed a coal strip mine and gasification plant a few miles east of Denver. The two companies, operating as Mintech Corp., have submitted preliminary plans to the Bureau of Land Management. The plans call for construction of a coal gasification plant by 1980 or 1981. The two companies and Consolidation Coal Co. already hold or have requested some 53,000 acres in federal leases. An additional 14,000 to 15,000 acres have been leased from private landowners. The coal is a low-grade lignite which can only be strip-mined.

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Engineering departments at both the **University of North Dakota** and the **University of New Mexico** are researching and studying the feasibility of wind power. In New Mexico, four mechanical engineering students said a study they did showed windmills may help satisfy household needs. University of North Dakota electrical engineering professor Jack Krueger is researching the conversion of wind power into heat.

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Northwest Pipeline Corp. of Salt Lake City and **Gulf Interstate Engineering** of Houston have announced they are studying the feasibility of building a coal-slurry pipeline to the Pacific Northwest. Planning calls for construction of an approximately 800-mile long pipeline from one of the coal-rich Rocky Mountain states. The pipeline would be big enough to carry coal in amounts equivalent to 65 million cubic feet of natural gas per day.

The Hot Line

across the country

Solar cells that generate electricity directly from sunlight could be competitive with conventional power sources within the next few years. Announcement of a major technical break-through in silicon cell production says cost of the cells could be cut by 95 percent. Harvard University and Tyco Laboratories, Inc. teamed up to develop the new process for developing the silicon crystals used in the solar cells.

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A device "resembling half an eggbeater" and called the **vertical axis windmill** is being tested by the **National Aeronautics and Space Administration** (NASA) at the Langley Research Center in Hampton, Va. NASA says the windmill will cost between $500 and $1000 and would provide "inexpensive and non-polluting" electricity for home use.

The helicopter-like apparatus would be attached to the roof of a home by a 15 foot vertical shaft. Conventional windmills, says NASA, have horizontal axes that "require more complicated gear mechanisms which decrease efficiency and increase costs."

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Sen. Hubert Humphrey has made "the boldest stroke so far for solar electricity and solar fuels," says The Task Force Against Nuclear Pollution. Humphrey's "stroke" is S. 3234, the **Solar Energy Research Act.** The bill would direct the Administration to spend $600 million over the next five years, instead of the $200 million which is now allocated. It would create a Solar Energy Council made up of the heads of the Atomic Energy Commission, the National Aeronautics and Space Administration, the Office of Technology Assessment, the National Science Foundation, the Department of Housing and Urban Development, the Federal Energy Office and the Department of Agriculture.

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In a report dated December, 1973, the Atomic Energy Commission's **Solar Energy Subpanel IX** stated that with funding at the $1 billion level over the next five years we could demonstrate the economic viability of solar electricity from wind power, solar fuels from plants, and solar heating and cooling. The report also says that we could get up to 30% of the country's energy from solar power by the year 2000. That is equal to the most optimistic predictions of the percentage nuclear fission could provide by that year.

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A major study on home units for generating electricity by means of **solar energy** has been launched by the Office of Technology Assessment. The study is to look at costs, technical factors, the environment, transportation, housing patterns, and the impact on total energy supplies.

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Within six years a federal security force costing $70 million will be needed to protect **uranium and plutonium** stockpiles, says University of Virginia law professor Mason Willrich. "It is possible to make an atomic bomb using information that is available in the open literature," says Willrich. All that is needed is a little graduate school training, a small laboratory and fissionable material, he said.

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Arctic Geology, a publication of the American Association of Petroleum Geologists, says the arctic regions of the earth must be contributing 20 to 25 million barrels of oil per day by 1990 in order to meet world energy requirements. The book includes papers by 24 Russian scientists.

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Canada wants some assurance that **Alaskan oil** is not going to destroy or endanger west coast areas through damaging oil spills. The Canadians have proposed an international environmental protection agreement before the tankers start hauling oil.

Hechler Warns West

Stripping Bill Filled With Loopholes

by Rep. Ken Hechler
(D-W. Va.)

The bleeding hills of Appalachia will be further ripped and torn, and the virgin plains of the West will be raped by the strippers under the terms of the bill just reported by the House Interior and Insular Affairs Committee.

Despite noble efforts by Rep. Patsy Mink (D-Hawaii) and Rep. John Seiberling (D-Ohio), the committee has produced a woefully weak compromise filled with the kind of loopholes the coal and utility lobbyists have written into state strip mine regulation for the past 30 years. For over a year, the Nixon Administration and its allies in the coal industry have joined hands with a majority of the Interior Committee and danced a deadly minuet to produce a watered-down bill.

H.R. 11500 spells false hopes and empty promises for thousands of people in the mountains and on the Great Plains. Enforcement power is given primarily to the states, whose regulatory track record is dismal. The production-oriented Department of the Interior is given some nominal authority, freezing out the Environmental Protection Agency, which has a little more backbone and experience in water quality control. Instead of requiring that strip mining must maintain water quality, it is suggested in Sec. 210(b)(14) that operations "minimize the disturbances to the hydrologic balance at the minesite and in associated offsite areas and to the quality and quantity of water." In Sec. 210, the committee also failed to provide adequate protection of the coal seam aquifers and alluvial valley floors in the West. According to Sec. 210(b)(6), erosion is to be controlled "as effectively as possible" — whatever that means.

For the first 40 months after the bill is enacted, even weaker "interim standards" apply in Sec. 201, thus inviting a virtually unregulated coal rush before somewhat stricter standards go into effect over three years hence. The only really good features of the bill are the strip ban in National Forests and fairly strong citizen participation provisions which mandate public hearings and citizen suits. Yet the weak "reclamation" standards mean that Congress is placing all the responsibility on the poor citizen in the hollow to go out and fight his own battles against the well-heeled legal talent of the coal company and its newest parent-in-law, the oil corporation.

With eight times as much coal which can be deep mined as stripped with present technology, you would think the Interior Committee would act to meet the energy needs by encouraging deep mining. The Seiberling Amendment attempted to do precisely that, by equalizing the disparate costs of deep and strip mining through a $2.50 per ton tax with rebates favoring deep mining operations. The western stripping interests teamed up with the profiteering lobbyists everywhere to scuttle the Seiberling Amendment in the closing days of the committee debate. The Jones Amendment was adopted with a drastically lowered tax tied to BTU content which favored western strip mining at the expense of eastern deep mining, thus spurring the pell-mell coal rush westward.

There are several villains in this drama — including the Administration lobbyists who threw their weight in on the side of the coal and utility interests attempting to weaken the bill. You would think the Administration would have the guts to stand up for the public interest which the taxpayers assume that public servants should be protecting. Carl E. Bagge, President of the National Coal Association, is paid handsomely to maximize already-fat profits for the coal industry. When Mr. Bagge contends, as he did in a May 1 statement that H.R. 11500 will "allow the surface coal mining industry to bleed to death in two or three years instead of sentencing it to immediate strangulation," he is telling what I bluntly label a lie. When Mr. Bagge contends, as he did in the same statement, that the House bill "would make surface mining impossible in much of Appalachia" and "would also wipe out most surface mining in the West," he is telling an absolute untruth and he knows it.

To make it worse, Mr. Bagge is acting very much like a hypocrite. Having succeeded in weakening H.R. 11500 up and down the line, Mr. Bagge is now playing the game of painting this faded rose as a skunk cabbage in hopes that he can get the bill weakened even further on the floor of the House. He secretly hopes that if he labels the bill as prohibitive, and I label the bill as too weak, then Rep. Morris K. Udall might be inspired to claim that the only reasonable middle course between extremes is to enact H.R. 11500.

For hundreds of thousands of Americans, it would be a disaster to enact H.R. 11500. The bill raises false hopes that it can provide the coal to meet the Nation's needs without destroying valuable top-soil, causing silt sediment and acid to pour into streams, disrupting aquifers and other sources of water, irreparably ripping up the land, and bringing more fear and despair to many thousands of people in strip mined areas.

I will fight this bill. I will continue to fight against the exploitation of land and people. I will fight to strengthen the bill by restoring the Seiberling Amendment. Then, I will fight it by attempting to phase out the strip mining of coal entirely within six months in mountainous areas and within 18 months in relatively flat areas.

Hechler Says Fight Strippers

"West Virginia's beautiful mountains and once-clear streams have been left bleeding and polluted by the strip mining of coal. You are at a crossroads of decision in Wyoming, and I hope you don't commit hara-kiri on your own land and people," said Rep. Ken Hechler (D-W.Va.) at the Fourth Wyoming Environmental Congress in Sheridan.

Congressman Hechler is the most outspoken opponent of strip mining in the House. He is sponsoring a bill to outlaw all strip mining within 18 months.

"The slick salesmen are teaming up with the tinhorn politicians to sell the people of Wyoming on this fake prosperity which will raise taxes, raise prices, overcrowd the schools, overtax other public facilities, bring in the phony boom of trailer camps, and destroy a way of life which is the envy of 49 other states," Hechler said.

"These arrogant coal barons haughtily tell you that their values are so superior to your own life style that you must put the state of Wyoming on the sacrificial block so the coal barons can enjoy a better life on the West Coast and in the industrial East. They don't hesitate to suck your rivers dry to run their coal gasification plants. They will lie, cheat and steal to get your precious land. And they will snicker at the suckers they are making out of you," he said.

"I implore you not to follow the example of West Virginia which has already been ripped and raped, but stand up and fight," Hechler said.

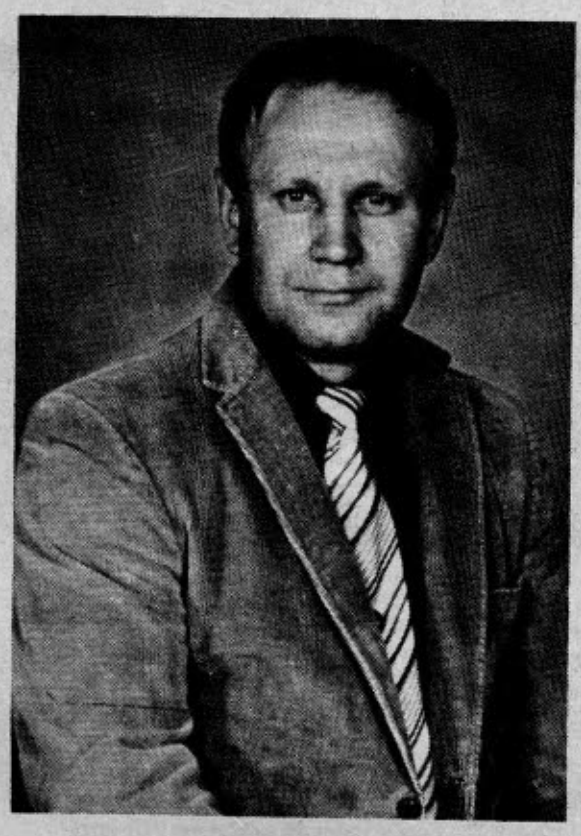
Planning Aids Wildlife

We need land use planning for the sake of our wildlife, says a Montana Fish and Game Department official.

Land developments reach far beyond the acre or two involved, says James A. Posewitz, the Department's environment and information chief. For instance, the bighorn sheep that winter along the Gallatin River near Big Sky, Mont. are in trouble not because of new homes, but because they are being harrassed by the homeowner's dogs.

Posewitz says the cumulative effects of subdivisions on wildlife are becoming serious. The Bitterroot Valley is a "wall-to-wall bedroom" and there are increasing problems with subdivisions as far east as the Bull Mountains between Billings and Roundup, he said.

"If you destroy the habitat then you destroy the animal. Dry up a creek and it doesn't matter what the fish limit is — there won't be any," Posewitz said.



James A. Posewitz, administrator of the Environment and Information Division, Montana Department of Fish and Game, Helena, received a 1974 American Motors Conservation Award. Posewitz was one of 17 men and five women to be honored with the award which has been presented annually since 1953 to conservationists as recognition for outstanding achievement in the preservation of renewable natural resources. Winners receive a sculptured medallion and an honorarium of $500. His prodding has caused the Fish and Game Department to become a state leader in spurring legislation that defines industrial activity, land use, stream protection, water pollution and recreation.

Western Roundup

Denali Citizens Council Formed

A "Denali Citizens Council" has been formed in Alaska to bring together individuals who are "honestly concerned and interested in protecting the unique values of McKinley Park and the region surrounding it."

Pete Martin, a photographer and park planner from Anchorage, has been elected as acting chairman of the group. He said the group was formed because Mt. McKinley National Park and the immediately adjacent area is on the verge of major development.

"Critical planning decisions will be forthcoming at all levels," ranging from the private sector to the state and federal levels, he says. "We want to create a flow of information which will directly influence these decisions and help shape the destiny of this outstanding national park before those decisions are foreclosed."

Martin said that more information about the Council may be obtained by writing Denali Citizens Council, General Delivery, McKinley Park, Alaska 99755.

Idaho Leaders Cite Planning Need

A former U.S. Senator, Len Jordan, told the North Idaho Chamber of Commerce that Idaho must get on with land and water resource planning. His words were echoed by Gov. Cecil Andrus, the president of the University of Idaho, Dr. Ernest Hartung, and both the national director of the Bureau of Land Management, Curt Berklund, and Vern Hamre, Intermountain Regional Forester from Ogden. Jordan said planning is necessary because the country's resources are not infinite.

Judge Says Time for Planning

Montana Gov. Thomas Judge, in proclaiming Soil Stewardship Week, said the time has come for the state to plan for the protection and wise use of Montana's land resources. Judge said that productive agricultural lands are steadily being lost to strip mining, urban sprawl, and subdivision and recreation developments. He said other productive lands were being damaged by overgrazing, man-caused erosion, and other poor management practices. He said planning is vital: "We need a more profound realization of the ultimate significance of our lands."

Man Fined for Destroying Ruins

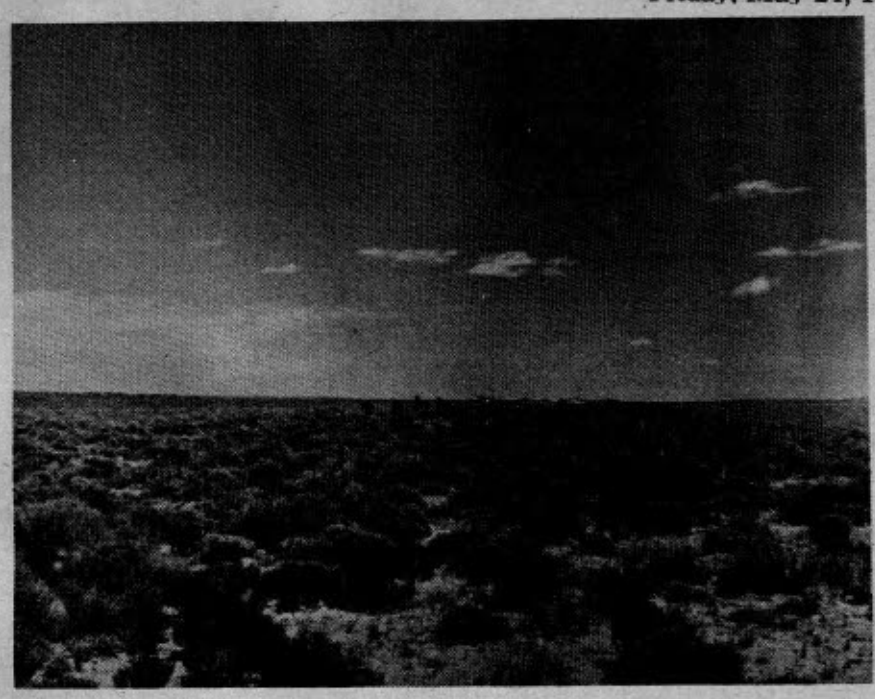
Illegal digging into an ancient Indian ruins in the Cedar Mesa-Grand Gulch area near Blanding, Utah, brought a $100 fine and 60-day jail sentence for a 19-year-old Colorado man. The jail sentence and $75 of the fine were suspended, providing the man does not violate the Antiquities Act again. He was brought to justice under a new Bureau of Land Management program instituted to protect priceless artifacts of ancient cultures.

Oahe Project Under Attack

The Oahe Irrigation Project in South Dakota has been overrated according to a study recently completed at Johns Hopkins University, Baltimore. The study was released last week by United Family Farmers, a group of more than 100 farm families in the Oahe area. The study says expected benefits exceed costs for the Oahe Project because the Bureau of Reclamation has altered its benefit-cost analysis to improve the project's appearance. The study then refutes the Bureau benefit-cost analysis on three major points — cost of money to the farmer, cost of farm labor, and a 100-year pay-out period which is twice as long as normally used.

Still another criticism was leveled at the Bureau of Reclamation in regard to the acreage limitation and residency requirements of the Reclamation Act of 1902. Dr. Paul S. Taylor, economist and professor emeritus at the University of California, says the law is specific in that no landowner can own more than 160 acres and must reside on the land or nearby. He charges the Bureau has not followed the law and would probably violate it on the Oahe Project.

Taylor, who is a national authority on the social and economic effects of the federal reclamation act, said Bureau policy has allowed large landowners and farm operators to receive disproportionate benefits from the subsidized irrigation programs. And, he says, it has allowed landowners and farm operators to acquire and retain large landholdings on projects.



The Wyoming Bureau of Land Management office has issued a warning of penalties for "recreational" harassment of wild horses, or the theft of horses and their colts. Those shown above are part of the large herds on Wyoming's Red Desert.

"We have had reports of persons chasing the horses on motorbikes, apparently just for fun," said Charles J. Haszier, range scientist at the BLM's state office in Cheyenne. "And, too, there have been a few cases of people finding new foals and taking them home."

The maximum penalty imposed by Congress for harassing, stealing, or killing one of the nation's "wild, free-roaming" animals is a fine of $2,000 and imprisonment for a year, Haszier noted, and if a motor vehicle is used an additional $500 fine and six-month sentence may be imposed.

Briefly noted . . .

The Bureau of Land Management says it has identified about 600 wild and free-roaming horses on national resource lands in Idaho. The BLM is now putting together management plans for the horses.

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The federal government has filed a motion in U.S. District Court in Cheyenne to dismiss a suit brought against it by the State of Wyoming and the Wyoming Wool Growers Association. The suit contends the federal government is responsible for controlling predators on federal, state and private lands.

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The controversial Jackson airport, at the foot of the Grand Tetons in Grand Teton National Park, will not get runways lengthened to accommodate big jets. That is the decision of the Department of Interior. The runways will be widened and other safety features incorporated but Interior ruled against extending the runways further into the park at this time.

* * *

In a search for the black-footed ferret, the National Geographic Society will concentrate on Wyoming. This state is believed to be one of the last refuges for the rare and endangered mammal. Anyone who sites a black-footed ferret should contact Dr. Tim Clark, Ferret Search, Box 1330, Jackson, Wyo. 83001.

* * *

Colorado has just completed what may be a pilot model for water quality in the state. The model is a 20-year plan for the Roaring Fork Basin, which includes Aspen, Colo. The plan shows ways to maintain or improve the existing water quality in the Roaring Fork, Frying Pan and Crystal rivers and includes a monitoring program. Wright-McLaughlin Engineers of Denver prepared the report for the Colorado Department of Health.

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The Montana Stock Growers Association has gone on record in opposition to two additional power generating units at Colstrip. Montana Power Co. is now building the first two units of 350 megawatts each. The company has requested permits to build two more of 700 megawatts each. The Stock Growers said they favored the third and fourth units to be built at "power load centers."

* * *

Idaho Rep. Steven D. Symms said he was "sickened" and "discouraged" by a revival of the Land Use Planning Act. The act was voted out by an 8-7 vote of the House Rules Committee last week. The Committee voted to table the bill 9-4 back in February. Symms said, ". . . this collectivist idea has cropped up again from the same rancid intellectual soil. I'm just sick about it."

Thoughts from the Distaff Corner

by Marge Higley

When we started, we weren't the least bit sure that we would be able to get all the way into our own personal "Shangri-la." Spring comes late, so high in the mountains, and Routt County (Colo.) had a near-record snowfall last winter. But the day was warm and sunny so we (my sister Pearl and I) tossed an overnight bag, a couple of warm jackets, and some food into the back of her little red VW and set out.

At Baggs, near the Colorado-Wyoming line, we were told that the road up the Little Snake River was passable only with 4-wheel-drive vehicles, so, reluctantly we took the longer way, through Craig, to Steamboat, then up the Elk River road to Hahns Peak.

The fields on either side of the bank-full river were turning spring green — a beautiful splash of color against the backdrop of snow covered mountains. As we climbed higher we noted that the aspens were still stark and bare in their winter dress, but the willows were showing pale tinges of yellow-green. Snow lay in deep drifts under the spruce and pines on the hillsides.

When we came to our turnoff we were delighted to see that the road, although muddy and rutted, was clear of snow. We learned later that only two weeks ago the snowplow had cut its way through 10-foot drifts. At her cabin, we made short work of opening the shutters and getting the water and lights back into operation. Then we went for a walk.

In the meadow, last summer's knee-high tangle of grass now lies flat and grey, pressed against the ground by the heavy winter snows. As we carefully picked our way over the wet spongy earth, it was almost impossible to keep from stepping on some tiny pale-yellow flowers, and some equally tiny blue ones, that were blooming practically at ground level. I had the feeling that they were trying to make the most of their brief moment of spring-time glory (before being overshadowed by the taller, brighter growth of summer) for whatever eyes were lucky enough to behold them. Under the evergreen trees, the pinkish-green shoots of Alpine lilies had sprung up at the very edges of the snowdrifts. And where the sun had melted the snow earlier, many were in full bloom, their yellow petals curling backward like little elves' caps.

Back at the cabin we sat on the porch and watched a couple of grey squirrels busily darting up and down the tree trunks. We saw lots of robins and red-wing blackbirds, a few white crowns, and one lone humming bird hovered hopefully where the feeder had hung all last summer. And a most welcome sight was the pair of sandhill cranes feeding in the willows near the creek. We didn't see any deer, but knew that they were around because there were lots of tracks in the soft dirt.

After a late supper we put on our warm jackets and went outside to stand for a few minutes, savoring the smells and sounds of the pitch-black night. The dank, pungent odor of wet earth intermingled with the spicy aroma of the evergreens and the smell of wood burning in the fireplace. And in the meadow, hundreds of frogs raised their voices in chorus, accompanied by a steady "whrush-whrush" as water from the melting snowbanks rushed noisily down every little slope and gully toward the creek.

Later, we sat in the cozy living room and watched the flames dancing around the logs in the fireplace. Tomorrow we had to return to "civilization," but for now we were content to relax, and contemplate the experiences of today.

Isn't it odd that sometimes a day that starts early and ends late can still make you wish that there were more hours in it?

"Bighorn!" has been selected as the best western documentary film of the year at the Western Heritage Awards of the National Cowboy Hall of Fame. It has also won a number of other awards in its field. The film is a 26-minute color portrayal of the life history and ecology of the Rocky Mountain bighorn sheep. It concurrently depicts the birth and growing up of a lamb and the growing old and dying of the old ram of the band. The film stresses the fact that, "Man has finally come to realize that the bighorn sheep, and all these other wild things, are his responsibility. They are in our trust. And we now have a choice. We can conserve them wisely, or wipe them from the face of the earth." Prints of the award-winning film are available for rental at $25 from Stouffer Productions, Box 15057, Aspen, CO 81611.

Salt Lake Shelters Pelicans

by Dr. Florence Krall

During the fall and winter months the island is bleak and empty, but commencing in March and continuing until September, it pulsates with one of nature's mysterious phenomenon. The Island is Gunnison, in northwestern Great Salt Lake. The biological phenomenon is the breeding of the white pelican, **Pelicanus erythrorynchos.**

Gunnison Island with its barren Mississippian limestone and sparse vegetation provides a near-perfect site for the nesting of the white pelicans. The pelicans nest and raise their young in dense, communal colonies. The females lay their two eggs on the bare ground in depressions or heaped up debris. Both sexes share incubation, brooding, shading, and feeding tasks.

Unlike most other birds, the pelicans are practically voiceless and non-aggressive. Their passive and communal tendencies make them easy prey. Thus, isolated Gunnison Island provides an ideal habitat free from mammalian predators that could threaten the colony.

The island is within flying distance of fresh water marshes where the white pelicans forage for carp, their main supply of food. A single bird may fly from 80 to 100 miles each day in search of food.

In 1971 the white pelican was placed on the list of protected species of North American birds by an addition to the Migratory Bird Treaty. Recent evidence has shown that power lines are claiming the lives of pelicans as well as those of hawks and eagles.

According to Fritz Knopf of the Utah Cooperative Wildlife Research Unit, the white pelican colony on Gunnison Island is the third largest in the United States. Colonies at Chase Lake in North Dakota and Pyramid Lake in Nevada are the only colonies that surpass the Gunnison Island colony in numbers.

The colony on Gunnison Island is the largest in the intermountain states and produces 90% of all the young in this region. Two small colonies of about 300 adults are found at the Riverside Reservoir in Colorado and on the Molly Islands in Yellowstone Lake. Mr. Knopf says his studies show the Gunnison Island Colony to be stable with approximately 5,200 adults producing about 2,250 young each year.

The greatest threat to the white pelicans, states Knopf, is disturbance by man. Unlike the brown pelican, the white pelican has not yet shown reproductive decline due to DDT. Direct human disturbance and habitat deterioration provide the greatest threat to the white pelican.

The pelicans are especially susceptible to disturbance during nesting, the month-long incubation period, and the first weeks after emergence of the young. If disturbed at these times, the adults may abandon their nests completely or remain away for several hours exposing eggs or young to sun, chilling, or seagull predation. Since the early '30s, interested citizens and conservation groups have continuously sought wildlife refuge or sanctuary status for Gunnison Island. In the fall of 1972, the Gunnison Island Committee was formed with the intent of seeking protection for the white pelicans.

Although some progress has been made, the committee continues to be very concerned about Gunnison Island. Increased gas and oil exploration on the Great Salt Lake, increased use of the lake by recreationists and industrial and chemical corporations, and exploitation of the island by its owners are all areas of concern.

Heronemus, Windmill Captain

by Bruce Hamilton

"I am convinced that the published U.S. Energy Policy, which places primary emphasis upon expansion of combustion and fission processes, is fundamentally in error insofar as the long-term survival of mankind on earth is concerned" says William E. Heronemus, the captain of wind power advocates in this country. "Rather than simply complain about the processes which I think are wrong, I have at all times disciplined myself to show that there could be alternatives, and that they would bring us significant net advantage rather than a reduced quality of life."

Heronemus is a professor of civil engineering at the University of Massachusetts. A retired naval officer who managed the design, construction and repair of submarines in the service, Heronemus now teaches and does research in ocean engineering. For the last four years he has become engrossed in alternative energy sources, particularly those requiring ocean sited power plants — wind power and power from ocean thermal gradients. These two sources "could satisfy all the projected energy requirements of the 21st century," according to Heronemus.

"I personally am opposed to the waste of energy that occurs in this country and I am concerned about the rate at which irreplaceable fossil fuels are being burned. But I am equally concerned about the consequence to our domestic and international system that would accompany any sizable decrease in energy consumption. All the above has led me to the conclusion that solar energy alone could and should become the mainstay of our domestic and global energy system, starting just as soon as we can make the arrangements," says Heronemus.

"If all of mankind persist in their planned growth of energy demand for another 26 years, at that point in time the total world's annual energy consumption will be of the order of one quintillion (10 to the 18th power) British thermal units (BTUs) per year. To achieve that rate of energy release by combustion and fission processes, we will be clawing apart the earth to obtain coal, we will be at the point of maximum feasible production of petroleum and gas resources, we will have a pyramid of high level radioactive wastes still above ground in South Carolina waiting for that solution to their safe storage, a pyramid that would surpass King Tut's wildest dream, we will have very little clean air, very little blue sky and very little clean, cool ground water left, and we may well have created irreversible weather modification," says Heronemus.

Wisconsin, Minnesota, Michigan, Montana, and the Dakotas could harvest a valuable second crop from windmills along fencelines and above the forests.
William E. Heronemus

Since the beginning of recorded history, man has devised wind powered systems to do useful work. A Chinese vase dated 4500 B.C. shows a vertical axis windmill not too different from some operating in 1974, according to Heronemus. When Genghis Khan captured Persia, he took millwrights back to China with him to set up windmills. Such windmills are still in common use in China to pump water for irrigation. Since patents were started, over 3,500 "windmill" patents have been issued.

Most of the wind machines developed over the centuries have been forgotten. To many Americans the broken and abandoned wind pumps found on old ranches and farms are the only reminder of this forgotten energy source. Yet over the past few years a new interest in wind power is picking up, and this is largely to the credit of Heronemus. Wind power was abandoned because it was unreliable and expensive when compared with fossil fuels. Now Heronemus is showing the country that wind power is reliable and competitive. Its pollution-free and inexhaustible nature are added attractions.

Nobody makes the (wind power) hardware yet, but that's more plus than minus. If New England would get with it, she could free herself from the fuel merchants, reassert her former economic independence, get all the energy she needs without pollution, and develop a new industry that could provide the manufacturing jobs she so badly needs.
William E. Heronemus

"A mature wind power technology, albeit circa 1945-1950, exists: assembly line production of components could start in a relatively short time. Wind power could impact the U.S. energy market starting in as few as four years if treated as a national priority goal," says Heronemus.

"Many significant wind power development programs were mounted in different countries in the past — none could ever show a significant economic advantage for wind power generated electricity except for very remote regions where oil or coal transportation costs dominated the cost of delivered electricity. The United States is now entering an era where projected fuel costs suggest wind power may have a significant economic advantage," says Heronemus.

"The average revenue (1976) required per kilowatt hour of electricity delivered by this (wind) system on demand was calculated to be 33 mills. In 1971 that was not competitive, and the official predicted price of electricity in New England was projected downward. In 1973 the 33 mills is competitive and the actual price of electricity is headed upward," says Heronemus.

"The resource is huge, and it can be tapped by relatively simple machines in large numbers

(Continued on page 16)

Eavesdropper

LOONEY LIMERICKS

by Zane E. Cology

Are Wyoming's resources your goal?
Try our Wind, instead of our Coal —
We've plenty to spare,
And we're willing to share,
So we won't be just one big black hole!

Scientists report that about 30,000 gallons of water a year are used to water the average lawn in a humid area of the United States. A lawn in a dry region, such as Colorado, can soak up 90,000 gallons.

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The Environmental Protection Agency says the packaging industry now uses 50% of all U.S. paper production, 87% of the glass, 11% of the aluminum, 20% of the plastics, and about 9% of the steel. Packaging has increased by one-third since 1958. It is estimated that if packaging could be cut back to the 1958 level, the annual energy equivalent of 100 million barrels of oil a year could be saved. Most packaging results in increased solid wastes.

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The National Center for Health Statistics reports birth and fertility rates in the United States dropped to their lowest points in history last year. The national total fertility level dropped to 1.9 children per family. It was the second consecutive year that rates had fallen to record lows.

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A once-a-year birth control vaccine is a possibility. That is the announcement from a Ohio State researcher, Dr. Vernon Stevens. He hopes to begin clinical trials of the vaccine in 1975 but said it probably would not be approved for use for another eight years. The vaccine is derived from a female hormone.

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The Environmental Protection Agency has suspended sales of all pesticide aerosols containing vinyl chloride which are used in homes, food handling establishments, hospitals, or other enclosed areas. The vinyl chloride is a gaseous chemical strongly suspected of causing a rare liver cancer.

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One of the Danube River's loveliest stretchs, some 60 miles upstream from Vienna, Austria, is threatened by a dam and hydroelectric project. Some 20-odd miles of a region known as Wachan is to be dammed for the requirements of international cargo shipping and power generation.

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New York City's 30,000 tons of daily trash and garbage have suddenly become valuable. Waste paper and junked vehicles are particularly prized. Consolidated Edison is also buying wastes which can be mixed with oil and used as a power plant fuel. Even strip mine operators in Ohio and Pennsylvania want trash for reclamation fill.

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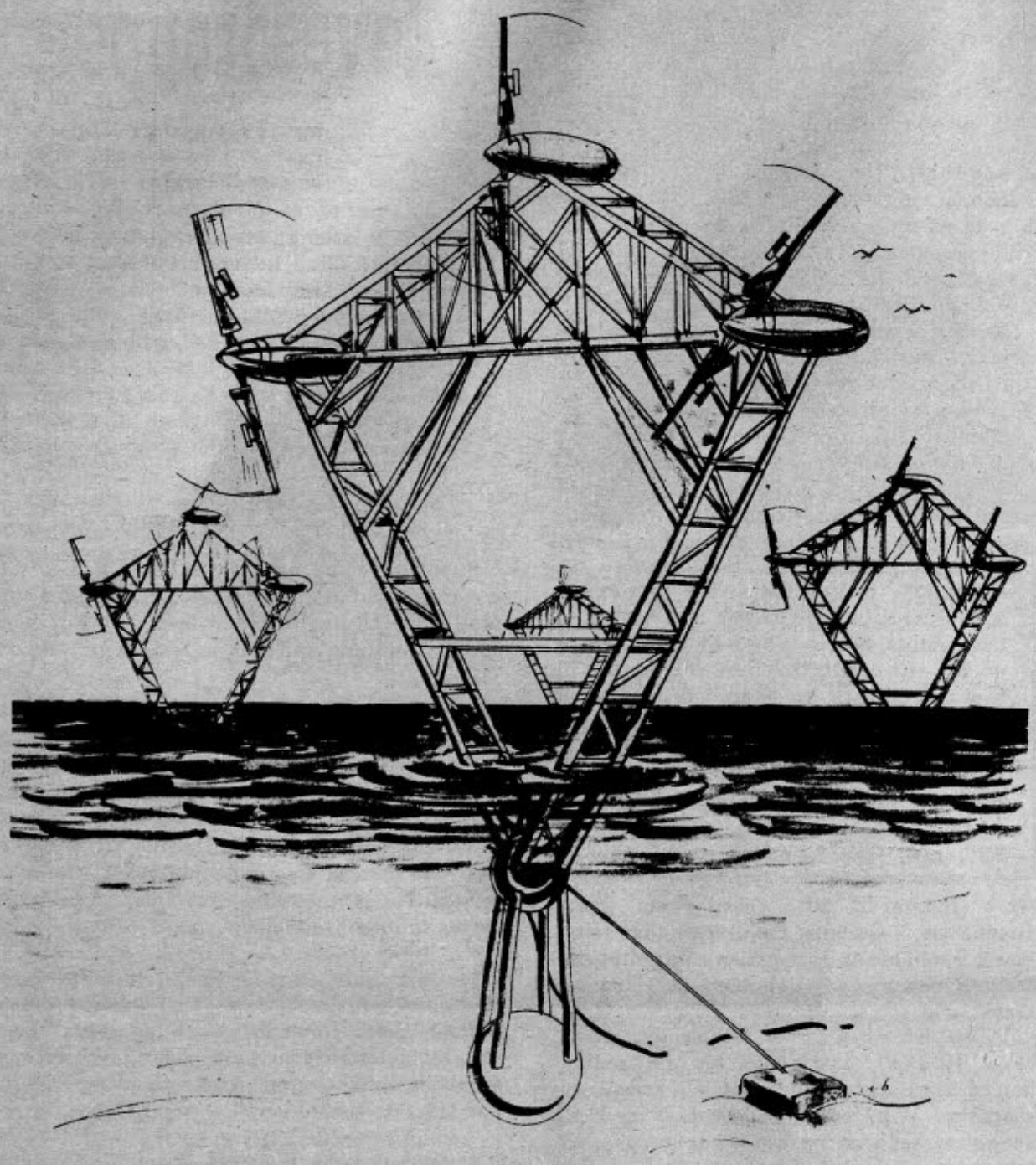
Sewage treatment sludge may someday have both economic and environmental benefits for society, says EPA Administrator Russell Train. The benefits can't come too soon since Train points out that the nation's sewage treatment plants are now producing about 20 thousand tons per day. He says the sludge could be particularly useful as a soil conditioner and as a constituent of organic fertilizer. Methane gas can also be produced from it.

Heronemus...



An artist's conception of William E. Heronemus' Offshore Wind Power System. Hundreds of these towers anchored off the New England coast could tap a "pollution-free" renewable energy resource to supply all of that region's energy needs. Storing power for windless days could be accomplished by electrolizing sea water to produce hydrogen. What about visual pollution? Heronemus says, "It would be no problem to locate the windmills ten or more miles off the coast out of sight from shore. The continental shelf off the New England coast gives ample room for hundreds of them."

(Continued from page 15)

sharing the existing scene, or by large wind barrages flung across the prevailing winds," says Heronemus. "Wind generators in vast numbers can be located without hindrance to the current use to which land is being placed. Grazing land, tilled land, either along fence rows or throughout the fields themselves, could carry large numbers of generators. The air space over secondary roads, if oriented essentially normal to the prevailing wind, could carry tens of thousands of miles of cable suspension systems with no adverse effect on the highways below. New tall buildings, if set far enough apart, could in some locations carry big enough wind power arrays to make them self-dependent for energy. The hundreds of thousands of square miles of forest land, particularly the pulpwood farms and other commercial forest lands, could be surmounted by wind power arrays. The vast expanse of East Coast continental shelf could support huge arrays of wind power extraction machines."

To insure moderate to strong, steady winds you have to reach up for them. The velocity of the wind increases logarithmically with height above ground. "Going up 100 to 1,000 feet in the air immediately presents two problems: (a) large numbers of wind generators can become objectionable to the human eye, and (b) the taller the support the greater the cost. Here one must face harsh reality: if lofty, visible wind generators are going to be objectionable in any area, then the entire proposition must be abandoned forthwith. Practical wind power systems simply can't assume a low profile. And if the towers cost too much, again, forget it. The product is up there: if it can't be reached economically, it can't be sold," says Heronemus.

"I have no aesthetic ability at all unless it involves the topsides of a ship," says Captain Heronemus. "I can do pretty well designing destroyers and battleships to make them look nice, but everything I do turns out looking like a warship. I'm sorry, but that's my trade."

"You should not confine yourself to a low number of wind machines on an array," says Forrest Stoddard, one of Heronemus' graduate students. "You can go up to 60 and even to a 100 per tower array. The larger the number of windmills on the array, the lower the cost of the entire system." Individual towers would be a

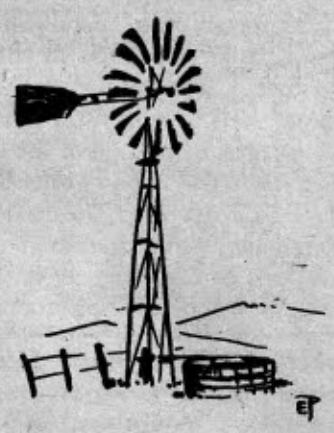
"Where the winds are light to moderate, arrays of large numbers of small machines can produce a significant annual yield whereas larger machines might not. Where the winds are moderate to strong, larger machines are more economic," says Heronemus.

Heronemus is also concerned about the earth's heat budget as it is influenced by energy conversion. "Wind power is using the energy of the sun almost direct and, as such, doesn't add to the heat of the earth or the pollution of the atmosphere, unlike the burning of fossil fuels or nuclear power," says Heronemus.

His concern is that the earth may be nearing the limit of heat it can absorb without major climatic changes. With over 80% of the world's ice locked up in Antarctica, even a slight increase in world temperatures could speed melting. Some scientists say the climate is already heating up and cite melting glaciers in the Alps and the appearance of warm water fish way out of their range. A switch to wind power could slow or stall the trend.

Despite Heronemus' predictions of cheap, plentiful, non-polluting renewable wind energy, there may not be a windmill in your immediate future. Heronemus reports that the Atomic Energy Commission feels wind power is a 21st century power source. He says this may be a self-fulfilling prophecy since only two per cent of the commission's research budget goes into solar related projects. "We need an Argonne or Oak Ridge for solar energy," says Heronemus.

"In the United States, we expect the federal government to develop energy sources. Unless Uncle Sam does it, it won't be done, since there aren't enough entrepreneurs in solar energy as a commercial venture. Private industry isn't willing to get involved so far, since no one can corner the market on the sun and the winds," says Heronemus.



In the NEWS