

SPECIAL ISSUE

High Country News

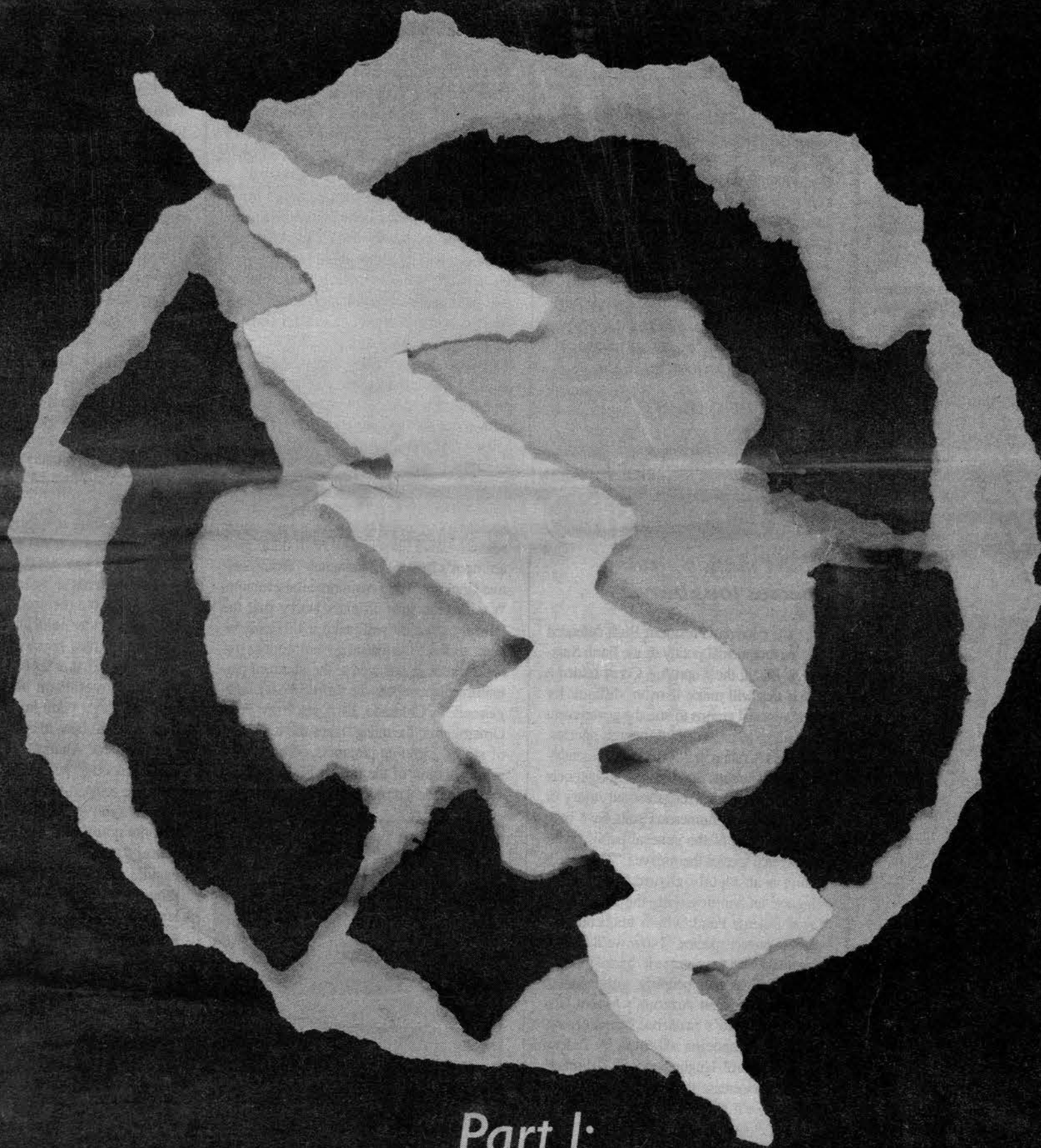
June 29, 1992

Vol. 24 No. 12

A Paper for People who Care about the West

Three dollars

The Electric Revolution



Part I:

Conservation comes of age

Dear friends,



HIGH COUNTRY NEWS

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Does minutia matter?

Reader Lorna Carson of Wyoming wrote to say the paper was fine except for page two "about who stopped by in Paonia." We wonder if she is right: Are we boring people with news of visitors to a small newspaper in an even smaller town? If we reach a conclusion, we'll pass it on, right here in "Dear Friends."

Meanwhile, intern Michelle Riley happily left us to take a permanent position with the Paonia district office of the Forest Service.

Another Paonia resident, Verla Clemens, made the *New York Times* recently with news of her desire to sell a gold-mining ghost town called Wide Awake. At 9,700 feet near Central City, Colo., the town she owns is still on state maps, but no one has lived there for decades, says Verla.

We sometimes fear this pleasant but remote burg has been discovered. Several hundred BMW motorcyclists are due to convene in the Paonia park, and now the 20,000-strong Rainbow Family of former or current dropouts from American culture is streaming into the area.

Signs are up in food and other stores saying "We have no public bathrooms," and the like. Town meetings with or without the family are packed, and no one seems able to concentrate on anything else. Ross Perot? Who's he? In Paonia the concern is nudity in the laundromat, drugs, and lots of feet tromping around high-country Forest Service land. We are not immune to this fascination (see page 3).

Passing through

In other Paonia news, visitors to the

HOTLINE

Court makes saving species tougher ...

The same day President Bush defended U.S. environmental policy at the Earth Summit in Brazil, the Supreme Court issued a ruling that will make it more difficult for environmental groups to sue the government for failing to protect endangered species. Last week's ruling, a 7-2 decision, essentially says that groups and individuals can only file suits if they suffer personal injury or harm. Currently, numerous suits have been filed on behalf of the general public or the endangered species themselves. "The court's ruling is absolutely absurd," says Mark Hughes, an attorney with the Sierra Club Legal Defense Fund, which frequently litigates to protect species. "Now we'll have to litigate on what the nature of 'harm' means." The group has suits pending with regard to the red squirrel on Arizona's Mount Graham, Colorado's razorback sucker, and endangered species affected by federal predator control. Hughes adds, "The ruling is going to increase the cost of our litigation because we'll have to fight off a flurry of motions about our standing."

... and also limits states

A recent Supreme Court decision could compromise a state's ability to make the federal government pay for polluting energy and military sites. The court ruled 6-3 that Ohio may not penalize the Energy Department for past contamination at the agency's Fernald uranium-processing plant near Cincinnati. The ruling still allows states to impose sanctions to force federal agencies into compliance with state environmental laws, and states may also seek court orders to halt continuing pollution. But the justices prohibited fining federal agencies for past



Rita Clagett

These signs were put up at a local diner when the Rainbows came to town

HCN office included Gregor Gardiner, a teaching assistant in history at the University of Colorado, Boulder; Chuck and Joanne Howe, also of CU at Boulder; recent Hamilton College graduate Morgan Lee, who is job hunting; Kate Hirson and Peggy Daniel of New York, who are both in the film and television business; Kevin McKibbin and Mary Gower, on their way to Crested Butte; and Greg Anderson, a high school teacher in Oracle, Ariz., who was seeing western Colorado on vacation. Jim Horvath, a carpenter from Denver, was also here while on vacation and recalled the first Rainbow Family gathering 20 years ago. He was not interested in the reunion. But he told us of a T-shirt he glimpsed at a Grateful Dead concert. It read: "Get your own band, kid."

Gene Ramsey also stopped by. He says he's retired but showed us post cards featuring his brilliant color photos of wildflowers of the Rockies. He can be reached at Box 242, Hamilton, MT 59840.

Lest we forget...

Tim Crawford was the fine photographer of Lorraine Mintzmyer in the last issue. Thanks to Alan Fisk-Williams, who sent us a Japanese flag to help decorate the office.

Congratulations to reporter Michael Milstein of the *Billings Gazette*, who writes for HCN frequently. The Wyoming Wildlife Federation recently gave him its "Communicator of the Year" award for covering environmental news with thoroughness and passion. To Mick Geesling and James Youngdahl of New Mexico, Tom Meacham of Alaska, and several other catchers of typos, we surrender! But we already said that Sen. Dennis DeConcini's state is Arizona. Or is it Texas?

Finally, we wanted to pass on a letter from Harry Taylor in Wyoming, to the *Jackson Hole News*: "I am not retired and don't plan on it till they pat me in the face with that spade."

— Betsy Marston for the staff

abuses. The majority opinion, written by Justice David Souter, said the federal government's "sovereign immunity" from punitive fines applied to environmental clean-up. Washington state officials worry that the Fernald decision will make it difficult for them to force the federal government to pay for decades of pollution at the Hanford plutonium plant, reports the *Seattle Post-Intelligencer*. In Colorado, EPA attorney Peter Ornstein said the ruling "takes the teeth out" of states' clean-up programs, although the rehabilitation of the Rocky Flats Nuclear Weapons Plant probably won't be affected.

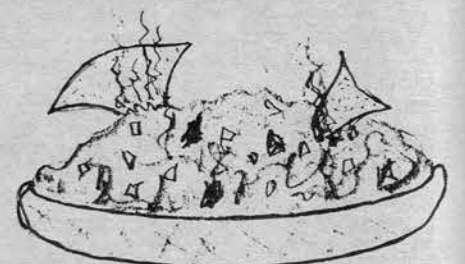


Bison will still be killed

A federal appeals court refused to halt the killing of bison that move out of Yellowstone National Park onto private and Forest Service land in Montana. Killing adult bison outside the park is justified by the possible dangers of bison spreading brucellosis to cattle and causing property damage, said the 9th Circuit Court of Appeals. According to

the court, killing stray bison has not diminished the park's bison population, which number between 2,500 and 3,000. Of the three main herds in Yellowstone, the killing affects only the northern herd, with its tendency to wander north out of the park. That herd, which now numbers 600 to 800, will be maintained at at least 200 bison, according to a government plan upheld by the court. Whether bison infect cattle with brucellosis is still open to debate (HCN, 5/4/92). The Fund for Animals had challenged the killings in court because it said not enough evidence existed that bison spread the disease. Wayne Pacelle, director of the fund, said the court's decision vindicated "19th-century attitudes toward bison." Bison, Pacelle said, "don't pose any substantial danger to cattle — maybe to fences — but knocking down a fence doesn't seem to warrant capital punishment."

BARBS



Rita Clagett

Get it straight, Rockwell, guacamole's spicy but it doesn't burn.

A federal judge fined Rockwell International Corporation for 10 felony and misdemeanor violations at the Rocky Flats nuclear weapons complex near Denver. The counts included a 1989 incident in which plant officials told the public that a spill of toxic chromic acid was guacamole from the employees' cafeteria, reports the *Chicago Tribune*.

WESTERN ROUNDUP

Cultural diversity comes to small town

PAONIA, Colo. — A brand-new T-shirt for sale in this town of 1,500 reads, "Don't shoot! I'm a local hippie." Other new sights include teens with noserings and grizzled men with salt-and-pepper braids gathered in front of the pay phone, the liquor store and the Cave Cafe. At the post office, if you're not smelling woodsmoke from the patchwork stranger in front of you, you're overhearing neighbors complain, "We're being damn invaded."

For many residents, this is their first experience with street beggars and requests for "spare" change.

The new people around town introduce themselves as Coyote, Red Moon Song, Water Singing on the Rocks. They are part of the Rainbow Family, gathering for its 20th anniversary "World Peace and Healing Festival" in the Gunnison National Forest, 30 miles outside of town. TV and newspaper reporters from around the state are trickling in behind them.

The expected group of 20,000 would double the county's population, and if the gathering exceeds Grand Junction's 33,000 residents, the tent village at about 10,000 feet will become the largest city on the Western Slope. Some members arrived early to set up camp near Overland Reservoir on Grand Mesa, but most aren't expected until the seven-day reunion begins July 1.

Local meetings have been lively. At a get-together for concerned parents, one father complained that his teenagers had taken food up to the camp and tried to barter it for "a whole smorgasbord of drugs." At another town meeting, called by Rainbow members to address concerns about the ensuing culture clash, one resident said, "Face it, the people you're bringing with you are the dregs of society. Are you going

to take them away when you leave?"

Little White Owl replied with passion: "Of course we will. People who can't go anywhere else can come to us and be welcomed. We will feed them and love them and accept them when you cast them out." Rainbow members are said to range the economic spectrum from physicians to homeless alcoholics. They live in small towns, cities and communes in every state and many countries.

When a local woman complained that the national forest "is our playpen, and we can't enjoy it this summer," Forest Service officer Warren DuBois replied, "There are other parts of the forest you can use for one year."

A number of residents commented on the apparent double standard that allows the Rainbow family to gather on Forest Service land without a permit while everyone else is required to get permits for long-term camping and cutting firewood. DuBois said that in 1988 a federal judge in Texas upheld the

family's constitutional right to gather on public land without a permit, based on a technicality in Forest Service regulations.

An older woman who recently retired to Paonia, reacted more positively. "I'm thrilled you all are here." She held up the latest *Utne Reader* with a cover on tribal living. "This is what it's all about — you all are great."

At least three ranchers scheduled to graze their livestock near the reservoir disagree. They've had to work out special arrangements with the Forest Service to adjust the timing and location of their pasture rotations, said officer Harry Shiles.

Overland Ditch Company stockholders, who own the water in the reservoir, worry that the gathering will pollute and deplete their irrigation water. "Our watershed is our lifeblood," said one farmer. "We've kept mining and logging companies out, why can't we keep these people out?"

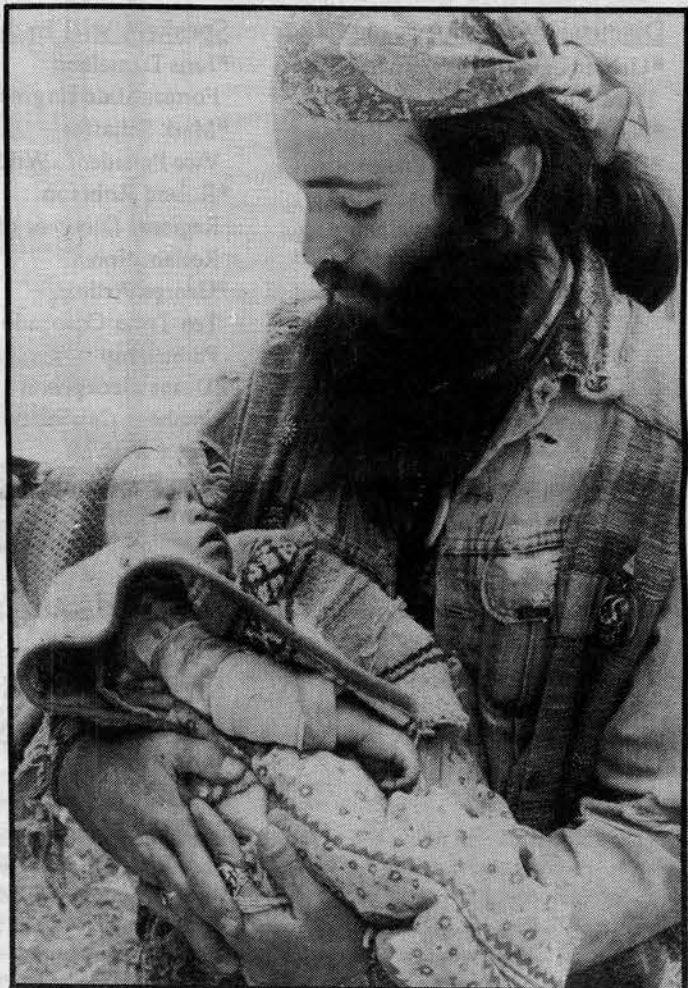
In an agreement between Rainbow and Overland representatives, company president Pete Kasper donated his six-acre-foot share from the reservoir to the Rainbow Family to end the conflict over water use. To allay shareholder concerns about pollution, county health officers are monitoring water quality daily.

Forest Service soils scientist Terry Hughes said the long-term effects of 20,000 people defecating in the woods should not be devastating. "If they dig their latrines where we suggest, the waste should leach into peat bogs where it can be broken down and not affect groundwater," he said. His main concern was that the family keep its waste covered, to keep flies from landing in the latrines and then on food in the kitchens.

Rainbow members invited area residents to visit their camp, but urged them to leave their guns at home. Free food and hugs were promised to everyone who makes the trek. The festival culminates in a July 4th sunrise-to-noon silent meditation for peace, which ends with everyone joining hands in an "om" circle, said Badger.

At least a few Paonians can't resist the opportunity to time-travel back to the '60s, and plan to visit the site, which features a Quit Yer Bitchin' Love Light Kitchen. A large meadow, with a spectacular view of the nearby peaks, will burgeon into a tipi and tent village by July. One businessman said, "I missed Woodstock, I'm not going to miss this."

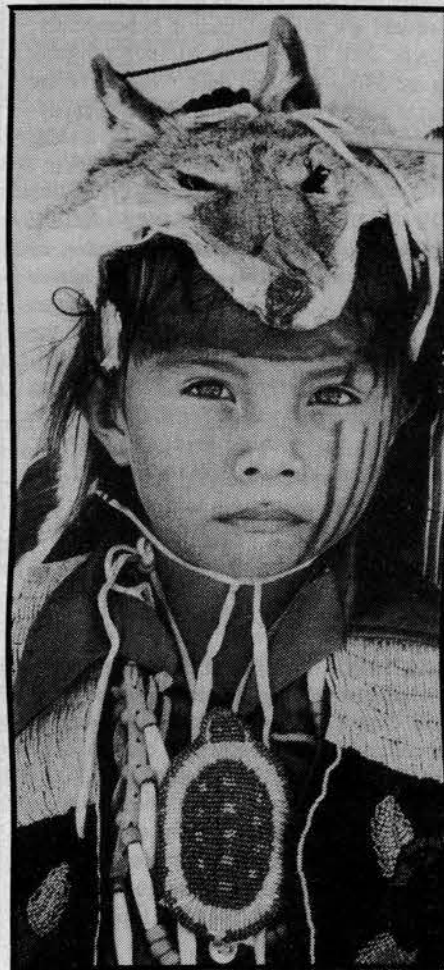
— Rita Clagett



At Popcorn Palace, Firecatcher holds Forest Moon, a baby he helped deliver at last year's Vermont gathering

Rita Clagett

HOTLINE



John Running

Eternity DuBray

An image of Eternity

When Eternity DuBray, an Oglala Sioux child, posed for photographer John Running in 1984, he did not expect his picture to appear years later in an MTV video, on record album and compact disc covers and in promotional products for the heavy-metal band, The Cult. Now, Eternity and his family have filed a \$60 million lawsuit against the Flagstaff-based photographer, the band and Warner Bros. Records. The suit claims the photo was used without permission and has damaged Eternity and invaded his family's privacy. In the video, Eternity's image appears burning. Running, who is known for his stunning portraits of Native Americans, says he received verbal consent from the subject.

Parker decision is ambiguous

A federal judge ruled in early June the federal government is not responsible for the loss of 620 cattle, worth \$1.1 million, that a Wyoming rancher claims were infected by wildlife straying off federal reserves (HCN, 3/9/92). But Judge Clarence Bremmer said federal land managers should have done more to rid wild elk and bison herds of brucellosis in Yellowstone and Grand Teton national parks, as well as the nearby National Elk Refuge. Brucellosis is a disease that can cause domestic cows to abort. He ruled wildlife from those reserves probably had infected cattle owned by the Parker Land and Cattle Co. of Dubois, Wyo., and that the government should not "do nothing" to prevent such problems. Parker, however, had not proven that government negligence was directly responsible. Both ranchers and land managers have watched the case closely, some suggesting a ruling for Parker would be reason for the government to bar livestock from public lands. The decision may cast doubt on Montana's policy of killing bison that leave Yellowstone National Park. But Brimmer came down solidly on neither side. While chastising the government for negligence, he also faulted Parker for not protecting his cattle through vaccinations. Any rancher grazing on public lands "accepts the risk that many dangers may be found on a grazing permit," Brimmer said.

Pesticide firms seek to stop local control

The Federal-State Pesticide Regulation Partnership Act of 1991 is one of those quiet little bills no one hears about until it is signed into law. A nice piece of work for chemical companies, it would take away the right of local communities to regulate pesticides in their own backyards.

"It's about as anti-democratic as you can get," says Becky Riley of the Northwest Coalition for Alternatives to Pesticides, "and the most serious threat to local pesticide reform since NCAP's founding in 1977."

The bill is a response to a Supreme Court ruling last June that affirmed the right of cities, counties, school districts and other local government units to decide how pesticides could be used within their jurisdictions. "The Supreme Court decision made it clear that we could end up with a confusing patchwork of regulations," explains an aide to Oregon Rep. Mike Kopetski, one of the

bill's co-sponsors. "This could make business difficult for some people. In our district, for example, we have several nurseries whose operations cross jurisdictions. We want to make the regulations statewide."

If passed, says NCAP, the bill would overturn about 100 existing local ordinances. Notification laws, which require pest control operators to post signs when they spray, would be struck down. Pesticides would be exempted from local hazardous materials regulations. In its original form, the bill would also prevent communities from adopting least-toxic pest control policies for their grounds and buildings. Integrated Pest Management programs adopted by many school districts and parks departments would be tossed out. This last provision, says an aide to Kopetski, was too broad for the congressman and may be changed.

But even if modified, says NCAP's Riley, the bill weakens what safeguards exist against toxic pesticides. She points to the pesticide spill last year that sterilized 45 miles of the Sacramento River, the deaths of more than a million fish from agricultural runoff in Louisiana, and the 84,000 pesticide poisonings reported each year.

"Federal and state laws are ineffective," she says. "There's no substitute for well-informed local regulations."

The bill is now working its way through congressional subcommittees. Almost half the 52 members of the House Agriculture Committee are co-sponsoring the bill, but pesticide activists still hope to derail it before it gets to the House floor.

"If the bill gets out of committee," warns NCAP's Norma Grier, "it'll be hard to stop."

— Jim Stiak

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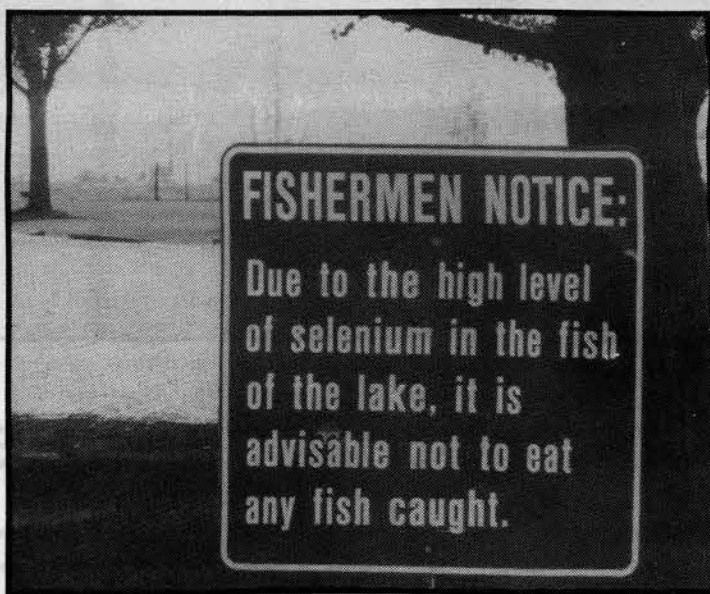
COLORADO'S ANNUAL WATER REUNION

It must be summer, since the 17th annual Colorado Water Workshop is set for July 22-24 at Western State College in Gunnison. Speakers and discussions will focus on three themes during the conference: The law of the river, changing demands in the basin, and proposals for changing institutions. Speakers include Mark Schaffer, vice president of The Wilderness Society; Judith Jacobsen, assistant professor of geography at the University of Wyoming; Jack Ross, chairman of the Upper Colorado River Commission; Duane Georgeson from the Metropolitan Water District of Southern California; and George Arthur, vice chairman of the resources committee, Navajo Nation Council. The registration fee is \$200, but three, expense-paid scholarships are available for grass-roots environmentalists. For general information call 303/641-2238. To apply for a scholarship, send a letter of request to: Lucy High, Director, Colorado Water Workshop, Aspinall-Wilson Center, Western State College, Gunnison, CO 81231.



MINING HANDBOOK

A new handbook prepared by the Land and Water Fund of the Rockies teaches citizens how to get involved in Colorado's mining permitting process. *The Citizen's Handbook on Mining in Colorado: A "How To" Guide Through the Mine Permitting Process*, presents the laws, procedures and regulations of mining in the state. Designed for people who want to understand, and perhaps to intervene in the mine-permitting process, this 26-page booklet outlines who's in charge of mining in Colorado, how mining is regulated, and how permitting a mine works. It also includes sections on strategies for public involvement, arguments to use, and people who can help simplify the complex system. For a copy, send \$1 to the Land & Water Fund of the Rockies, 1405 Arapahoe, Boulder, CO 80302 (303/444-1188).



A sign at Sweitzer Lake

TOO MUCH OF A BAD THING

Irrigation wastewater laden with high concentrations of selenium harms fish and wildlife in western Colorado, say government researchers. Selenium, an element found in shale layers and sand, can be deadly if ingested in high concentrations. The U.S. Geological Survey found selenium danger greatest at Sweitzer Lake in Delta County, a sink for runoff from the Uncompahgre irrigation project. For example, a six-ounce serving of catfish taken from the lake contained five times the amount of selenium allowed by the U.S. Department of Agriculture. The Uncompahgre project was also found responsible for elevated selenium levels in birds and fish at the Escalante State Wildlife area. Levels there matched those at the Kesterton National Wildlife Refuge in California, where birth defects among hatchlings are common. The 100-page *Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Gunnison and Uncompahgre River Basins and at Sweitzer Lake, West-Central Colorado 1988-89* is available from USGS Books and Open-File Reports Section, Box 25425, Mail Stop 517, Federal Center, Denver, CO 80225-0425.

GREEN WINGS

Pilots from around the country have volunteered their time and planes to fly free missions for environmental groups. In just over a year, the non-profit Environmental Air Force has organized nearly two dozen flights for groups including The Nature Conservancy and the Trust for Public Land, says director Alan Brecher. "All flights have been on the East or West Coasts because that's where the groups are," Brecher says. "But we hope to get the word out in the Rocky Mountains and the Midwest this summer, and eventually be of service internationally." "The pilots are people who say, 'I fly for fun, I'm flying anyway, how can I help the planet?'" Of the network's more than 70 members, most are pilots, some are professional photographers, and others support the group's efforts to assist environmentalists who can't afford costly aerial surveys or photos. For more information, contact Alan Brecher at 4101 Kelly Drive, Philadelphia, PA 19129 (215/951-0300).

GREEN FIRE

A new Wilderness Society publication called *Green Fire* packs four pages each month with news about the Endangered Species Act and the impending congressional debate over its reauthorization. The first issue, May 1992, offers a sampling of "Wise Use" groups that oppose the act, including the Desert Conservation Institute in Sacramento, which has ties to the mining industry, and the Environmental Conservation Organization, backed by the Land Improvement Contractors of America. In its reading list, *Green Fire* reviews a little known World Wildlife Fund publication called *For Conserving Listed Species, Talk is Cheaper than We Think: The Consultation Process Under the Endangered Species Act*. The publication analyzed Section 7 consultation from 1987-1991, and found out that out of 71,560 informal and 2,000 formal proposals, only 18 activities were cancelled because of potential adverse effects on endangered or threatened species. The journal also includes an overview

of the act's chances in Congress, a puzzling assortment of quotes from U.S. Fish and Wildlife Service director John Turner, revealing his equivocal stand on the act, and a calendar of relevant events, deadlines and expected decisions on listing proposals. For a copy of the newsletter, write The Wilderness Society, 900 17th St., N.W., Washington, D.C. 20006-2596 (202/833-2300).

— Rita Clagett

CANYONEERING

In 1987, Joe Bauman wrote a comprehensive book about Utah's San Rafael Swell (*Stone House Lands*, University of Utah Press). Now in 1992 comes *Canyoneering*, written by Steve Allen and with a foreword by Joe Bauman. While the two books are about the same area, and while both writers love the San Rafael Swell, they do not cover the same ground. Steve Allen spent the better part of a year walking and climbing down practically every conceivable side canyon; this book describes 63 of what he rates as the best hikes and alludes to scores of other options, some of them "intense." While this is primarily a hiking guide, it includes a narrative about the area and the importance of protecting it. Many of the hikes are included in the Utah Wilderness Association's wilderness proposal. The book can be obtained, autographed, for \$15 from the Southern Utah Wilderness Association, 1471 S. 1100 E., Salt Lake City, UT 84105. All proceeds will go to SUWA. University of Utah Press, Salt Lake City, Utah. Paper: \$15. 256 pages. Illustrated with maps and photos.

— Bert Fingerhut

SHOULD ANIMALS BE KILLED FOR FUN?

Citizens of tiny Nucla in western Colorado are getting ready to welcome sharpshooters and newshounds to the third annual Top Dog World Championship Prairie Dog Shoot, July 10-12. Some animal-rights activists are expected to show up, too. In 1990, 106 shooters blew away 2,956 prairie dogs in two days and ignored several dozen protestors. Last year, 100 contestants from 15 states killed 2,264 of the burrowing rodents and split more than \$10,000 worth of prizes. Protestors, however, skipped the scene. This year, a group called Prairie Dog Rescue of Englewood, Colo., is organizing a protest of the event, and another citizens' group is circulating petitions to put the issue of killing animals for fun on the Colorado ballot in November. "Body-count contests were illegal from 1951-1979, when the state statute was revised to protect only big-game animals from contest killing," says Ross Thenhaus, director of REBANCK, which stands for Restore the Ban on Contest Killing. His initiative would make it illegal to run a contest where "the intent or result" involves killing birds or mammals. REBANCK needs 80,000 signatures on petitions by Aug. 3 to qualify for the ballot. For more information, contact Prairie Dog Rescue, P.O. Box 8054, Englewood, CO 80110 (303/266-3687), or REBANCK, P.O. Box 440576, Aurora, CO 80044 (303/755-0722).



Russell Chatham/The Ninemile Wolves

THE WOLVES OF NINEMILE VALLEY

"They say not to anthropomorphize — not to think of them as having feelings, not to think of them as being able to think — but late at night I like to imagine that they are killing: that another deer has gone down in a tangle of legs, tacked in deep snow; and that once again, the wolves are feeding."

So starts *The Ninemile Wolves* by Rick Bass, an impassioned tale of wolves moving south from Canada into Montana. The Ninemile Valley is not far from Missoula, Mont., and except for its proximity to Interstate 90, "it is a valley perfectly suited to the wolves' survival." The Ninemile wolves might have had a chance, but of three adults, one was hit by a car on the interstate, one was shot and the other disappeared. Two of the six pups born in the valley survived and remained in the area. Three of them were shot; one escaped to an unknown fate. Bass tells of the wolves' arrival, deaths, births, travels, hunts, escapes and entrapments. Just as important to his saga are the people involved: two ranchers who learn to love the pack they watch daily in their hay field, the wildlife biologist who stays dedicated to wolf recovery regardless of political setbacks, and Bass himself, a Montanan who intertwines himself in the fate of the animals. He ends hopefully, though acknowledging that the enemies of the wolf are many and powerful.

"It'll break your heart if you follow this story too closely, and for too long, with too much passion. It's never going to end. At least, I hope it doesn't ever end. But as long as there are roads, and humans moving up and down those roads, there are going to be bleak, bleak moments, again and again."

Clark City Press, 109 W. Callender, Livingston, MT 59047. 162 pages. \$22.95 hardcover. Maps, photographs and the wolf pack's family tree.

— Caroline Byrd



Russell Chatham/The Ninemile Wolves

The Electric Revolution

For much of its first decade, 1970 to 1980, *High Country News's* primary beat was energy and the environment. The paper covered new power plants, coal mines and other development projects, and the staff eventually came to believe that unless the nation's appetite for electricity was curbed, the West as we know it would be buried under coal-fired power plants, coal-gasification plants, dams and transmission lines.

So, in the early 1980s, in an attempt to hurry the future, the paper ran numerous articles about renewable power and conservation. Those stories — portrayals of homemade solar heaters, experimental windmills, and adobe homes — were ahead of their time, and of reality.

In this issue and the next, the paper revisits conservation and alternative energy sources. *HCN's* special issues editor Steve Hinchman

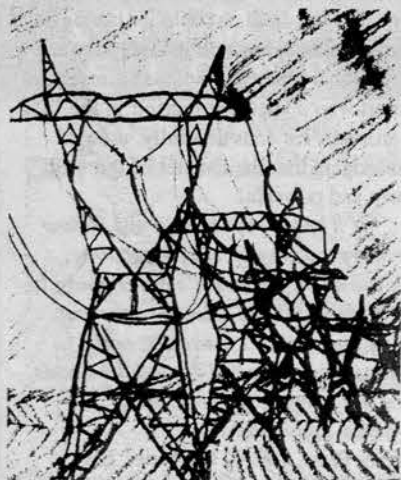
and 16 writers find that in the intervening decade a virtual revolution has occurred in energy technology.

Their articles about efficient lightbulbs, high-tech windmills, new solar panels and regulatory reforms show that conservation and renewable power have come of age. But equal advances in gas turbines, clean coal technologies and pro-nuclear legislation will make the impending energy boom a race between traditional power plants and conservation.

Huge economic and environmental consequences are at stake in this race. As in energy booms past, the West's future rests on how the nation decides to generate and use electricity.

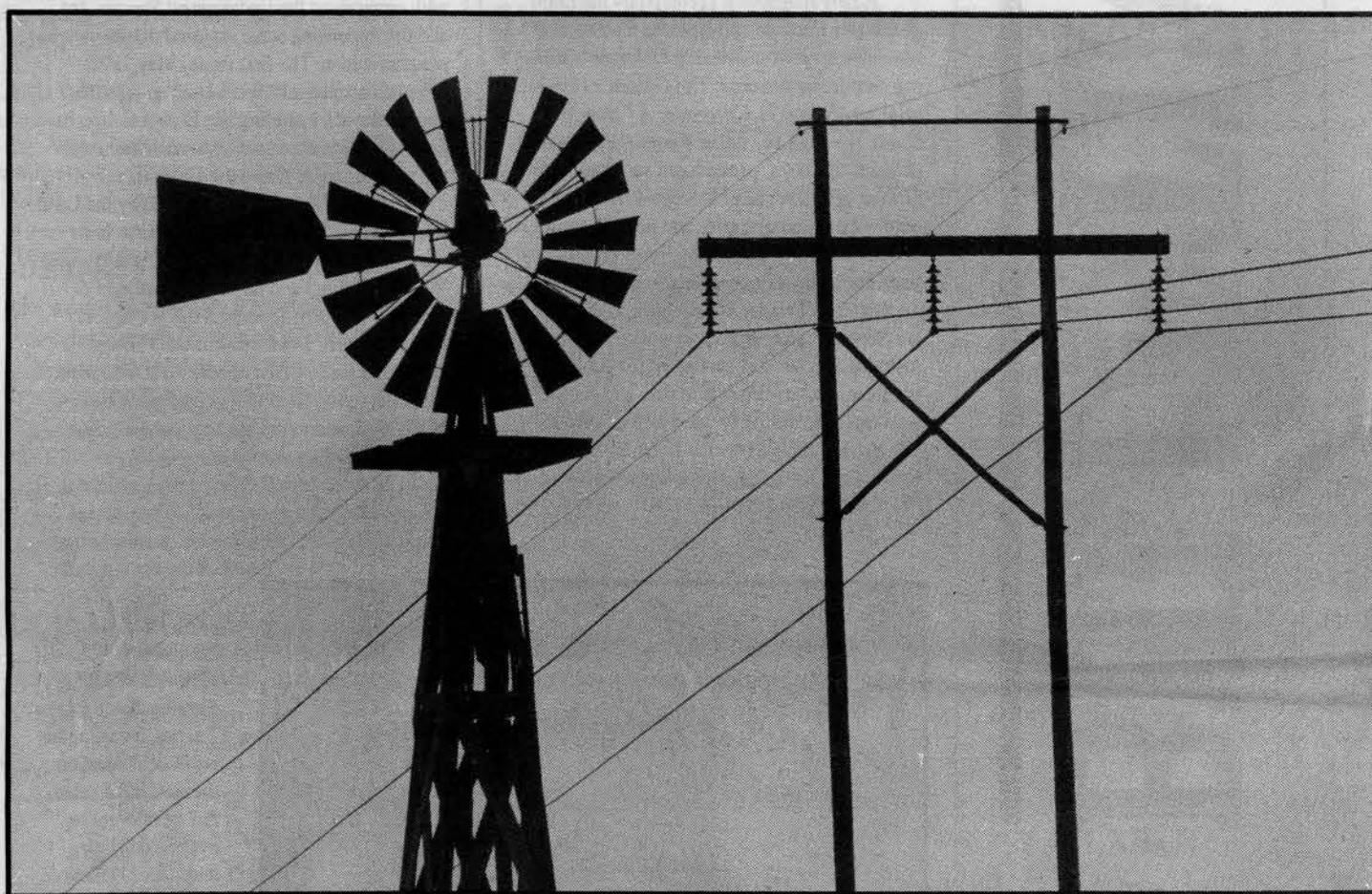


As the West's decade-long glut of electricity fades, the region has a choice: rekindle the energy boom that nearly overwhelmed the region in the 1970s, or begin a new era of conservation and renewable power.



Diane Sylvain

Mike McClure



Can innovation and efficiency replace dams, power plants and coal mines?

by Steve Hinchman

After a decade of surplus, the excess electricity that once swamped power lines across the West and much of the nation is rapidly vanishing.

The Pacific Northwest and California predict possible shortages of electricity before the year 2000. Soon after, electric deficits are considered possible elsewhere in the West and the nation.

To keep the lights on and economies running, public utilities, rural electric associations and certain federal agencies have begun planning the next generation of power supplies. What they choose may be the most important economic and environmental decision the nation makes in this decade. That decision — between traditional alternatives like dams and coal and nuclear power plants, and conservation and renewable power technologies — is the subject of this first of two special issues on electricity in the West.

Much is at stake. Electricity is a key to the country's economic health and

quality of life. Since 1950, our use of electricity has grown consistently, even when other energy sectors remained flat. According to the North American Electric Reliability Council, even at today's modest growth rates, the U.S. will need over 100,000 megawatts of new electric capacity by the year 2000, and probably another 100,000 megawatts by 2010.

During the same 20 years, half of the nation's coal-fired power plants — about 150,000 megawatts — will reach old age, and have to be rebuilt or shut down and replaced.

That adds up to 350,000 megawatts: equal to 270 new Glen Canyon Dams, 400 Three Mile Island nuclear power stations, or 150 Four Corners coal-fired power plants. It would be the largest build-up of new power supplies in U.S. history, costing hundreds of billions of dollars and likely causing massive environmental damage.

Given the West's wealth of energy resources, its still-clean air and wide open spaces, much of that new capacity, and the fuel to power it, will probably be built or mined here.

The 350,000-megawatt prediction — similar to those made at the beginning of the last energy boom in the 1970s — should give Westerners instant *deja vu*.

When the 1970s energy crunch hit, utilities went on a construction spree, building dozens of giant 1,000-megawatt coal and nuclear power stations. The federal government — including the Bureau of Reclamation's North Central Power Plan, and the Carter administration's Energy Mobilization Board and Synfuels Corporation — proposed to meet the predicted crisis by strip mining millions of tons of Western coal and oil shale to supply giant new coal gasification plants, oil refineries and the new electric power plants.

It was the largest industrial build-up ever planned, and called for construction of new towns, diversions of several Western rivers and the loss of agricultural and forest lands. As one federal report put it, the 1970s energy boom would have turned the West into a "national sacrifice area."

But the boom died first. The recession, conservation and rising electricity prices flattened or even cut demand for electricity, leaving the nation's utilities

with expensive power plants they couldn't pay for.

In the end, the boom-bust sank numerous energy companies, bankrupted several public and private utilities, damaged the economies of many Western towns and degraded the environment.

Now, 10 years later, Western energy interests are beginning to dream of a comeback. It could come fast. The federal government has begun to move, relaxing rules for leasing of Western coal and opening oil and gas drilling. In addition, energy bills in the Senate (*HCN*, 3/9/92) especially, but also in the House, would subsidize clean-coal technology, ease licensing of nuclear power plants, and generally emphasize increased supplies.

The 1970s boom was stopped by a Reagan administration that initially, at least, was hostile to giant subsidies for oil shale and coal gasification, by a recession, and by quick and on-the-ground conservation. Caulking, insulation, blankets for hot water heaters, lower thermostat settings, and more efficient cars and lower speed limits all reduced energy use.

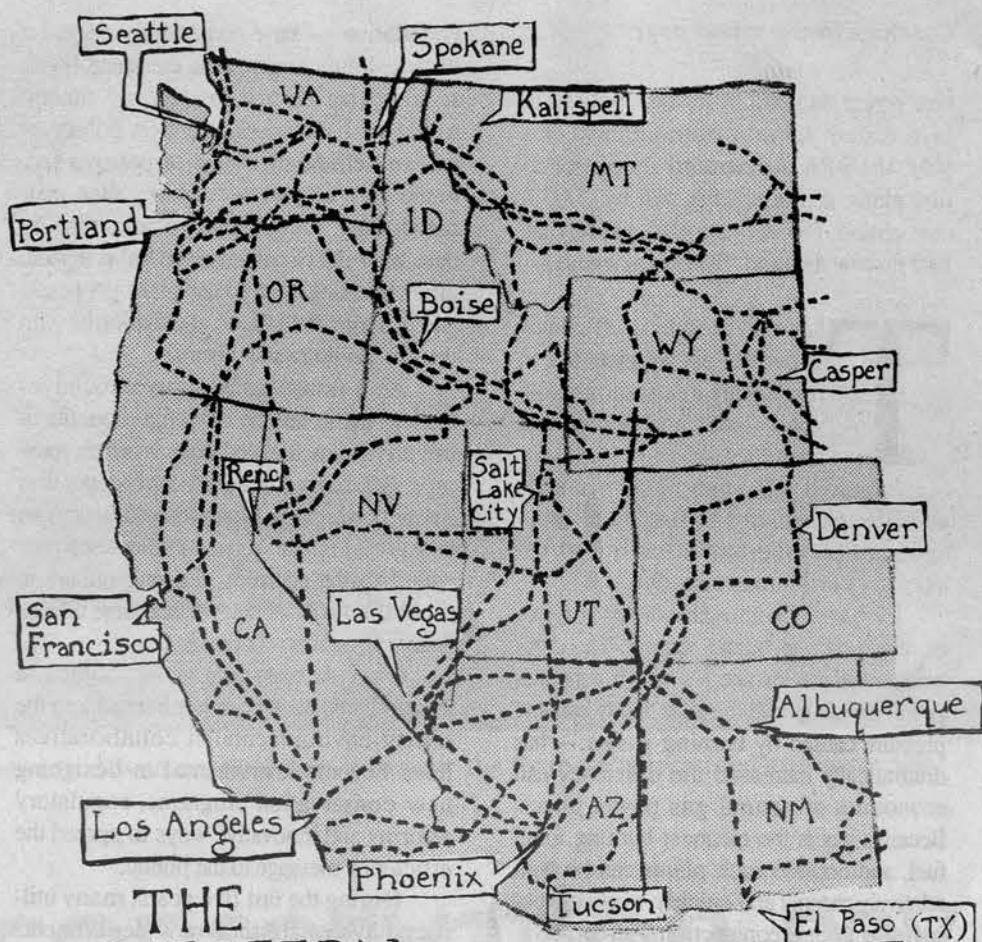
Those easy fixes have been implemented, and the West's energy interests believe that future growth can only be met by increasing supply — more coal, gas and nuclear plants.

But some experts and utility executives disagree. They are betting that a new generation of conservation techniques, as well as alternative power technologies, will once again make large-scale expansion of supplies unnecessary.

The future, they say, lies with efficiency and conservation: making existing energy supplies go further. In addition to the so-called "megawatts" from saved energy, these experts point to new super-efficient and super-clean gas cogeneration plants, and to rapidly improving renewable technologies, such as high-tech windmills, mass-produced photovoltaic cells and giant solar thermal plants in the West's deserts.

In fact, most recent major electric advances have not been in nuclear power design or in clean coal plants, but in the efficiency of appliances — compact fluorescent lightbulbs, low-flow showerheads, super-efficient furnaces and air conditioners, variable-speed electric motors, computers and televisions. Advances have also come in building and insulating techniques.

Projected savings are impressive. A compact fluorescent lightbulb consumes 70 to 90 percent less energy than the incandescent bulbs they replace; new electric motors use 50 percent less electricity than older motors. Overall, studies



THE WESTERN GRID

Diane Sylvain

by both industry and environmental groups show the new techniques could first defer construction of new fossil-fuel-based power plants, and then cut electric use 45 to 75 percent below current levels.

The power of conservation is being confirmed in the field. Initial experiments in the late 1970s and early 1980s by utilities in California, Wisconsin and several New England states found that increased efficiency can save thousands of megawatts of electric capacity for half the cost of a new thermal power plant, and reduce pollution to boot.

Those tests have rekindled the energy conservation movement. In the last few years, over 200 U.S. utilities have begun large-scale efficiency programs — such as distributing new lightbulbs and buying new motors for factory assembly lines.

According to two industry trade groups, the Washington, D.C.-based Edison Electric Institute and the Palo Alto, California-based Electric Power Research Institute, utilities are now spending about \$2 billion a year on conservation, which is generally matched by their customers. By 2000, they predict utilities will be spending \$10 billion to \$15 billion a year on conservation. If that

is matched by customers, total expenditures — \$30 billion a year — will equal what the nation spent on power plant construction during the peak of the 1970s boom.

Those investments could make a huge dent in future demand. EPRI forecasts that new conservation programs will save the nation 25,000 megawatts in the 1990s, surpassing the 20,000 megawatts saved in the previous two decades. That would eliminate the need for about 25 large coal-fired or nuclear plants — or a quarter of the 100,000 megawatts forecasters say is needed in new construction by the year 2000.

But industry officials say the conservation field is growing so fast that those numbers are already out of date. Over the next 20 years, four of California's largest utilities say they can supply 70 to 100 percent of their new electric demands — about 8,000 megawatts — from efficiency alone at a lower cost than new construction.

The federal Bonneville Power Administration, the largest seller of electricity in the Pacific Northwest, has identified conservation as its first priority for

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Conservation comes of age

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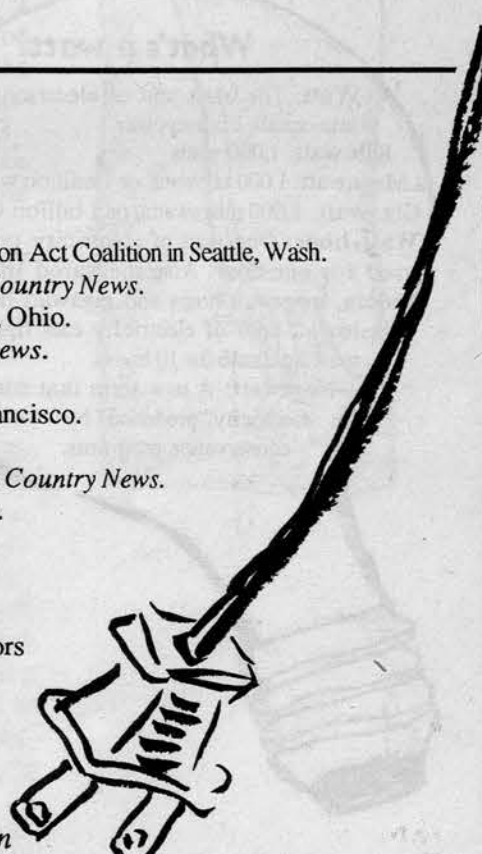
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Efficiency and innovations ...

Continued from previous page

new power and one of its best options to help restore salmon populations. This year, the BPA accelerated its conservation plans, and now says that by 2003 it can obtain 750 megawatts, more than half its new demand, from efficiency.

The rapid growth in efficiency is paralleled by progress in renewable technologies — wind, solar and geothermal power.

Improved efficiency, new materials and lower costs are taking renewable options like wind and solar out of the laboratory and into production.

Even traditional fossil fuel power plants are enjoying a technical revival. The combined-cycle gas turbine — which generates power by using both the heat and expanding pressure caused by burning gasses — has dramatically increased the efficiency and economics of natural gas power plants. Because gas is the cleanest-burning fossil fuel, and because such plants can be built relatively cheaply and quickly, many utilities are using them in conjunction with conservation or to replace older oil and coal plants.

The recent mix of technical advances has, you might say, electrified the utility industry, and turned the search for 350,000 megawatts into a race between different strategies.

While the federal administration and the Senate are trying to revive old extractive energy policies, state regulators and innovative utilities are developing a new vision of how the country will produce and distribute electricity in the future.

This competition is possible because much of the utility industry is not regulated from Washington, but by the states. And many state public utility commissions and state legislatures have embraced the new conservation strategies.

The states' activism can be traced to intervention by environmental groups. Three groups — the Environmental Defense Fund, the Natural Resources Defense Council and the Conservation Law

Foundation — have successfully waged a decade-long campaign at the state level, arguing that electric ratepayers' money would be more wisely spent on conservation and efficiency than on expensive and, in the case of nuclear reactors, often malfunctioning, central power plants. One by one, state utility commissions have agreed, often rejecting new power plant proposals and ordering the utilities to collaborate with their environmentalist enemies.

As a result, many utility executives have come to see the economic benefits of the environmentalists' conservation message: Efficiency is generally far cheaper than a new power plant. Moreover, efficiency can be gained in small increments that keep pace with growing demands, allowing utilities to avoid the financial risks of building billion-dollar, 10-year power projects.

Over the past five years, some old antagonisms have been left behind and the utility-environmentalist collaboratives have become instrumental in designing new conservation programs, regulatory reforms and innovative ways to spread the efficiency message to the public.

During the last five years, many utilities have established new departments for conservation, with ever-larger budgets. Efficiency is the hot topic at electric trade conferences and in industry magazines, and it is a new category in most industry trade reports.

Some of the most advanced utilities, such as the giant San Francisco-based Pacific Gas and Electric, or the nearby but much smaller Sacramento Municipal Utility District, have begun revising corporate strategies. They say they hope efficiency and gas-cogeneration plants will create a bridge to the day when most of their power will come from small neighborhood and rooftop renewable power stations and their existing coal and nuclear plants can be dismantled.

In the end, it may be a tight race between the old and new energy paths.

Efficiency has economics and many environmental benefits

behind it. But making efficiency work on such a large scale will be tremendously difficult. It requires significant regulatory reforms, retraining utility executives and engineers, and changing public attitudes.

By comparison with this uncertainty, burning fossil fuels at big central power stations is a certain answer to future demand. It works, and many utilities — especially the rural electric associations and cooperatives that dominate the rural, inland West — don't see the necessity of change.

Moreover, since the bust the feds have gotten more efficient, too. Wasteful and chronically troubled energy programs, like the two earlier synfuels efforts, have been dropped. Instead, Congress is promoting its new Clean Coal III program, a billion-dollar research and development effort to seek ways to help coal-fired power plants meet the requirements of the 1990 Clean Air Act.

Similarly, the House and Senate energy bills would relieve the nuclear industry of an \$11 billion debt to the federal government, and fund a research program to design a new generation of smaller, standardized nuclear reactors. The bills would also make it easier for utilities to win licenses for nuclear plants, as well as new gas pipelines and, in the Senate version, small hydroelectric dams.

But even as Congress prepares to revive the extractive energy industry, a long reaction against past excesses is visible in legal battles over air pollution at coal-fired power stations in the Southwest, and in fights over fish extinction, erosion and other impacts from federal dams on the Colorado, Columbia and Missouri rivers. The government has forced the Navajo Generating Station to control its pollution over the Grand Canyon, and lawsuits have forced the Bureau of Reclamation to re-evaluate its operation of Colorado River dams.

Inexorably, it seems, both economic and environmental concerns are pushing the nation to wean itself from heavy dependence on fossil fuels. But that evolution can only occur if efficiency and alternative technologies replace fossil fuel and nuclear generated electricity. Thus far, no one knows if they will. □

The ABCs of electricity

A few technical definitions and explanations will help make this special issue more understandable:

Private, or investor-owned, utilities are for-profit businesses, generally owned by shareholders who receive annual dividends.

Investor-owned utilities are tightly regulated by state commissions, often called public utility commissions, or PUCs. Investor-owned utilities are dominant in urban areas and on both coasts.

Most of the inland West is served by publicly owned, not-for-profit utilities, which come in three forms: a municipal utility or utility district; a rural electric association (REA); and larger regional generation and transmission cooperatives, which supply power to REAs and municipal utilities.

Instead of selling shares to raise capital, they are funded by their cities or by their consumer-owners. Some are eligible for low-interest loans from the federal treasury. Instead of being regulated by the state, they are generally governed by an elected board.

A fourth kind of public utility is a fed-

eral power marketing agency, which sells power from federal hydroelectric projects. In the West, these include the Portland, Oregon-based Bonneville Power Administration, which covers the Columbia River Basin dams; and the Golden, Colorado-based Western Area Power Administration, which covers the Colorado, Missouri and Rio Grande basins. They are governed by federal statute.

Whether public or private, utilities all face the same physical questions when managing their electric systems and planning for future growth.

Utilities measure electricity in two ways — energy and capacity. Capacity, measured in kilowatts, is the rate at which a power plant or group of power plants can produce energy. The energy itself is measured in kilowatt-hours.

There are several analogies to explain electric capacity and energy. Sometimes electricity is compared to water flowing in a pipe. The "capacity" of the pipe is the number of gallons per second it will carry. The "energy" delivered by the pipe is the volume of water that flows out of it over a period of time.

The critical factor for most companies is capacity. Electric demand — or the rate at which a utility's customers use elec-

tricity — is notoriously uneven, coming in daily and seasonal peaks and valleys.

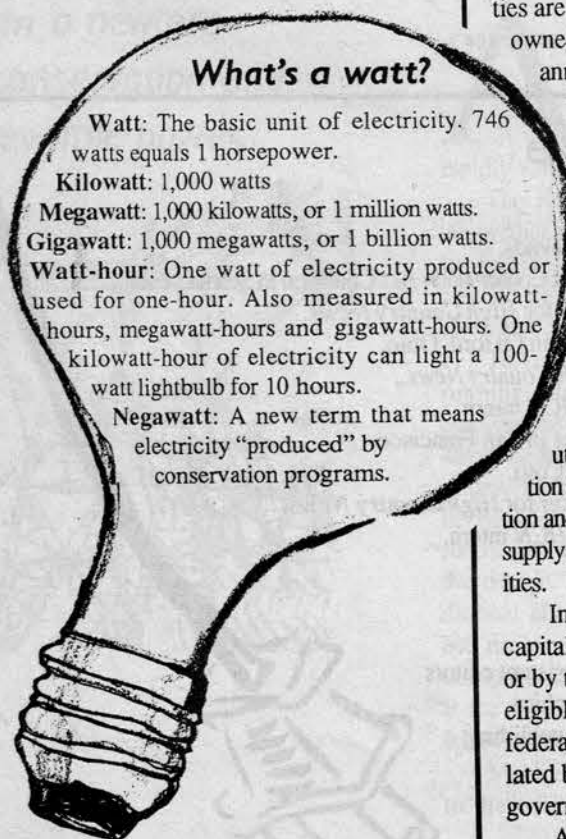
In winter, daily peak load hits in the morning hours, as people turn the heat back up, take showers and cook breakfast. In summer, electric use peaks in the afternoon and evening, as people turn up air conditioners, cook dinner and turn on lights, televisions and other appliances.

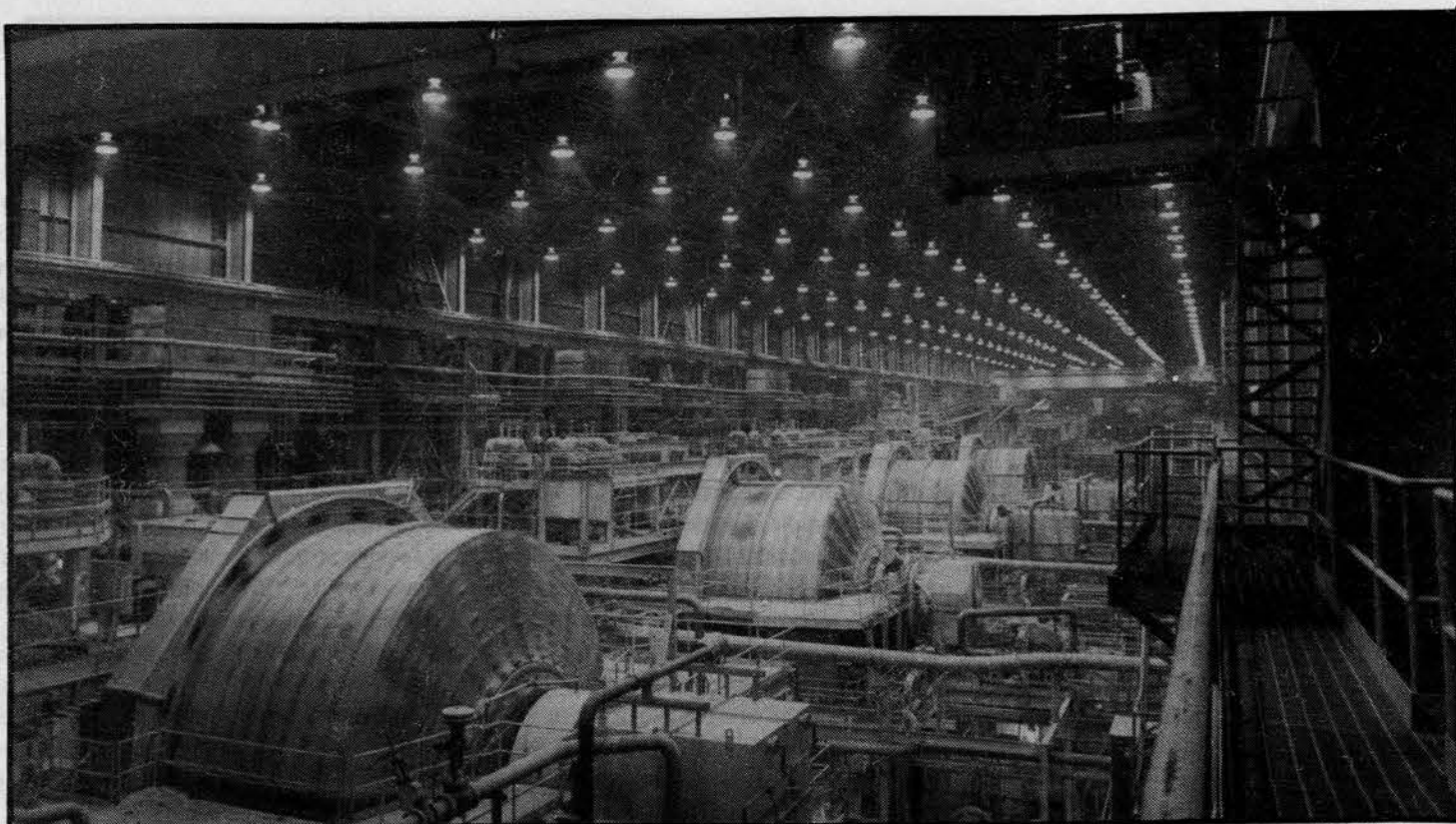
The daily or seasonal peak load — often as much as 20 percent greater than normal electric demand — determines how much electric capacity a utility must own. That in turn determines how many power plants or power purchase contracts a utility needs.

A utility's baseload — the minimum amount of electricity its customers use, which usually occurs late at night — determines the amount of power it must have continuously on-line.

To prevent blackouts or brownouts, utilities maintain a reserve margin to deal with unexpected demands, build new power plants to stay ahead of consumer growth, form power pools with neighboring utilities, and join regional utility pools to provide access to distant power plants and consumers.

— Steve Hinchman





Steve Hinchman

New lights at the AMAX Henderson mine in Silverton, Colorado, will save the financially troubled company 300 kilowatts and \$92,000 a year

Making conservation pay

by Steve Hinchman

Cheryl Luce and her four children spent the coldest days of last winter clustered around a kerosene heater in the living room of their suburban home in Denver, Colo.

At night they turned on the electric heat in one bedroom. "All four kids sleep in there," says Cheryl Luce. "Our electric bill is \$185 a month now and we can't afford any more."

Their house is typical of the 10-year-old Grange Creek subdivision: most are all-electric and their electric bills are sky-high.

However, as a result of an experimental conservation program, the Luces' cold nights and kerosene days may soon be over.

This spring the local utility, Public Service Company of Colorado, agreed to help the Luces and 169 other Grange Creek homeowners buy efficient, forced-air, gas furnaces. According to Bill Kallock, who works for the private energy-consulting firm running the experiment, Public Service's \$1,000 rebate typically covers the wholesale costs of the new furnace and ductwork. The homeowner pays for installation.

Although unconventional, the project is a good deal for everybody. Gas heat is warmer than the old electric baseboards and will lower the Luces' and other residents' utility bills by nearly \$500 a year each, says Kallock, who does the audits. A typical project repays the homeowner's costs in two winters, he says, and often leads them to install extra insulation, low-flow showerheads and other energy-efficient devices.

Public Service, which supplies electricity and gas to over 70 percent of all Coloradans, gets back 8 to 9 kilowatts of electric capacity for each new furnace it buys in Grange Creek. Although the project covers only a fraction of one subdivision, it will free 1.4 megawatts of Public Service's electric load. At a cost of about \$240 a kilowatt, that is less than one-eighth the cost of building a new coal-fired power plant, and less than half the cost of a modern, combined cycle gas plant. It is the cheapest power Public Service could buy.

Conservation will also keep Public Service out of environmental trouble. By substituting natural-gas heat for coal-

fired electricity, the project will reduce Public Service's emissions of carbon dioxide — a major greenhouse gas — by 18 tons per year. And, because it is more efficient to burn gas in the home rather than coal or gas in a distant power plant, the project is a net energy-saver.

This and other conservation projects could forever delay the need for Public Service's next power plant — the coal-fired Pawnee II station planned for Colorado's eastern plains. That would help keep Western skies clear and save the company and its customers millions of dollars.

With those innovations, Public Service is likely to become the first large utility in the Rocky Mountain

West to join what some conservationists call the "negawatt revolution." That transformation is largely a result of regulatory reforms.

Several years ago, the Colorado Public Utilities Commission approved trial changes in the state's electric regulations that gave Public Service a financial incentive to try new conservation technologies.

As a result, Public Service is running dozens of experimental conserva-

tion and efficiency programs such as Grange Creek. Over the next three years, those programs will "buy back" over 100 megawatts of electric capacity from homes, ski areas, supermarkets, office buildings, malls, farms and even the Amax Corp.'s Henderson molybdenum mill in the Colorado mountains.

Those experiments are working so well they may permanently change how Public Service does business. Up to now, the investor-owned utility, which earned \$1.8 billion in 1991 with a peak load of just under 4,000 megawatts, has built only giant coal-fired power plants and one failed nuclear reactor. But based on successes in Colorado and elsewhere, the Colorado PUC recently ordered Public Service to investigate expanding its conservation program.

The 1991 directive requires Public Service to join forces with an environmental law firm and two state agencies to work out permanent regulatory reforms and large-scale conservation programs for Colorado. If this new collaborative effort succeeds, it would make conservation — not new construction — Public Service's top priority.

For Public Service, which has suffered hard times since closing its malfunctioning Fort St. Vrain nuclear power plant in 1989, conservation may help end its financial troubles. But making the transition from experiments to a full-scale conservation program will be difficult. For the Colorado company, like most utilities, conservation is a whole new way of doing business.

In the past, as demand for electricity increased, utilities simply built new power plants. But during the 1970s energy boom, many overbuilt. When the boom collapsed in the early 1980s, much of the industry found itself trapped by mounting debts and surplus power. Ultimately, half a dozen of the most overextended utilities slid into bankruptcy, including Public Service's rural neighbor, Colorado-Ute Electric Association.

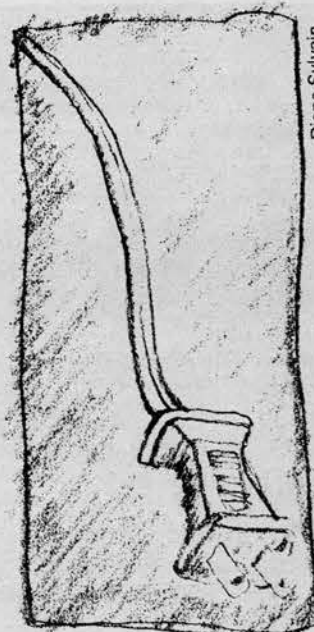
Now electric use is rising again. But a sobered industry, put off by the high costs of new power plants and growing environmental constraints, is reluctant to build. Instead, many companies and regulators are looking to the customer's side

In the West and the nation, investor-owned utilities lead the charge for conservation because regulatory reforms have made conservation the most profitable way to go.



Steve Hinchman

Cheryl Luce and her children with the kerosene heater that helped warm their home last winter



Diane Sylvain

Continued on page 11

Less electricity and more brains

Amory Lovins, 45, is a courteous but sharp-tongued Chaplinesque figure, with spectacles framed in thick black nylon, an equally black moustache, and a prized collection of photographs of orangutans on his office walls.

For 20 years, as an alternative energy researcher and advocate, he has been a persistent critic of the energy industry — arguing against nuclear and coal plants not just for safety and environmental reasons, but also because economic vitality depends on giving them up.

He made the case in a famous 1976 article in *Foreign Affairs*, where he proposed national energy policies be reformed to follow a "soft energy path": improve energy efficiency, use renewable energy sources such as solar and wind power, and add small-scale power generators to the neighborhood grid.

This approach, he has claimed over and over again since 1976, would be less expensive and less polluting and make the nation far less dependent on foreign oil. If the U.S. had consistently promoted energy conservation since the 1970s, "We wouldn't have needed a single drop from the Gulf last year. Instead of naval guns, we could have mobilized caulk guns."

While most politicians debate the costs of stopping global warming, Lovins says the nation could easily cut carbon dioxide and other "greenhouse gasses" by 20 percent through efficiency, without hardship or inconvenience — and save \$200 billion in the process.

Until recently, Lovins has had to defend his views against virulent attacks from the energy establishment. But such attacks rarely happen anymore.

These days Lovins generally introduces himself as "chief cook and bottleneck" of the Rocky Mountain Institute (RMI), an energy research center based in Old Snowmass, Colo., which employs about 50 people. The center is managed by his wife and frequent co-author, Hunter Lovins, who is also a lawyer, rodeo rider, disk jockey and bouncer at a local bar.

RMI is small, but it is one of the main reasons why the utility industry has widely adopted demand-side management and efficiency. After years of consulting for individual utilities, Lovins formed Competek in the mid-1980s. Competek tests energy-efficient technologies as they hit the market and then passes on the results to utilities and other industries.

Competek's original work helped break the conservation barrier and now supports efficiency programs in about 80 utilities and 145 industries and governments in 35 countries. If anything, Lovins says, the advances in efficient technology — in lighting, furnaces, air conditioners, refrigerators, water heaters, energy control systems, industrial assembly lines and new building technologies — are coming faster and

are better than ever.

"You can now save twice as much electricity as five years ago, at only a third the cost," he says. Unlike the 1970s, Lovins says, conservation today does not mean freezing in the dark. "Call it efficiency, not conservation," he says. "I'm talking about delivering the same or better services with less electricity and more brains."

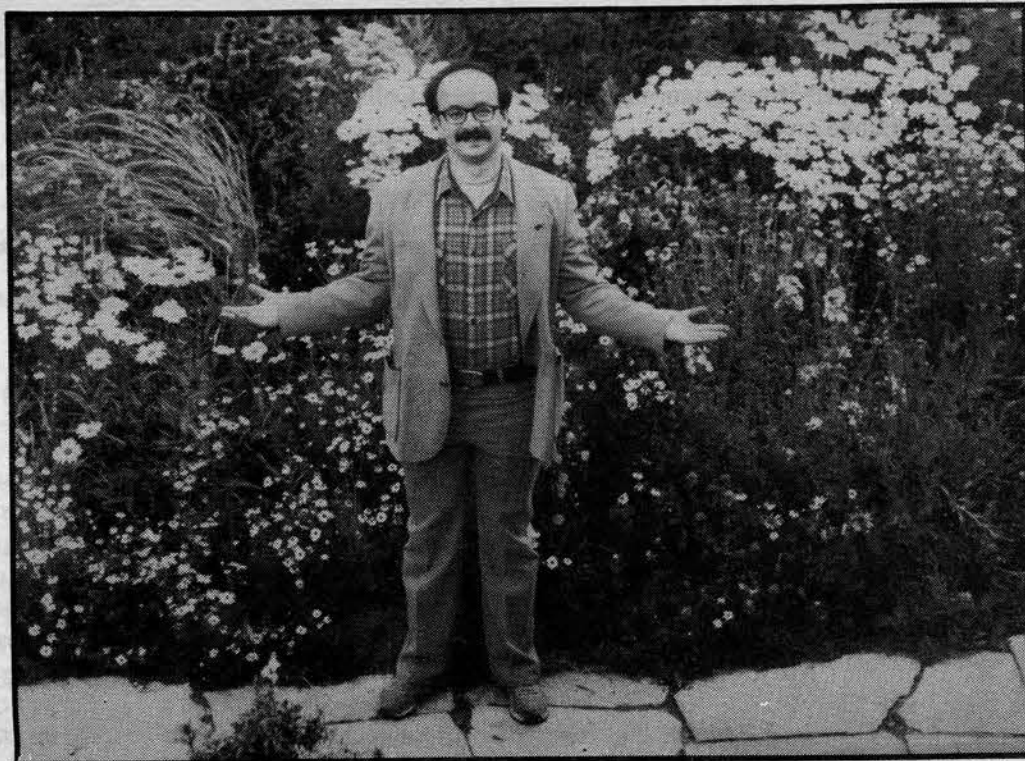
For example, new designs for compact fluorescent lamps and electronic ballasts use 75 to 85 percent less electricity than the incandescent bulbs they replace. Many prefer compact fluorescents because they give off a broader spectrum of light, providing a more pleasant environment and, in

cost of 0.6 cents per kilowatt hour.

Despite the difference in the numbers, the point, all analysts say, is that the U.S. can save huge amounts of electricity at very low costs. Moreover, the trend appears to be accelerating. A new study in preparation at the Rocky Mountain Institute shows that integration of conservation technologies multiplies savings and cuts costs.

"(We are) showing 80 to 90 percent savings at negative costs generally," says Lovins. "Efficiency has now clearly become cheaper than just operating costs for existing thermal power plants."

If Lovins is correct, it means that 80 to 90 percent of today's power



Rocky Mountain Institute

Efficiency guru Amory Lovins

industrial settings, higher productivity.

The potential savings from the new bulbs and other efficient lighting technologies is enormous. According to a recent article in *Scientific American* co-authored by Lovins and experts from the industry-sponsored Electric Power Research Institute, converting the nation's homes and office buildings to efficient lighting could save a quarter of total U.S. electric use: 20 percent in direct lighting costs and another 5 percent in reduced size of cooling equipment necessary to compensate for the waste heat emitted by incandescent bulbs.

Equivalent savings, they say, are available from electric motors, which currently account for over half of all electric use in the U.S. A mixture of new designs and variable-speed drives could save 44 percent of the power U.S. motors consume, or 22 percent of total U.S. electric use.

The list goes on: heavily insulated refrigerators and freezers can now consume 80 percent to 90 percent less electricity than traditional models; televisions 75 percent; photocopiers 90 percent; and computers 95 percent.

Watt by watt, it adds up to the greatest potential change to the electric industry since nuclear fission. A 1990 report by the Electric Power Research Institute found it is technically feasible to save 24 to 44 percent of total U.S. electric use by 2000, some cheaply and some expensively.

Lovins's Rocky Mountain Institute estimates that with more time the nation could eventually cut electric use by 75 percent, at a very low average

plants will eventually be shut down. Efficiency will allow the nation to provide the same services from the remaining 10 to 20 percent of its present fleet of plants, perhaps coupled with a new generation of renewable power plants.

"We will look back on the big thermal power plants that are now the bulk of our energy supply with the same kind of nostalgia that we have for steam locomotives: here were these enormous machines that served us well until something better came along."

That's a radical message, and as in the 1970s, Lovins may be ahead of the times. However, he optimistically says the conservation revolution is causing a profound shift in the utilities' mission and culture. "They are realizing that customers want services, like comfort, illumination, hot showers and cold beer, rather than simply more kilowatt-hours."

"I would say half the utilities in the country by now — a year ago I would have said only a third — have realized that electricity is expensive and efficiency is cheap. This cultural change is going much faster than I would have ever thought possible."

"When utilities like the Sacramento Municipal Utility District or Pacific Gas and Electric go to an efficiency and renewables strategy, then those approaches are no longer viewed as some kind of pie-in-the-sky radical environmentalism, but rather as hard-headed utility economics, doing the cheaper things first."

— Art Kleiner and Steve Hinchman

Making conservation pay ...

Continued from page 9

of the meter, to free power now used inefficiently. The change from adding supplies to reducing demand has given rise to the industry name for conservation — demand-side management.

DSM's potential is enormous. Industry and independent experts estimate that conservation technologies could meet all of the nation's new electric needs and cut electric use by 50 percent or more. (See accompanying story.) But making conservation work requires significant changes.

"The complexity of DSM is far greater than anybody assumed," says Ted Flannigan, who, as head of the Results Center in Basalt, Colo., tracks the nationwide progress of utility demand-side management programs.

"While the advocates are saying we can cut 75 percent of total electric use, and even the more conservative ones are saying 45 percent, the utilities are saying, 'No, what we can really cut is just about 20 percent of load growth,' which might be 2 to 4 percent of total electric sales," says Flannigan.

The problems are vast. Demand-side management is by its very nature decentralized, and therefore runs counter to the top-down, centralized way utilities are now managed. It means changing public perceptions and buying habits. It means re-educating the nation's architects and building contractors, re-tooling factories, retrofitting cities and office buildings — essentially redesigning America. Moreover, improvements in technologies are happening so fast that it is hard for utilities, let alone individual manufacturers or consumers, to keep up.

It is also — at least initially — expensive. A compact fluorescent lightbulb costs about \$15, compared to 75 cents for an incandescent bulb. While it will save the purchaser money in the long run, outfitting a house with compact fluorescents can cost several hundred dollars. An efficient refrigerator can cost \$1,500 to \$2,500.

Re-tooling a factory means buying new equipment and paying for down-time. Few homeowners or companies are likely to make such investments on their own.

That leaves the leadership to utilities. They connect everyone who buys electricity and are the most capital-intensive industry in the nation. But before the industry can teach or finance a large-scale switch to efficiency, it must change.

That's where the problems start. Even utilities like Public Service, which want to change, face high barriers. For example, under most state regulations, investor-owned utility profits are tied to how much power they sell. Spending money to help customers save electricity is an expensive investment that loses sales.

For demand-side management to work, both utilities and environmental groups say regulations have to change. In 1988, the National Association of State Regulatory Agencies agreed, and passed a resolution urging its member public utility commissions to allow utilities to profit from investments in conservation.

Regulatory reform generally occurs in two stages. "Decoupling" comes first.

Traditionally, the price of electricity is based on the amount sold in a recent test year. State commissions set the new rates so that a utility will recoup its expenses, plus earn a regulated rate of return of about 12 percent.

Any extra juice the company sells above projected sales is almost pure profit, which creates a powerful incentive to sell more electricity.

Decoupling severs these excess sales

from profits. Rates are based on how many customers a utility serves rather than how much power it sells and excess profits must be returned to customers in the form of rate reductions. That neutralizes the incentive to sell more power.

The second reform creates a financial incentive for conservation by allowing utilities to share some of the profits gained. Typically, the incentives allow a utility to keep 15 percent of the savings it generates. So, if conservation saves a utility \$10 million per year, \$8.5 million must be returned to customers as a rate reduction and \$1.5 million is kept by the utility above and beyond its normal profits. That often causes demand-side management departments to mushroom and conservation goals to double, or more.

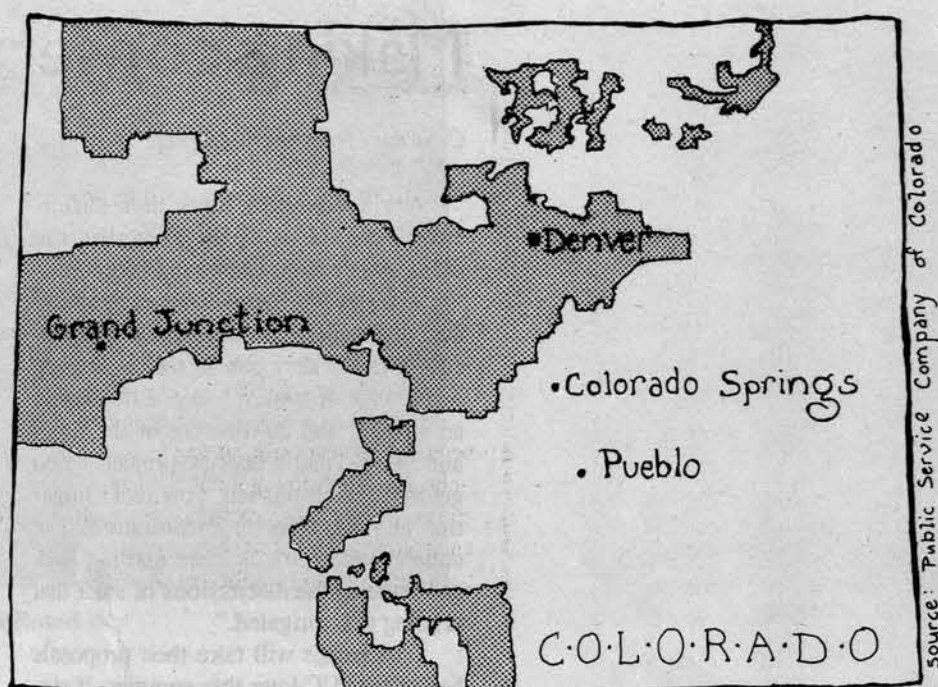
Most states are adding a third layer of reform, called Integrated Resource Planning or Least Cost Planning. It seeks to create a level playing field by forcing utility planners to compare DSM with traditional options, such as building a new power plant or purchasing power from another utility. It also allows far more public involvement in the planning process.

Combined, the reforms can transform a utility's strategy. The classic example is Puget Sound Power and Light, the largest investor-owned utility in Washington state.

"In the early 1980s, Puget was the utility that environmentalists loved to hate," says Ralph Cavanagh, head of the Natural Resources Defense Council's energy project and a founding member of the California collaborative, a coalition of utility, consumer and environmental groups that helped pave the way for utility experiments with conservation.

Puget was a driving force in the Washington Public Power Supply System (WPPSS) plan to build five large nuclear power plants in the Columbia River basin. After that plan collapsed, driving Puget and many other utilities in the region to near-bankruptcy, the company was forced to turn to efficiency.

In 1991, Puget and the Washington Utilities and Transportation Commission adopted innovative reforms that tied Puget's profits to how efficiently it served its customers, not to how much power it sold. The company immediately increased its conservation goals by 200



■ PSCo Electrical Service Territory

Diane Sylvain

Public Service Company of Colorado covers less than half the state but serves most of the population

percent, and by the end of the year exceeded those targets. Next year's goals are 50 percent higher.

"Puget is now the most aggressive utility in pursuit of energy efficiency in the Northwest," says Cavanagh. "It's an extraordinary precedent."

Colorado may follow Puget's example. In a recent order setting up a collaborative to investigate energy efficiency, the state's public utility commissioners drew heavily from the Washington experience, and from collaboratives in California and New England.

The Colorado collaborative includes Public Service, the Boulder-based Land and Water Fund of the Rockies, the Colorado Energy Office and the Colorado Office of Consumer Counsel. The PUC has told them to design large-scale conservation programs and annual conservation targets for Public Service.

Separately, the parties are preparing testimony on other reforms, including decoupling and incentives, integrated resource planning, and regulations that would require Public Service to account for pollution and other impacts when planning a new power plant.

Continued on next page



Steve Hinchman

King Soopers engineer Leonard Micek uses a light meter to test new lightbulbs that will brighten the Denver store and cut its electric load by 17 kilowatts. The bulbs were purchased through the Public Service Co. conservation program

Making conservation pay ...

Continued from previous page

While members have their differences, the coalition is changing the debate over energy issues in Colorado.

"Parties who could never agree on anything before now are setting up a process whereby they can agree on a fairly wide range of issues," says Eric Blank, an attorney and co-director of the Land and Water Fund's energy project. "You get more accomplished, you avoid litigation and you transfer information. The collaborative spirit is even spilling over and imbuing the discussions of stuff that is going to be litigated."

The groups will take their proposals before the PUC later this summer. If significant changes are approved, as expected, it would give Colorado a new regulatory system and put it in the forefront of the conservation revolution.

"It's very clear to us that this is a movement that is going to succeed," says Morey Wolfson, assistant to the PUC commissioners. "It is a better public process that promises to yield better economic and environmental results."

He is echoed by Joe Heckendorn, manager of rates and regulations for Public Service: "These dockets, in our opinion, represent a substantial change in the direction our company is going to go... If all these work as they are supposed to, it will ultimately be the most cost-effective and environmentally sound basis for our investors."

If they are right, the ideas are likely to spill over into neighboring states. The West — except for the coastal states — has so far been reluctant to experiment with conservation. However, the Land and Water Fund's Energy Project, formed to promote energy efficiency in

the Rocky Mountain region, has already begun to intervene in electric cases in Utah and Arizona, and is studying New Mexico and Wyoming. According to Blank, the Public Service case will develop a track record that should make it easier to convince other Western states to try conservation.

Nationally, most observers expect such changes. According to a recent survey by the National Association of Regulatory Commissioners, some 24 states have initiated at least partial regulatory reforms, and eight more are in progress.

Once reforms are in place — and utilities see conservation as a source of profit, not a penalty — it could make DSM the norm rather than the exception.

Says Jane Finleon, manager of Public Service's new DSM department, "If you need a significant savings, a significant incentive grabs the attention more and helps us look for more and more ways to implement conservation programs cost-effectively." ☐

Lightening lighting's electric load

There are two ways to meet the demand for more energy: raise the bridge or lower the river.

Demand-side management — "lowering the river" through conservation — is said to be cheaper than "raising the bridge" by building new power plants. But it is not simple, as the search for better ways to light homes and office shows.

Lighting offers enormous potential savings. Nationwide, it consumes about 25 percent of electricity, including power used by ventilating and air-conditioning to carry off waste heat. There is a lot of waste heat: conventional incandescent bulbs dissipate more than 90 percent of their energy as waste heat. Even conventional fluorescent tubes are very inefficient. To power a 34-watt conventional ballast requires 80 watts.

Overall, studies by the Rocky Mountain Institute, the Electric Power Research Institute and others show that half or more of the power going into lights is wasted. The University of Rhode Island found that an astonishing 78 percent reduction in lighting loads is possible at a cost of less than one

cent per kilowatt-hour.

But efficient lighting takes more than installing low-watt bulbs. For maximum savings, building designers must integrate lighting into an overall efficiency plan.

"Oftentimes, lighting is the last to be done; it's the last detail ... so they put in the least expensive" but not necessarily the most efficient systems, says Diana Campbell.

Campbell is manager of an institution devoted to squeezing the most light out of every kilowatt. Called the Seattle Lighting Design Lab, it offers equipment displays, demonstration rooms, a technical library and computer software to engineers, lighting designers, architects, contractors and other professionals.

The lab was founded to bring efficient lighting to Northwest buildings and marks a new approach to conservation and efficiency. Increasingly, utilities are focusing not just on retrofitting buildings that waste energy, but also on retraining the architects, engineers and contractors that build new structures.

The Seattle Lighting Design Lab, founded in 1989, was the first institution of its kind. Since then, Pacific Gas and Electric opened its \$7.5 million Pacific Energy Center in San Francisco, a state-of-the-art showcase and laboratory for lighting and hundreds of other energy saving technologies. Similar institutions are under way in New England and other states.

The labs hope to take the guesswork out of new designs, and give builders a chance to see new technology in action. So far the Seattle facility has had more than 12,000 visitors. Operated by Seattle City Light, it is co-sponsored by the Bonneville Power Administration, Natural Resources Defense Council and the Northwest Conservation Act Coalition. It has a 1,200-square-foot "mock-up" room into which architects bring furniture, carpeting and other room items to test lighting designs. Also available is a sample board room, office and hallway, as well as a rotating "vignette,"

such as a hotel room displayed earlier this year.

Architects learn how to use natural light in a lab that allows them to alter artificial illumination to complement natural light. Architects can also take models of their buildings into the lab and measure "daylight" entering the building from an artificial sun on the ceiling.

Natural light can save money. At Ocosta Junior-Senior High School in Westport, Wash., 58,000 square feet out of 67,000 square feet receive daylight thanks to more than 40 skylights. On bright days, 37,800 watts, or 42 percent of the total electric load, is eliminated.

The Emerald People's Utility District in Eugene, Ore., lights its headquarters with 1.85 kilowatt-hours per square-foot per year. That is one-fourth the energy needed by a conventional building that complies with the Northwest Power Planning Council's model conservation standards.

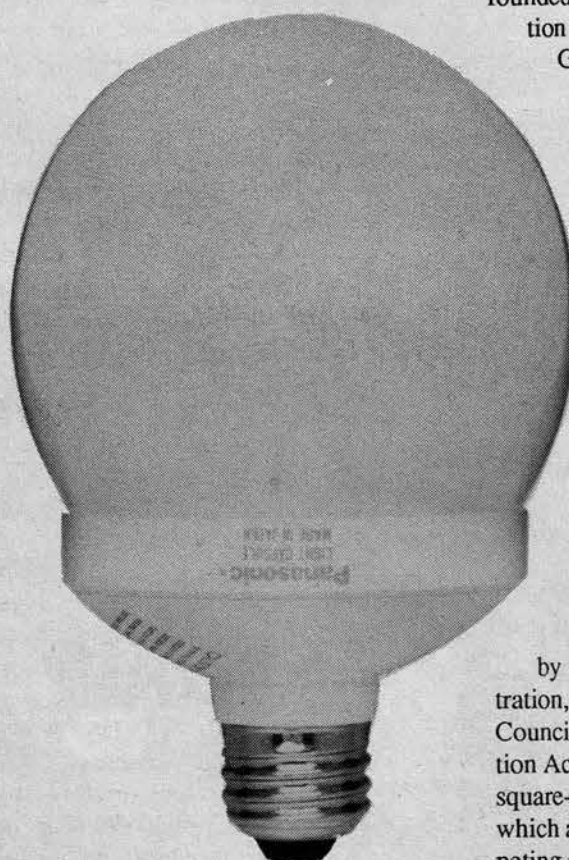
Among the most effective techniques available in the light lab are:

- **Lamps.** Compact fluorescents use up to 80 percent less energy than incandescent bulbs. And they last 10,000 hours, compared to 1,000 hours for incandescents. At \$12 to \$24, the initial cost is high, but over its lifetime a typical 15-watt compact fluorescent, equivalent to a 45-watt incandescent bulb, saves \$5 per year, in addition to eliminating the labor needed to change nine bulbs.

- **Ballasts.** As the name implies, ballasts stabilize current flowing through fluorescent bulbs. High-frequency ballasts can cut power use by more than one-third when coupled with efficient bulbs. For example, a 34-watt T12 electronic ballast requires about 60 watts, while a conventional 34-watt ballast, with an iron core and a copper coil, draws 80 watts.

- **Controls.** Dimmers, clocks, automatic switches, daylight sensors, "task" lighting and motion sensors reduce energy by dousing lights when not needed and by using adjustable levels of artificial light to supplement natural light. The result is savings of 50 to 65 percent.

— Jim DiPeso



A high-efficiency 'light capsule' by Panasonic



An almost-clear day at Grand Canyon ...



... and a heavily polluted day

National Park Service

Paying for pollution

by Florence Williams

Building a coal-fired electric power plant in the West was once relatively simple. A utility had only to show a need for new power and then tap into the region's abundant supply of coal. Investment capital and regulatory approval were givens.

But by the time a consortium of power developers tried to build the 2,000-megawatt Thousand Springs plant in Nevada two years ago, the ground had shifted. Critics pointed out the plant would release 17.2 million tons a year of carbon dioxide, one of the pollutants widely held responsible for global climate change. The plant, designed to provide power for California, would also emit sulfur dioxide and nitrogen oxide, both acid rain pollutants.

When the critics spoke, regulators listened, as did potential investors. Plans for the facility became final in 1990, just as Congress was rewriting the Clean Air Act and several states, including Califor-

nia, were considering strict carbon dioxide emission standards. With these events as background, a giant fossil fuel-burning power source appeared untimely indeed. The project's financial backers fled.

Since then, the pollution factor has come into its own as a major influence on the search for new power. California and Nevada both recently passed laws requiring utilities to consider the costs of environmental impacts when choosing new sources of electricity. Still in their infancy and not yet fully accepted, the regulations could change the way the country lights up.

"As far as California is concerned, coal is dead," pronounces Ralph Cavanagh, a policy analyst at the Natural Resources Defense Council in San Francisco. "Nuclear plants are dead. The future is high-efficiency natural gas, renewable energy and energy efficiency."

In addition to California and Nevada, 27 states either have laws or are currently devising policies to add environmental costs to the traditional power equation. Even the U.S. Department of Energy has

joined in, commissioning a \$1.3 million study to price environmental ills.

Such analysis is complex because it requires placing dollar values on visibility, or on a human life, or on a wildlife population, or on whatever may be affected by pollution.

Economists call these costs "externalities," because they lie outside the traditional loop of the consumer-producer transaction. In other words, the damages caused by burning coal are not reflected in our electricity bills. Despite a positive reception by many states and the Department of Energy, however, many in the utility industry and some state regulators remain skeptical or vehemently opposed to environmental costing.

"A big fat bloody 'No' is our perspective on externalities," says John Hughes, director of technical affairs for the Electric Consumers Resource Council (ELCON), a lobbying group representing large industrial consumers of electricity. He says the current approach to environmental costing unfairly singles out utilities and may result in unnecessarily high electric rates.

"The way externalities are being used now is naive. The concept will only work if it applies to everyone, including private industry, and if you know the prices. There's no evidence that anyone really knows how to price these things."

Nevertheless, many economists support the inclusion of social costs in resource decisions. And externalities are already influencing power plants. Last year at the Grand Canyon, the National Park Service, after studying the amount of pollution emitted from the Navajo Generating Station coal plant, hired an economic consultant to place dollar values on one of the country's most famous views.

Says Robert Rowe, the Boulder consultant: "We did a public survey to determine how people value visibility in the Grand Canyon. It turns out they value it a lot." Based on what people said they were hypothetically willing to pay for a good view, the dollar value of clean air at the Grand Canyon was "astronomical," totaling \$700 million, says Rowe.

In this landmark case, the Navajo power plant's owners agreed to spend \$90 million to install pollution scrubbers, which will improve the air over the canyon an average of 70 percent by 1999.

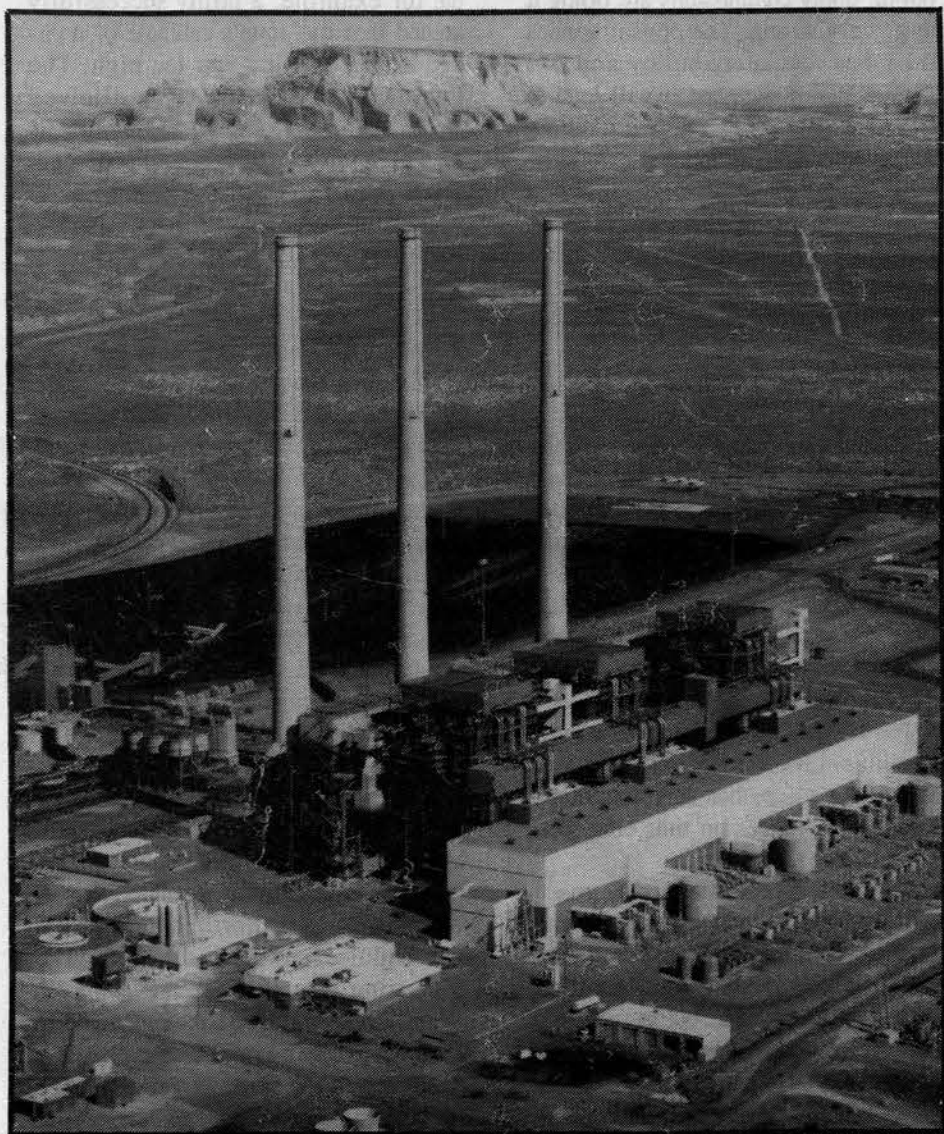
Supporters say inserting these previ-

Although the utility industry is one of the dirtiest in the nation, it has never been charged for its pollution.

A new movement among state regulators may force utilities to pay their environmental tab.



Rita Clagett



Salt River Project

Navajo Generating Station

Continued on next page

Paying for pollution ...

Continued from previous page

ously neglected costs into the power production equation makes economic sense, both for society and for the utilities.

"To me, the rationale of externalities is economic efficiency," says Victor Neimeyer, an economist with the Electric Power Research Institute, a utility-funded organization. He believes it will be cheaper for a utility to build a cleaner plant now than to build a traditional plant but then face high pollution-control costs in the future, as happened with the Navajo plant.

The search for inexpensive and clean power is not new. Environmental, or social, costing is the latest in a series of regulations that attempts to force utilities to choose power supplies at the lowest cost to society over the long run.

The first reform in supplying power — Least-Cost Planning — forces utilities to compare the cost of building a traditional power plant with renewable power or conservation.

Consideration of externalities adds another layer of reform by requiring utilities to consider social costs as well as operating costs. In some states, a utility needing more power must compare conservation and renewable options with traditional power plants and choose the cheapest. The cost of conservation will be reduced by its lack of pollution, while traditional power will look more expensive because of pollution and other social impacts.

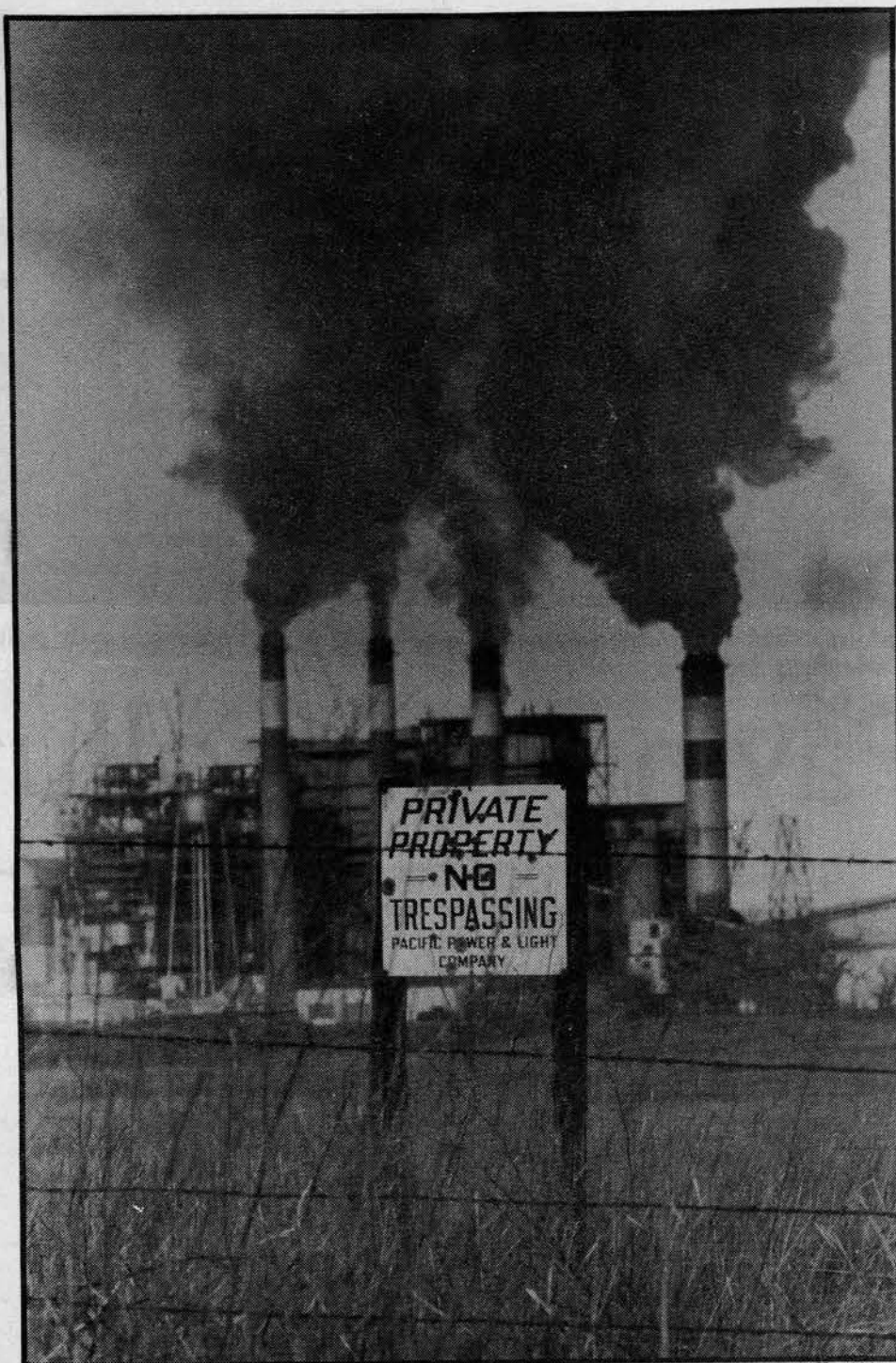
Such comparisons, however, depend on how accurately the cost of externalities can be calculated. Thus far, it is an inexact, controversial science. But it gained a more solid policy foothold in 1990, when Pace University released a study ranking power sources by their estimated social costs. Based on estimates of damage to crops, buildings, public health and ecosystems, the study found that burning coal costs society 6.8 cents per kilowatt-hour, while solar, wind and biomass cost less than one cent.

"Coal is the most harmful, and conservation and renewables are the least harmful," says Richard Ottinger, the professor at Pace University Law School who authored *The Environmental Costs of Electricity*. But, he says, coming up with dollar figures is not easy. How do you value a human life, for example? Ottinger says people want \$4 million before they will risk a fatal disease.

Such environmental costing is already affecting power decisions in the Pacific Northwest. Responding to a 1980 federal law, the Bonneville Power Administration has recently begun requiring that every new power proposal estimate the cost of environmental impacts. The projects BPA chooses reflect the lowest overall costs.

Using Bonneville's figures, which are based on the costs of controlling emissions and estimates of damage, burning fossil fuels is expensive. Sulfur dioxide, a corrosive gas that also contributes to acid rain, costs society about \$1,500 a ton, says Bonneville economist Elizabeth Bowers.

Bonneville also looks ahead to the costs that future regulations may impose on power plants built today. The agency asks plant builders if they can absorb such possible costs as a carbon tax. These assurances, usually secured by bonds, can be quite expensive. The result, says Bowers, will be the construction of cleaner plants and higher efficiency for existing sources. Similar efforts are being implemented by New York, California, Wisconsin and



Terri Moore

Mid-1970s air pollution: a coal-burning power plant near Glenrock, Wyoming, with malfunctioning scrubbers

Massachusetts.

Not everyone likes this approach. Paul Joskow, an economics professor at the Massachusetts Institute of Technology, told a conference last year:

"Unfortunately, a significant number of public utility commissions are doing it wrong, very wrong. The consequences will be bad regulatory policy and bad environmental policy, and it will lead to higher electricity prices and less environmental protection in the long run."

Joskow argues that state utilities should not concern themselves with global impacts because they have a mandate to provide service to the public at the lowest possible prices. He also says that arbitrary additions to the cost of power may harm society if those costs are set too high.

Alan Krupnick, an economist with the Washington D.C.-based Resources for the Future and a proponent of environmental additions, agrees the costing methods are imperfect. For example, regulators in Nevada, California, Massachusetts and New York base dollar estimates not on damages, such as the cost of crop failure resulting from acid rain, but on how much it costs to control the pollution. If a scrubber costs 5 cents per ton of emission, then that must be the value society places on that emission, say some state regulators.

Krupnick argues that this approach, known as "abatement costing," fails to yield the true cost of the emission. For example, it costs more to control nitrous oxide than sulfur dioxide, but some scientists say sulfur dioxide does more harm.

"States have gotten off on the wrong foot with abatement costs," says Krupnick, who argues for a more accurate damage cost approach. "Economists

weren't involved in these debates in the formative stages. Now we're waving red flags, saying you're worse off with a wrong estimate."

Such uncertainty makes it difficult to enforce the new regulations. In Nevada, for example, a utility successfully argued that the state's estimate of damage from pollution was too high. The Public Utility Commission allowed Nevada Power Co. to come up with its own estimates, which were 90 percent lower than the state's. Nevada Power then convinced the PUC to let it build a traditional power source, in this case, expanding a natural gas facility.

Economist Krupnick says it is important to erase such ambiguity. He serves on a team recently hired by the Energy Department to calculate cradle-to-grave damage costs of different energy production cycles. He hopes the methodology will be used by all state regulators. "It makes sense for the government to develop methods to estimate these costs, so every state won't have to reinvent the wheel. My goal is to have a consistent set of social costs."

But in advance of consensus on the numbers, the idea of externalities has occupied a permanent seat in the country's energy arena.

Despite the expensive studies, the heated contention and the reluctance of the industry, the effort to value environmental wrongs is worth it, says Krupnick. Utilities may not be the only activity causing damage, but they make a good starting point with their mandate to act in the public's interest, he says.

"This will start to get the idea across. Ultimately, you want every activity to be social-costed. Transportation is next." □

Wind leads renewables

by Devin Odell

Dennis Elliott thinks of himself as a prospector. Poring over topographical maps, tables of information and reports from the field, he searches for spots to tap into a vast natural resource. He marks the best places, like the Blackfeet Reservation tucked up against the Canadian border in Montana, or the high plains of southern Wyoming, with a "6" or a "5." This is where energy company workers head to stake the richest claims.

The workers don't carry picks and shovels, Geiger counters or seismic devices. Instead, they build towers to measure the velocity and force of wind.

Elliott is a senior research scientist at Battelle Pacific Northwest Laboratories. The ore veins he draws on maps show the streams of wind that whistle through gaps in the mountains, sweep down off ridges and flow unbroken across Western land.

"We've documented the theoretical potential for wind energy," says Elliott. "We can say this for certain: The size of the wind resource is not a limiting constraint."

A widely quoted study done by Elliott for the Department of Energy shows that wind energy could eventually supply 20 percent of the nation's electricity. Indeed, if turbines were built everywhere in Montana (except national parks and the like) where the wind speed averages 15 miles per hour or more, the state's wind could theoretically satisfy 15 percent of the nation's 1987 electricity demand by itself.

The technology for converting all this wind into reasonably priced kilowatts is also improving quickly, placing wind far ahead of other renewable energy sources in the quest for large-scale applications.

In California, wind power presently

supplies 1.5 percent of the state's electricity and costs have fallen to about 8 cents per kilowatt-hour, a third of what they were in 1980 and nearly competitive with conventional sources.

These numbers have not yet swept Western utilities off their feet. "The unfortunate fact of wind is that it's not consistent enough," says Mark Stutz, a spokesman for Public Service Co. of Colorado. "With our cheap coal resource, we have no plans for any wind generation at this time."

There are, however, bright spots. Last October, wind developers submitted eight bids to supply power to Montana Power Company, and in January, three companies bid projects to Puget Sound Power and Light, Washington state's largest investor-owned utility. While Montana Power rejected its bids, Puget Sound recently announced it will begin negotiations with U.S. Windpower, the country's largest wind power developer, to build a 28-megawatt facility on a ridgeline outside Richmond, Wash.

Last fall, U.S. Windpower and Iowa-Illinois Gas and Electric Co. announced joint plans to develop "wind farms" in nine states, including North and South Dakota, Nebraska and Wyoming.

But Randy Swisher, executive director of the American Wind Energy Association, a Washington, D.C.-based trade group, acknowledges with a sigh that no major wind projects will begin in 1992.

"While the response has improved markedly over the last two years, we are still constantly up against the inherent conservatism of most utilities," he says. "They are very risk-averse and it takes a long time for innovation to take hold."

The task of converting utilities has also been made difficult by "misinformation about wind based on experiences

from a decade ago," says Robert Thresher, division director for utility systems at the National Renewable Energy Laboratory in Golden, Colo. When energy decision makers think about wind energy, they often think tax scams, breakdowns and "only in California," where energy is expensive and the renewables have been aggressively promoted by utility regulators, says Thresher.

In Montana, according to Paul Cartwright, a senior policy analyst with the state's Department of Natural Resources, "We had a lot of problems with the design of machines put near Livingston in the early '80s." For example, the wrong hydraulic fluid sent one of the turbines flying through the air when it froze up one cold day. "There's a lot of metal" left over from that, he says.

Wind advocates say such stories are ancient history. State-of-the-art turbines are available to generate power over 90 percent of the time and can last as long as 20 years with proper maintenance, says Edgar DeMeo, manager of the solar power program for the Electric Power Research Institute, a utility-sponsored research center in Palo Alto, Calif. And wind developers have learned much about where to place the turbines and how to run large numbers of them efficiently.

DeMeo expects utilities to start paying more attention to the next generation of turbines, which he refers to as "nickel machines" because they are designed to produce electricity for 5 cents per kilowatt-hour. By the end of this spring, 22 of these turbines, developed by U.S. Wind Power in partnership with EPRI, California's Pacific Gas and Electric Co. and New York-based Niagara Mohawk Power Corp., will be spinning in the hills east of San Francisco, generating electricity and what DeMeo hopes will be "a

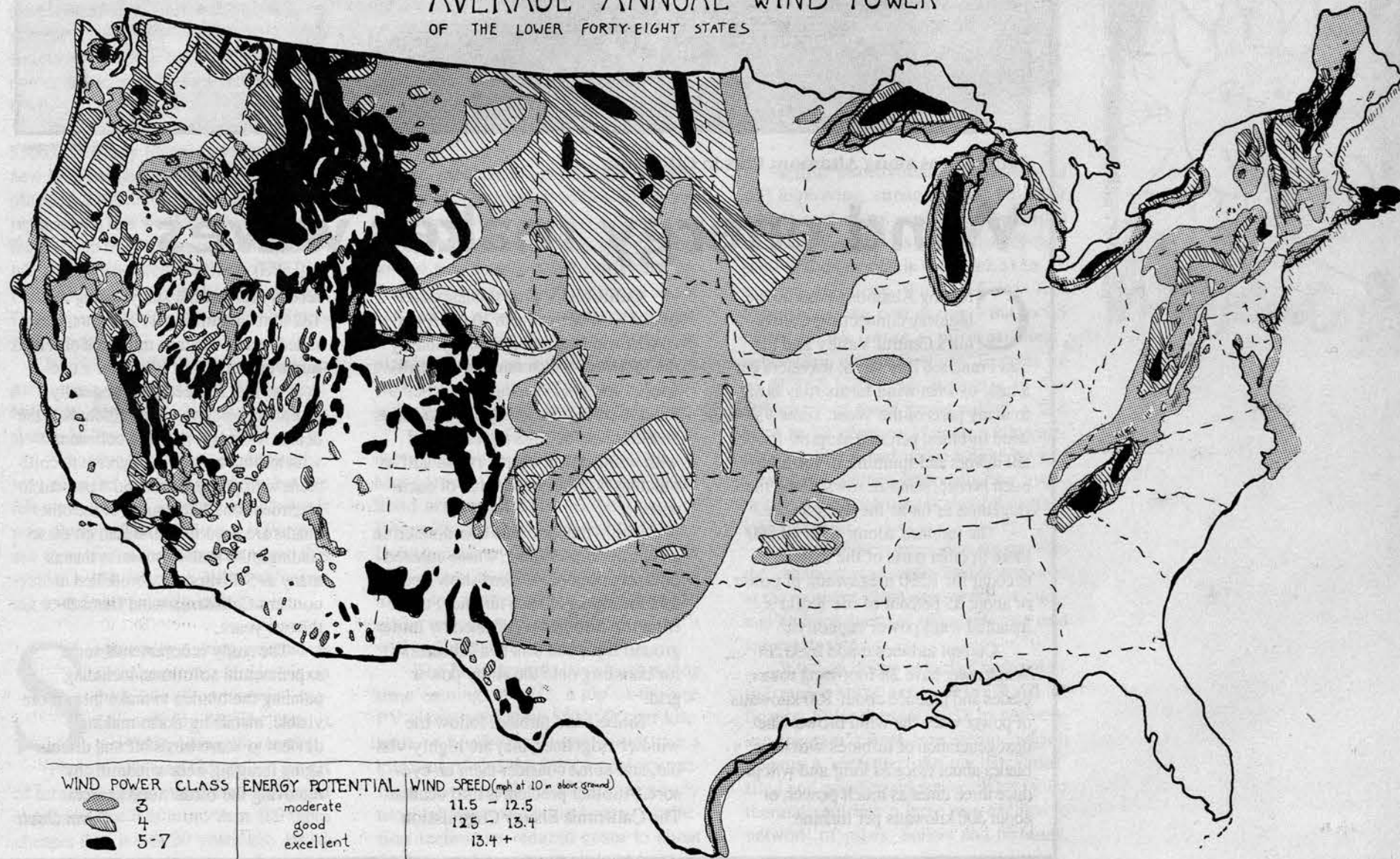
Research says there is no shortage of wind to make electricity. But the nation is short of utilities willing to bet on the resource.



Diane Sylvain

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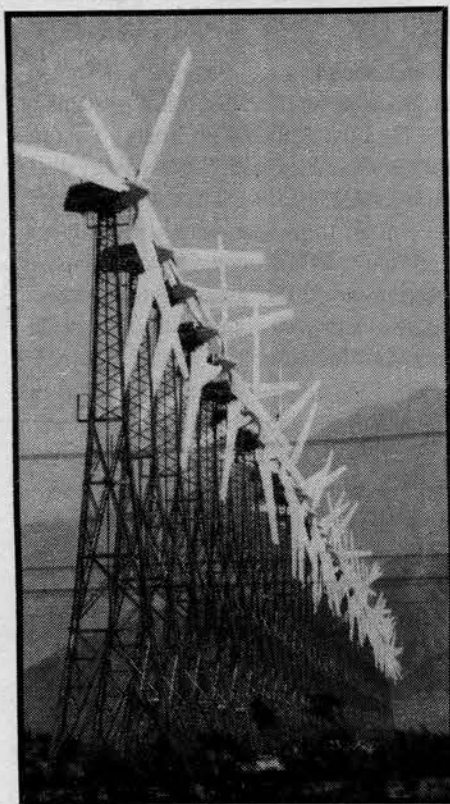
AVERAGE ANNUAL WIND POWER
OF THE LOWER FORTY-EIGHT STATES



Diane Sylvain

Source: Utility Wind Interest Group

Wind leads renewables ...



American Wind Energy Association
A wind plant on San Geronimo Pass, California

Continued from previous page

lot of very positive field experience."

Another breed of "nickel machines" is being developed in the Northwest by Advanced Wind Turbines Inc. of Redmond, Wash., with support from Puget Sound Power and Light Co. and the Department of Energy. The designer of the turbines, Robert Lynette, says his goal, in contrast with U.S. Windpower's, is to build "the least complex machine possible." Instead of the advanced electronic and hydraulic systems which will allow U.S. Windpower's turbines to respond flexibly to changes in wind speed, Lynette says he is focusing on an "elegant design" to make his machines more efficient and reliable. By the end of the decade he expects to have a turbine that will produce power for as little as 3.5 cents per kilowatt-hour.

No matter how good the turbines or cheap the electricity, utilities will have to undergo an "attitude adjustment" before they are comfortable with wind, says Thresher of the National Renewable Energy Laboratory. "They like to be able to just turn a unit on, dial in the power

level and not worry about it. Using wind takes a different kind of strategy and experience."

Like a sail on a power boat, wind can serve as a "fuel saver." When the wind is blowing, you can put your sail up and maintain speed while using less gas and creating less pollution. But using a sail well also means learning to constantly monitor the boat's direction, tend the lines and anticipate each shift in the breeze, tasks that a sailor accustomed to just flicking a switch and setting a course may find difficult.

Even the staunchest supporters of wind power agree that, at least for the next few decades, wind will be limited to supplying about 20 percent of any given utility's demand. Even at that level, though, incorporating wind energy will be difficult in states such as Colorado, where much of the electricity comes from coal-fired plants, which change power levels sluggishly.

In Northwestern states, which depend mostly on hydro power, wind may provide a convenient addition to the power supply, according to Lynette who, in addition to designing turbines, is the



U.S. Windpower

Wind farms along Altamont Pass in California

Wind energy makes waves

Crossing Altamont Pass on the highway connecting California's Central Valley and the San Francisco Bay Area, travelers get a taste of what wind farms may bring to many parts of the West: some 4,000 wind turbines, perched atop 80-foot-tall towers and spinning in the afternoon breeze, stand in rows along the ridgelines as far as the eye can see.

The turbines, along with 12,000 more in other parts of the state, account for 1,500 megawatts of power, or about 85 percent of the world's installed wind-power capacity.

Current turbines made by U.S. Windpower have 28-foot-long rotor blades and produce about 100 kilowatts of power when the wind blows. The next generation of turbines will have blades about twice as long and will produce three times as much power, or about 300 kilowatts per turbine.

California's wind farms extend over 27,000 acres, with 10 to 15 percent of the land actually occupied by the turbines, which must be carefully spaced to avoid stealing each other's wind. Cows graze beneath the turbines and ranchers say sharing their land with wind-power operators can add as much as \$2,000 to the value of each acre.

The wind farms are coordinated in a central control room, where colored dots on computer screens show operators the status of each turbine. Power from the turbines is collected by underground lines and sent to a substation for boosting onto the utility power grid.

Since wind turbines follow the windier ridgelines, they are highly visible, and some consider them an eyesore. Another problem is bird deaths. The California Energy Commission

recently released a study saying that 182 birds, including 119 raptors, were killed in a 13-square-mile area of wind farms on Altamont Pass over a two-year period. Sixteen were federally protected golden eagles. About half the deaths were attributed to collisions with turbine blades, 11 percent to collisions with powerlines, and 8 percent to electrocution. The causes of the other deaths are not known. Based on these findings, the study estimates that as many as 567 raptors were killed in northern California wind farms over the two years.

The study recommends some experimental solutions, including painting the blades to make them more visible, installing noise-making devices to scare birds off and discouraging foraging near windmills by removing the birds' food sources.

— Devin Odell

head of R. Lynette and Associates, a wind-industry consulting firm.

"For the Northwest, wind is also a fuel saver, but the fuel (it saves) is water," Lynette says.

Already Puget Sound Power and Light says it will go ahead with a 275-turbine, 28-megawatt project. Pacific Corp., the Portland, Ore.-based parent company of Pacific Power and Light and Utah Power and Light, says it plans to acquire 200 megawatts of wind power by 2001, if it proves cost-effective.

But even with increasing momentum, boosters say the final hurdle wind faces — and probably the most difficult — is to "level the energy playing field"

so wind can compete fairly with other energy sources.

"Without some major changes, wind will remain a nickel-and-dime business for a long time," says Lynette. "Utilities will put a few up so they can run the picture on the cover of their annual report, but you won't see any serious development."

Swisher, Thresher and other advocates favor regulation that would force utilities to include the cost of the pollution created by burning fossil fuels when they evaluate competing power bids. They also argue that wind should receive a production credit to compensate for tax subsidies received by oil, natural gas and

coal producers. Finally, since most of the windiest places are far from major population centers, they are pushing for government financing to expand and increase access to the nation's electrical transmission system.

Even without these changes, however, many in the industry are confident wind will win in the end. "Unlike the price for oil, gas or coal, the price for wind is not going to rise," predicts Lynette. In addition, "pollution standards for conventional plants are going to continue to become stricter and more costly. Someday, there will have to be a cross-over point. I just want it to be in my lifetime." ☐

Plugging into the sun

by Melinda Merriam
and Steve Hinchman

The cluster of cabins and old storefronts that is White Pine, Colo., doesn't look like a solar-energy laboratory. The former mining town sits at 9,800 feet in the midst of central Colorado's Sawatch Range, and getting there requires a tortuous 10-mile drive up narrow Tomichi canyon. In winter, both road and canyon are blocked by snow.

Precisely because of its tiny size and isolation, White Pine may soon become the first solar-powered town in the United States.

Currently, White Pine is connected to the electric grid by a five-mile, 73-year-old power line that needs to be replaced. At first, Public Service Company of Colorado planned to build a new line through the mountains, for about \$26,000 per mile. Then senior planning engineer Chuck Rhodes realized that the town's isolation, sunny climate and small electric load make it ideal for solar power.

Rhodes's design calls for a central solar plant — about 800 photovoltaic panels arrayed in four long rows — to generate 35 kilowatts of electricity. With battery and propane backups, that should power the 45 mostly summer homes in town.

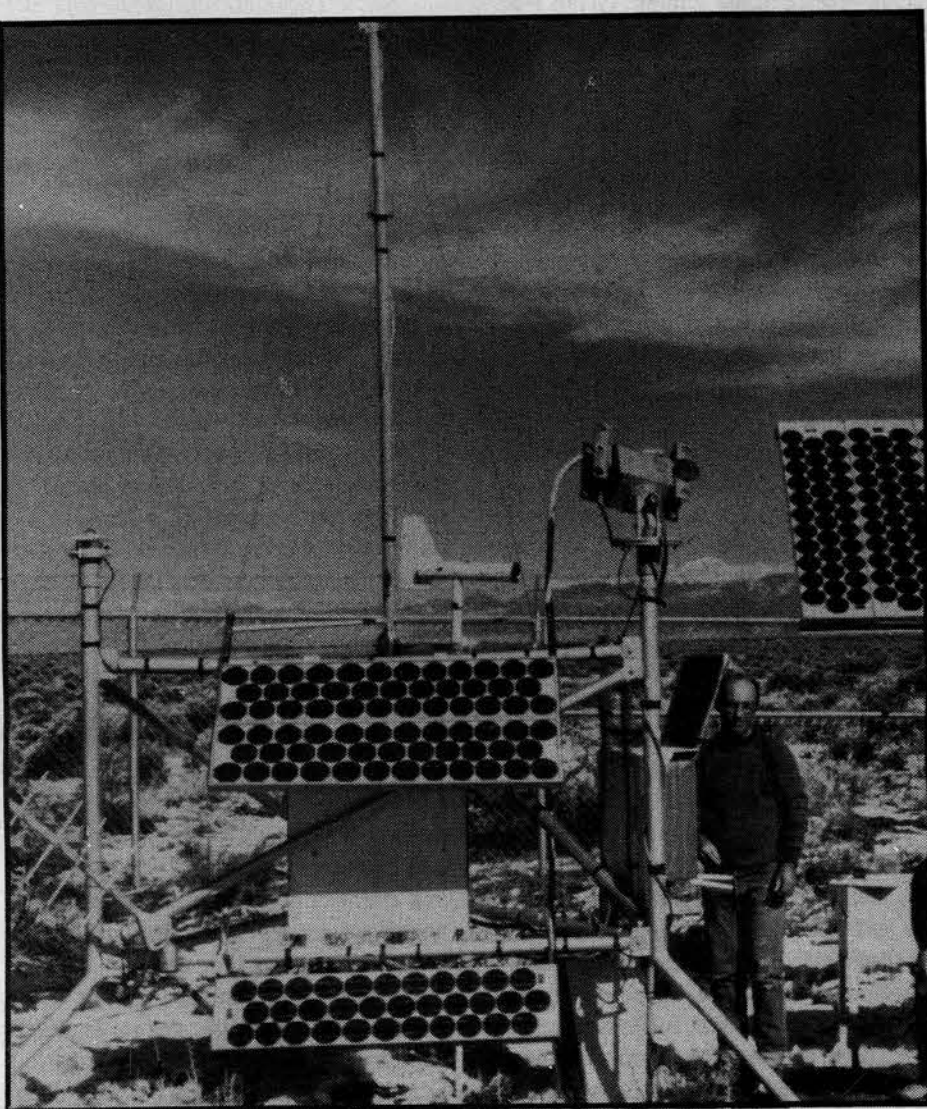
The photovoltaic system will cost \$500,000, nearly four times the cost of a new line, Rhodes says. His company has pledged \$130,000, equal to what the replacement line would cost, and is looking for help from the utility-funded Electric Power Research Institute (EPRI) in Palo Alto, Calif., and the U.S. Energy Department's National Renewable Energy Laboratory.

Rhodes says the DOE has agreed to participate, and EPRI's initial studies favor the project. He hopes to have the system on-line by Sept. 30, 1993.

"Photovoltaics are an expensive way to make power right now, but we felt we're gaining so much knowledge it was worth it," says Rhodes. "We will see more and more instances where this system is cost efficient. What we're trying to do is get an early start."

Solar energy, long rejected as an uneconomic dream, is on the brink of commercial success and, for the first time, is penetrating the utility market.

Photovoltaic technology, or the art of turning sunlight into electricity, is still expensive, but it is more than 100 times cheaper than it was 20 years ago. Moreover, PV and other solar technologies advance at ever-faster rates: many



A photovoltaic-powered remote weather station

experts predict solar power will be competing with natural gas before 2000, and could outshine coal by 2005.

Already, uses for solar are growing so fast that manufacturers can't keep up. Each photovoltaic panel produced in the U.S. today, about 15 megawatts a year, is sold instantly. New manufacturing plants coming on-line are expected to ease the pressure, and the infant solar industry is beginning to attract investors.

"We're finding there's a great deal more interest in collaborating from the big companies," says Dr. Tom Bath, head economist at the Department of Energy's National Renewable Energy Laboratories in Golden, Colo. "People with access to capital are finally getting interested in this stuff because they can make money at it. And that's when it will really start happening."

The breakthroughs have been a long time coming. In 1972, a top-of-the-line PV system cost about \$500,000 per kilowatt — hundreds of times more than a kilowatt of capacity from a coal- or gas-fired power plant. By 1990, major technical advances and refined mass production techniques reduced costs to about \$4,000 per kilowatt, which is only twice the cost of a new coal plant.

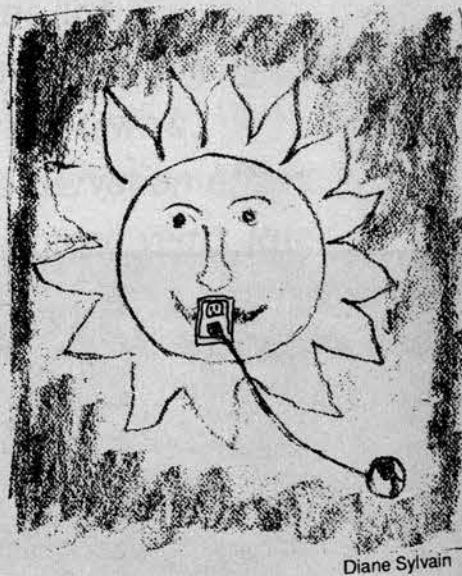
While photovoltaic technology is still improving, strong demand for solar panels and some remaining technical problems keep prices high. Most off-the-shelf brands available today are 11 to 17 percent efficient. With a 15-year life expectancy, the cost averages out to 25 cents to 40 cents a kilowatt-hour, depending on the sunlight. Experts at EPRI and NREL say increases in the efficiency of solar panels will drop the price to 12 cents to 15 cents a kilowatt-hour by 1995, and under a dime by the turn of the century. Nationally, the average cost of electricity is about 8 cents a kilowatt-hour.

Photovoltaic systems do not provide the cheapest renewable, fuel-free power at the moment. Both wind and solar-thermal technologies are more efficient and less expensive.

Wind is doing well, but new solar-thermal plants are proving hard to finance. Solar thermal works by converting the sun's heat into steam, which powers a turbine. Like nuclear, coal-fired and geothermal power plants, solar thermal requires a large and expensive network of pipes, boilers and turbines,

Continued on next page

*It's been
a long haul,
but rapid improvements
in photovoltaic solar
panels are opening
larger markets
for this technology.*



Diane Sylvain

Plugging into the sun ...

Continued from previous page

and it only works in the hot desert sun. That does not fit today's emerging market for small, flexible power plants. Recently, for example, the nation's largest developer of solar thermal, Luz International, was forced into bankruptcy despite very high efficiencies and costs approaching 8 cents per kilowatt-hour (HCN, 5/20/90).

But PV, despite higher costs, is thriving. PV converts sunlight directly into electric current, without boilers or turbines, and can be sized to produce anything from a couple of watts to a megawatt or more. Today's technology is good enough to work under weather conditions in every state except Alaska in the winter. Given that flexibility and compactness, PV has created its niche in the power market.

According to John Thornton, a principal engineer at the National Renewable Energy Laboratories' PV Applications Area, there are over 50,000 stand-alone photovoltaic systems at work in the United States. They power communications towers, weather and meteorology stations, highway and railroad signs, pumps for stockwater, microwave repeaters, military sites and home power systems.

Nearly all are tiny — from eight kilowatts down to 100 watts or less — and located far from the closest power line, and thus cheaper than a powerline. PV has become so cost-effective in remote areas that sales of photovoltaic panels have increased 30 percent a year every year for the last decade.

That expanding market is the key to PV's success, especially through the Reagan years, when federal funding on solar research was cut from \$150 million to \$35 million a year. The remote market has not only kept the PV vendors alive, says Jim Burk, director of EPRI's Storage and Renewables Department, but it has also funded new research and drawn in utilities and new investors.

Now, Thornton and Burk say, better technology and lower costs are opening bigger markets. At the Rocky Flats

Nuclear Weapons Plant outside Denver, Colo., a photovoltaic air-monitoring station sits 30 feet from a power pole. Until recently, it would have been linked to the grid. But Thornton, who helped design the project, says it was cheaper for the utility to use a solar panel than to "put a transformer on the pole and run the wires 30 feet over to operate this very low-power installation."

He can cite dozens more examples where utilities are using solar panels in place of new power lines. Power poles alone cost the U.S. utility industry from \$1,000 to \$4,000 each, or more than \$3 billion a year, according to the Utility Data Institute, and that's just a fraction of total transmission costs. PV, on the other hand, can be installed cheaply, without any special equipment, wherever and whenever electricity is needed.

Says Thornton, "It's reversing the economies of scale." He predicts that in the next 20 years, thousands of small, mass-produced solar systems will slowly begin to replace today's massive central power plants and million-mile transmission networks.

That possibility has captured the attention of utility executives and state regulators. In May 1991, the Colorado Public Utilities Commission approved a rule requiring that utilities offer new customers a cost comparison between photovoltaics and a new line.

"(In Colorado), the economics are now such that if you are more than 800 feet from an existing line, a residence is more cost-effectively served by photovoltaics than by extending the line," says Thornton.

San Francisco-based Pacific Gas and Electric, which already has more than 900 small-scale, remote PV systems, has found that at one mile it's cheaper to buy a homeowner a solar system than to build a new feeder line. In the new era of super-efficient appliances and conservation, most experts predict that eventually PV will be the cheapest power source for new homes no matter how close existing lines are.

In rural areas, savings can be even greater. After a spring ice storm knocked out \$1 million worth of power poles on Colorado's eastern plains, the rural elec-

tric co-op K.C. Electric developed a solar water pump to replace lines to isolated wells and stock tanks. So far, about 10 ranchers have moved to the new system and K.C. Electric officials say the utility will no longer replace or install new feeder lines to distant wells.

Nevertheless, use of photovoltaics by utilities is still limited. Utilities offer the greatest potential for PV, says Burk, but because of the industry's unfamiliarity with and skepticism of solar, it is also the greatest barrier to the spread of photovoltaics.

But Thornton, who has spent 29 years in solar research, much of it teaching utilities, says the industry is catching on fast.

"It's more heartening now than ever," he says. "The whole atmosphere has changed. When you walk into a utility now you are not seen as some kind of weirdo, and I have had a fair amount of treatment like that. There are utility people out there now talking about using renewables that never would have considered it even five years ago, much less 10 or 15."

He attributes some of the change to a new generation of executives, who are willing to consider social costs and try new approaches. And in part, he says, "It's pressure from consumers, the environmental movement and the government."

Some utilities are experimenting with the next level of solar technology: intermediate-sized solar power stations linked to the electric grid at distant or overloaded substations. Pacific Gas and Electric is designing a 500-kilowatt photovoltaic array to boost power at an overloaded substation in California's San Joaquin Valley. It would add enough electric capacity to meet the neighborhood's growing demand, without building new power lines.

Thornton says this and similar projects are on the edge of cost effectiveness, and could eventually save the nation hundreds of megawatts of electricity lost in transmission and millions of dollars in transformers, switches and other equipment costs.

Most experts say photovoltaics will continue to improve rapidly and compete in ever larger shares of the utility market. Advanced technologies, called thin films, may soon replace today's silicon PV cells. Southern California Edison and Texas Instruments have developed a thin film PV cell with aluminum foil backing that requires only 1 percent of the material standard silicon cells use.

Thin film cells are promising because they can be mass produced at very low cost. The Texas Instruments design cuts material costs from \$65 to \$1 a pound, and is expected to produce panels for \$1,500 to \$2,000 a kilowatt, equal to or better than the price of a new large-scale coal-fired power plant. Plus, Thornton says, the new thin film cells will come in flexible rolls that someday may be used as roofing on houses.

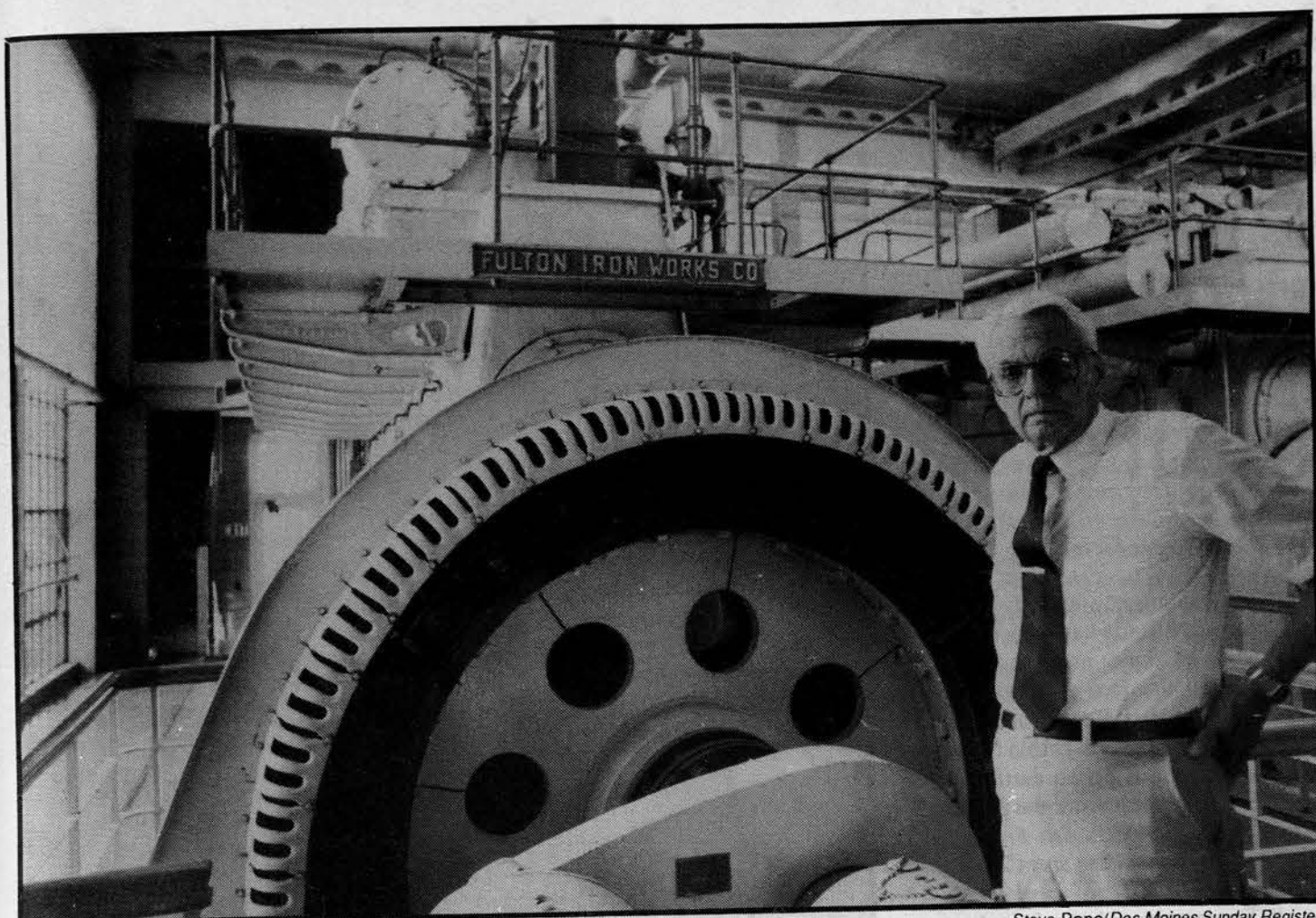
Japan's Sanyo Energy Corp. has a new rooftop solar shingle that it says is good enough to power an entire house. It should be on the U.S. market in three years, *Garbage* magazine reports.

The current projection, says Burk, is that thin film and other advances will cut photovoltaics' costs to 6 cents to 8 cents per kilowatt hour by 2005, putting solar in direct competition with fossil fuels. Once that happens, he adds, there's no limit to what we can do. ☐



William Courtney

Sacramento Municipal Utility District's Photovoltaic I and II projects in California



Steve Pope/Des Moines Sunday Register

Wes Birdsall by an Osage generator that usually sits idle because of his conservation program

A utility manager shows his town how to get rich slowly

by Heather Woodcock

If the U.S. had practiced efficiency for the last 20 years instead of spending billions on new power plants, chances are the country would look a lot like Osage, Iowa. Since 1974, the Osage Municipal Utility's efficiency programs have saved the northern Iowa farm town about \$1 million a year in energy costs, reduced electric bills to 60 percent of the national average and delayed the need for a new power plant beyond the year 2000. And while neighboring towns are still reeling from the farm crisis, Osage's economy is thriving.

Like most of America, Osage began to save energy after the 1973 oil crisis. By 1975, Wes Birdsall, manager of the Osage Municipal Utilities, realized that continued conservation would be the cheapest source of energy for Osage's 3,500 citizens. So, instead of designing a new power plant, the Osage utility designed efficiency programs to slow electric load growth from 7.2 percent a year to 3 percent a year. After two years of heavy marketing and proven successes, Birdsall gained both the trust of the community and a growth rate of just under 3 percent.

Since then Birdsall's efficiency ideas have had a remarkable effect. "Just about anybody you talk to in Osage has something to do with conserving energy," says Larry Unger, who runs Unger's Bakery in downtown Osage. Unger uses excess heat from baking ovens to heat his family's apartment above the bakery and the coffeehouse attached to the bakery.

"The only time we need to turn on our natural gas is when the temperature hits zero and the shop's closed. I feel good about what we've been able to save."

Osage's recipe includes both carrots and sticks. Since 1975, the utility has refused gas and electric service to any new home or business that does not have storm windows and doors, at least four



inches of insulation in the walls and eight inches in the ceiling.

At the same time, Birdsall has made efficiency both cheap and easy. The utility has 20 voluntary conservation programs and a newsletter, but mostly it gives efficiency away. Besides handing out a free hot-water-heater blanket to any customer that wants one, Osage also gives away free compact-fluorescent lightbulbs, low-flow showerheads and shade trees. Energy checks have been completed without charge in 56 percent of all homes and businesses in town. And the utility recently gave the local high school 60 low-flow showerheads, which will reduce hot water consumption by 1 million gallons every year.

Dean Meier, superintendent of the Osage Community High School, said the offer was made over a dinner conversation with Birdsall. "When I had the custodial staff check the water flow with five gallon buckets, it didn't even take a minute to fill them up," said Meier. "Now the showers only fill a two-gallon bucket in a minute."

Birdsall has been able to educate the rest of the town just as effectively. A few years ago he began to do infrared scans of all the homes in town. Homeowners could then examine the infrared pictures to see where heat was escaping. According to Rick Miller, manager of the town's lumberyard, "After infrared scans are done, there's a big increase in our insulation sales."

The utility has ramrodded large-scale projects as well. In the mid-1980s, Osage installed efficient high-pressure sodium lamps in all street lighting; they paid for themselves in four and one-half years. To reduce the need for air conditioning, Osage Municipal started a nursery and now plants shade trees in customers' lawns.

Since Osage began to pursue efficiency 18 years ago, it has not had to build a new power plant and probably won't need extra power until well after the turn of the century. Moreover, all 18 years of efficiency projects have only cost the utility \$350,000. By avoiding new construction, Osage has been able to pay off old debts and avoid new bond issues. Osage has passed the savings along to its customers, cutting rates five times, or 19 percent, in the 1980s.

The benefits include a greater sense of community and pride, as well as a stronger economy. Everett Steele, owner of the local supermarket, reduced his heating bill by capturing waste heat from refrigeration units. He says the saved money translates into lower food prices, and that helps him compete with the large discount stores in nearby Mason City.

Jim Hayden, the local Ford dealer, says the new energy-efficient windows and insulation in his showroom give him the lowest energy bill in a 20 dealership area, which has increased his bottom line.

"Wes has made this whole town aware," says Hayden. "I built an addition on my home recently and I wouldn't have thought to consider conservation if it hadn't been for the conservation tips in the utility's newsletter."

Though many utilities admire Birdsall's work in Osage, some question its applicability to larger areas. Birdsall, who will soon retire, says, "I see no reason why conservation can't be done elsewhere. Why don't we divide our cities into small Osages and get community help?" ☐

The end of the 1973 energy crisis was just the beginning of this small town's conservation effort. Eighteen years later, Osage, Iowa, reaps the rewards of its long-term strategy.



Rita Claggett

The end of the 'official future'

by Art Kleiner

A huge California utility tries to turn on a dime, abandoning nuclear power in favor of efficiency and alternative sources of energy.



It is startling how quickly Pacific Gas and Electric has become trusted by its former enemies. This is, after all, the once-despised Northern California electric utility and progenitor of the famous Diablo Canyon nuclear plant built on an earthquake fault. Even Tim Redmond, the political columnist at the weekly *San Francisco Bay Guardian*, which has spent 25 years bashing PG&E, says:

"They may have been forced into doing the right thing, but I think they're sincere about it. Their economists have actually gotten Amory Lovins's message."

Energy guru Lovins regularly consults for PG&E these days on a project retrofitting an East Bay office building. Its aim is to test the real savings of energy-conservation technology. It is one of 40 PG&E projects that include eliminating the wasteful aspects of its grid, subsidizing purchases of energy-efficient appliances, and helping builders install better air-conditioning ducts.

PG&E has pledged to provide 75 percent of its new power from efficiency, use small-scale solar/wind/turbine generators for the rest, and thereby eliminate the need for new large-scale coal or nuclear plants. Hence the praise from several conservation-minded San Franciscans, culminating with Ralph Cavanagh.

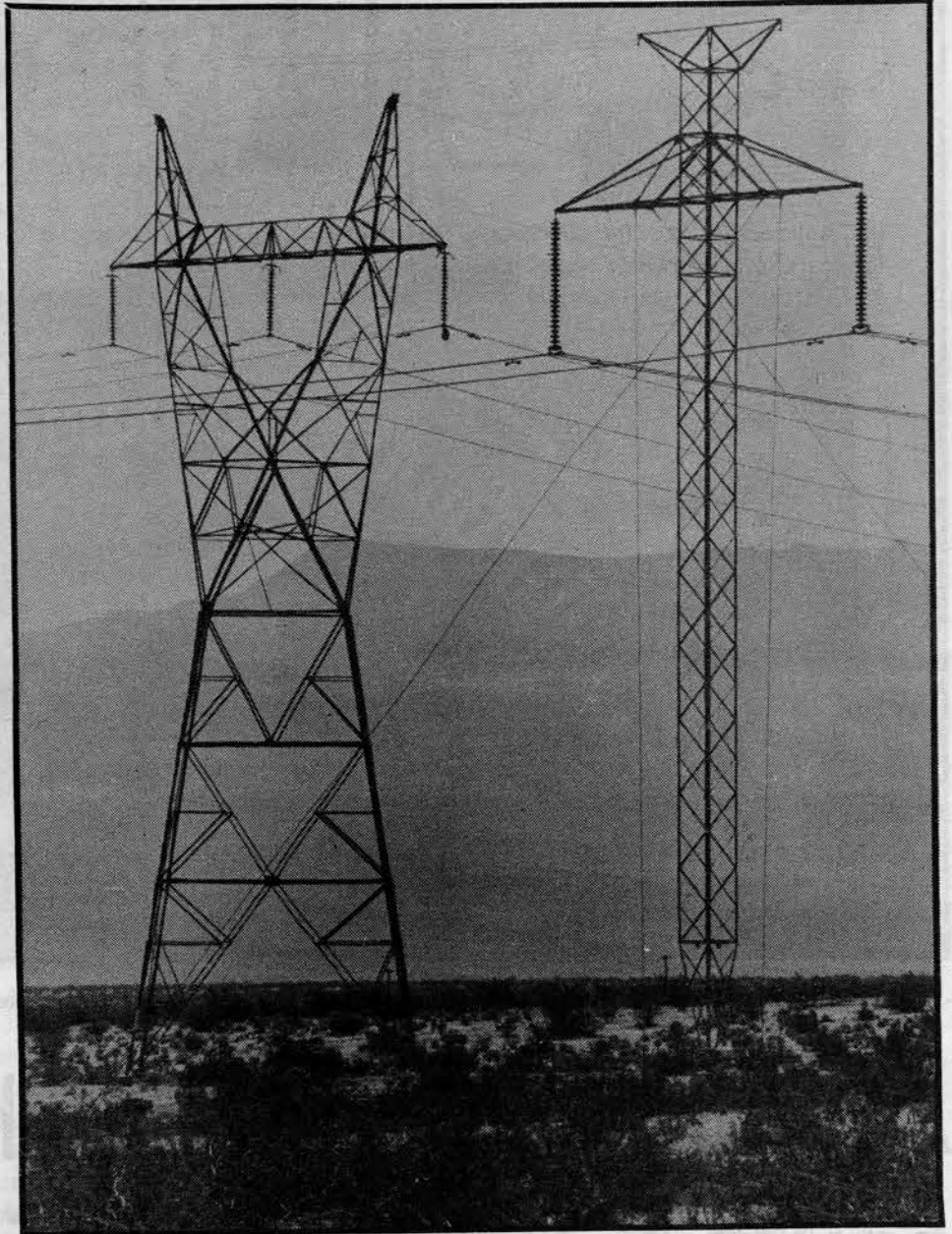
Cavanagh, whose last name rhymes with "cabana," is a lawyer for the Natural Resources Defense Council. In the early 1980s, he sued PG&E for trying to shift its Diablo Canyon costs onto ratepayers. But more recently, he was part of a coalition called the "California Collaborative," aimed at designing the state's energy future. It consisted of 15 groups that had rarely agreed before.

Cavanagh was one of the most fervent pushers for efficiency, but so was John Fox, the PG&E representative. Both men are bright, informal and in their early 40s; Fox is dark-haired and soft-spoken, while Cavanagh is sandy-haired and known for torrentially fast speech.

Anchored by these two men and after much negotiation, the group worked out an unprecedented agreement that allows utilities to keep 15 percent of the savings they glean from conservation.

"This is the most fundamental shift in electric utility rules since Edison," said Cavanagh. "We will no longer tie the profits of this industry to how much electricity it can sell, but to persuading people to use less electricity. Which is very much at odds with traditional, conventional, hide-bound thinking. It's a bold step and I credit PG&E for taking it."

For a big corporation, a shift from one profit-making mode to another requires a fundamental change of attitude; that change began three years ago within PG&E.



Mike McClure

One company official predicts his company may ultimately buy power from small-scale producers and produce none itself

Using a "scenario" process conducted by a futurist named Peter Schwartz, they dubbed their prevailing, 30-year-old view of the world "the official future." Every year more people would move to the state, buy more gadgets and use more air conditioning.

Given those assumptions, a utility



could only cope, it seemed, through massive new plants. Nukes. Hydropower dams. Heavy-duty wiring grids. The facilities were planned years ahead of time, and projects were always under construction, cycling borrowed money continuously from bank to construction firm, back from customers to the bank again.

But the official future turned out to be unbelievable when the PG&E executives matched it against reality. Diablo Canyon, budgeted at \$500 million, cost \$5.3 billion — an overrun that undermined the self-confidence of the company, whose nuclear group had been considered the managerial elite.

PG&E's leaders ultimately concluded that if they persisted with the official future they'd risk financial disaster: Energy efficiency was the only safe course under all possible futures.

"When you set new goals," said John Fox, "it becomes a great stimulus for creativity. You get all kinds of spillover benefits. We learned that customers really like these programs, whether they participate or not. For commercial customers, efficiency is a tool

for economic viability. We started questioning: 'If we can reduce generation, can we also save transmission and distribution costs?' We can downsize transformers. We can put in smaller cable."

PG&E employees began volunteering for the new projects: They were now seen as a path for advancement and tapped the long-suppressed sense of why many had joined the industry in the first place.

PG&E also had to recruit a far more diverse staff, who could, for instance, teach energy conservation in more of the 96 languages spoken by San Francisco citizens.

At least one high-level PG&E manager has predicted that eventually, his company may produce no power at all. Instead, it will broker power collected from thousands of smaller-scale producers — including photovoltaic- and wind-based power systems, neighborhood-scale gas turbines, and rooftop generators — and distribute it to millions of customers. If that happens, no new coal or nuclear plants will be needed in California, no matter how big the population grows, and existing centralized plants will be shut down.

There are skeptics. Some say the change of heart is still fragile, or that PG&E is keeping too much of the energy-efficiency profits.

And Ralph Cavanagh notes that the IRS plans to tax energy-efficiency rebates as income, adding a huge disincentive to conservation and decentralization.

On the other hand, as PG&E becomes a leader, utilities from around the country have been paying closer attention to its example — and to similar cases in southern California, Washington state, New England and Wisconsin. In each case, the official future has turned out to be a roadblock: Progress means learning how to gracefully put it to rest.

Can coal burn cleanly?

By Devin Odell

In the early 1980s, the southwestern Colorado town of Nucla, population 650, began to see its economic base slip away.

The energy bust first claimed the local uranium mining and milling operations. Then Peabody Coal Co. left. "Finally, we were down to just the power plant," says John Vanderpool, the town's mayor.

The plant, coal-fired and 25 years old, was on its last legs. From the standpoint of its owner, Colorado-Ute Electric Association Inc., it was little more than a benchwarmer in the utility's lineup of power producers. "Colorado-Ute always tries to use the lowest-cost energy source first," says Tom Heller, operations superintendent at the plant. "Because of

their low efficiency, the Nucla units were the last units to be loaded."

Instead of retiring Nucla Station, however, Colorado-Ute decided to revamp the plant, blending equipment from 1959 with the latest in high-tech coal burning, tripling the plant's power output to 100 megawatts and extending its life by 30 years.

Rather than ending up as a monument to an outmoded technology, Nucla demonstrated a clean new way of burning coal (see below).

The plant also became one of the first participants in the Department of Energy's Clean Coal Technology Program, receiving about \$20 million, or a third of its costs for two years, from the federal government. This \$5 billion joint DOE-industry program, begun in 1986, aims to "showcase a new generation of

innovative coal processes" by subsidizing projects that apply them.

These processes focus on finding ways utilities can continue to use coal, the nation's cheapest and most abundant energy source, while meeting increasingly stringent environmental standards.

Supporters of the program say that new coal technologies will be indispensable. Coal now supplies 57 percent of all U.S. electricity, about 1.5 billion megawatt hours each year and almost 100 percent of electricity production in coal-rich states such as Colorado.

But many coal plants are in the same position as the Nucla Station was: old, inefficient, dirty. In 10 years, according to the Department of Energy, more than 50 percent of U.S. coal plants, about

Continued on next page

Coal burns dirty, which now puts it at a disadvantage. To help coal survive as the nation's number one source of electricity, the federal government subsidizes a wide range of clean-coal research programs.

How clean coal helped kill a utility

As the accompanying article shows, rebuilding the Colorado-Ute Electric Association power plant at Nucla, Colo., was a technical success. Today, the plant helps demonstrate that fluidized bed technology can burn even a low-grade coal cleanly and efficiently.

Unfortunately, although the operation went well, the patient died a lingering and painful death.

Reconstruction of Nucla helped drive Colorado-Ute into bankruptcy in 1989, followed by total dismemberment in 1992. As a result, the Nucla plant is now owned by the Tri-State Generation and Transmission Association and Colorado-Ute no longer exists.

Its death was a result of actions taken decades earlier. All through the 1960s, 1970s and 1980s, Colorado-Ute had been hell-bent on growth, building

coal-fired power plants at Hayden and Craig, Colo.; trading away its hydropower from Glen Canyon Dam so it could build more coal-fired plants; and undertaking the Nucla rebuilding project well after the energy bust and a near-depression in its rural service area.

Nevertheless, reconstruction of Nucla was not a controversial decision in Washington, D.C., or in Colorado. The federal government made the grants and a bank set up to serve rural electric cooperatives loaned the rest of the money.

At home, the 28-person board of Colorado-Ute, drawn from its 14 rural electric cooperatives, backed the project, as did the Colorado public and media. Federally subsidized investment in infrastructure has been a way of life in the West for the past century, and Nucla seemed just another federal gift.

In addition, Colorado-Ute saw no alternative to growth. Under Girts Krums, its president for most of the 1980s, Colorado-Ute mocked conservation. In western Colorado, the very idea of doing well by using less electricity was inconceivable.

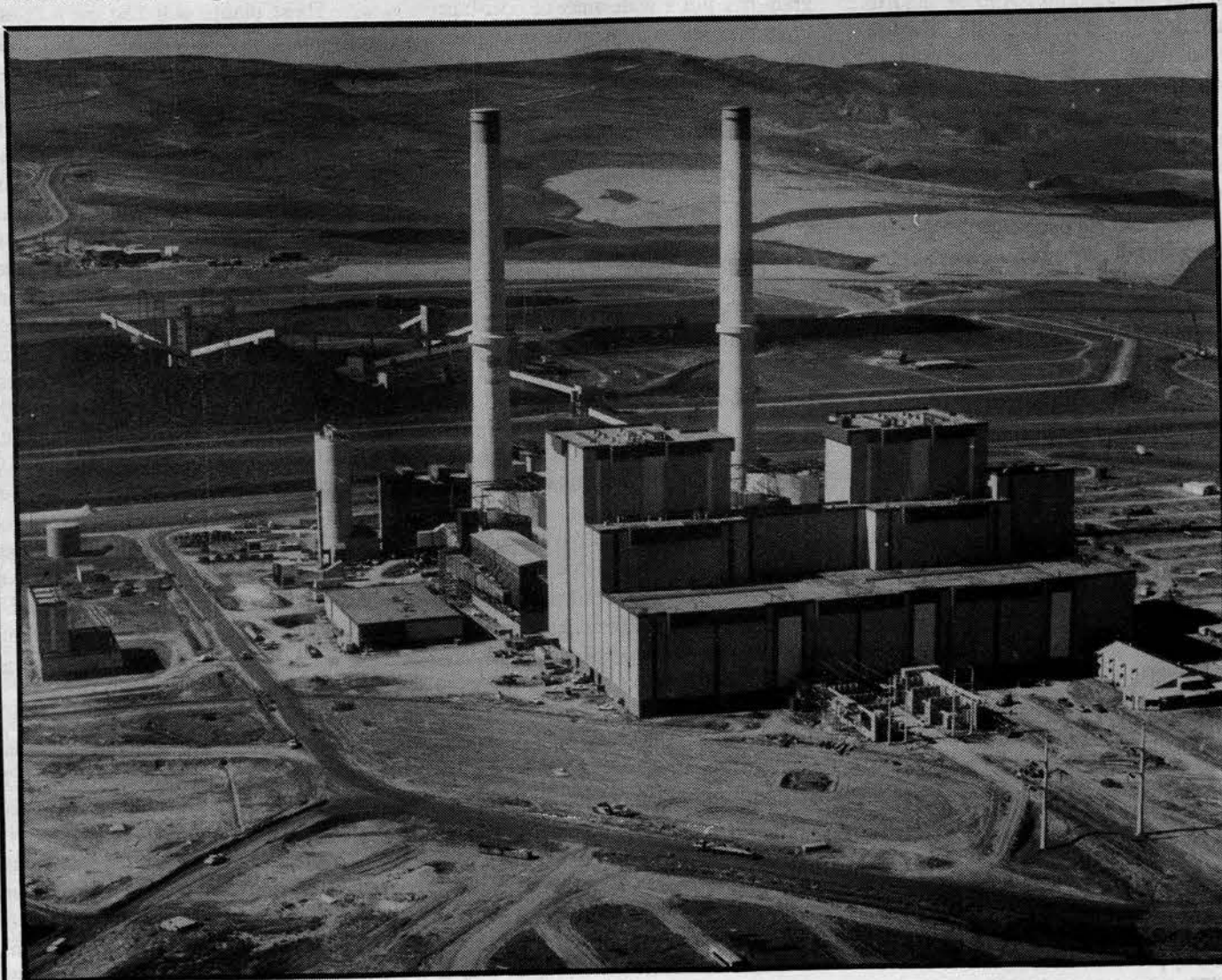
The disappearance of Colorado-Ute raises a larger question: Is a subsidized clean-coal technology a 20th-century answer to a 21st century situation? Did the program help cause Colorado-Ute's death?

Because Colorado-Ute was such an extremist organization, it is hard to blame its problems on the clean-coal program. However, it may be that the very existence of the program will divert some utilities toward a subsidized supply-side solution and away from solutions based on efficiency.

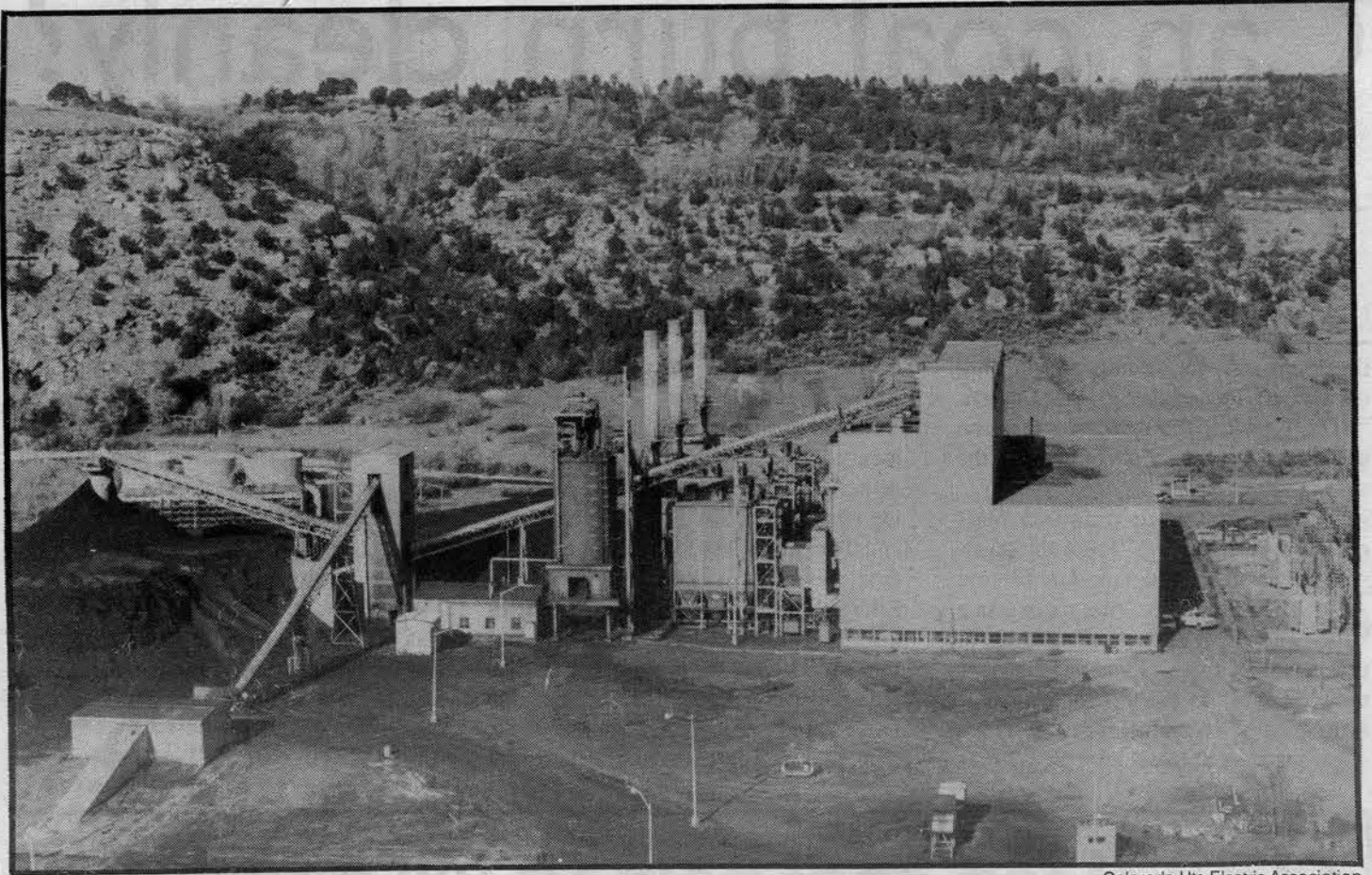
— Ed Marston



Rita Claggett



Beginning in the 1960s, Colorado-Ute traded away power from Glen Canyon Dam and built coal-powered plants, including this 850-megawatt plant in Craig, Colorado



Colorado-Ute Electric Association

Colorado-Ute's Nucla plant was an early participant in the government's Clean Coal Technologies Program

Can coal burn cleanly?

Continued from previous page

150,000 megawatts of capacity, will be 30 years old or older, the age when utilities usually retire or retrofit the plants.

At the same time, the department forecasts that the need for more baseload — or around-the-clock — energy capacity will increase sharply. And the department expects utilities to use low-cost coal to satisfy "most of these capacity additions" through the 21st century.

To fill that role, coal must clear a major barrier — the Clean Air Act Amendments of 1990. They call for major reductions by the end of the decade in sulfur dioxide and nitrogen oxide, coal's two main combustion pollutants and significant sources of acid rain and air pollution. And as landfill space becomes scarcer, coal plants will need to drastically reduce the waste they create.

Utilities are now meeting the requirements of the Clean Air Act by using "scrubbers" or switching to low-sulfur coal. The scrubbers, developed in the 1960s, can remove up to 90 percent of the sulfur dioxide from a plant's emissions. But because they make plants expensive to build, reduce electricity output by 1 to 2 percent, consume large amounts of water and create mountains of waste, they are not long-term solutions.

What is needed, says the DOE, is a fundamentally different approach to burning coal: a set of "clean-coal technologies" that can make coal burn as cleanly as natural gas, boost energy efficiency and cut the cost for coal-fired power plants dramatically.

That is where the department's Clean Coal Technologies program comes in. Just as the program breathed new life into the aging Nucla plant, utilities and coal interests hope clean coal will prove a fountain of youth for the coal industry as a whole, wiping the soot off its image and maintaining its place as the mainstay of U.S. electricity production.

"There's no question about it; the real future of coal will be with the best of the clean coal technologies," says John Grasser, spokesman for the Nation-

al Coal Association. "The utilities are going to see that as the way to go."

But critics say that even "clean coal" emits large amounts of carbon dioxide, a major cause of global warming. They question whether some of the \$2.5 billion the government spends to encourage coal wouldn't be better spent on developing renewables such as wind and solar power. They also point out that coal faces stiff price competition from natural gas power plants, which are both cheaper to build and emit less carbon dioxide per unit of energy, and a new generation of conservation programs known as demand-side management.

While it's still too early to tell how well the new technologies will allow coal to meet these challenges, the program has put a wide array of coal-burning processes to the test. As of the middle of last year, the DOE had spent \$1.5 billion on subsidies for 34 projects. Over the next two years, it will spend another \$1.2 billion on the final two rounds of the five-round program.

The clean coal technologies can be broken down into four categories: removing impurities from coal before it is burned; cleaning coal during combustion; cleaning gases released after the coal is burned; and converting coal into a gas or liquid that can be cleaned and used as fuel.

The options closest to widespread commercial application for repowering plants involve cleaning the coal while it burns. In systems known as "fluidized bed combustors," such as the one at Nucla, coal particles are suspended in a strong, upward flow of air and tumbled like a boiling liquid through the combustion chamber until completely burned.

Limestone mixed in with the coal absorbs the sulfur before it leaves the boiler, cutting sulfur dioxide emissions by more than 70 percent. And because the tumbling motion helps the coal burn more easily, temperatures can be kept low so that less nitrogen oxide will form. The process allows coal plants to meet emission standards without other control devices.

There are other benefits. The Nucla plant can burn a much wider variety of fuels cleanly, according to Tom Heller. "People have piles of these low-grade fuels lying around that have been sitting

there for years. We can buy it up and burn it."

The waste product the plant produces is gypsum, which can theoretically be used in construction or to improve soils, though Heller acknowledges the plant has not found a taker. Finally, repowering a plant using fluidized bed technology costs 50 to 67 percent less than building a new plant with the same capacity.

Among the cleanest processes in the DOE's clean coal program are "conversion technologies" that transform coal to a gas, purify it and then use the hot gas to power a gas turbine.

These plants will also use a "combined cycle," in which exhaust heat from the gas turbine boils water for a conventional steam turbine, producing more electricity. The combination of a steam and a gas turbine raises efficiency from 34 percent to as high as 50 percent with the newest designs. And because much of the sulfur, nitrogen compounds and particulates are removed before the fuel is burned, emissions can meet environmental standards without scrubbers.

Previous coal gasification or "synfuel" schemes were killed by falling energy prices, leaving the Great Plains gasification plant as the sole troubled survivor (*HCN*, 3/13/89).

Supporters of the new gasification combined-cycle plants say they will not meet the same fate as synfuels because they use the gasification process not to create a substitute synthetic fuel, which would compete against natural gas or oil, but primarily as a way to purify coal before it is burned.

The impressive claims made by clean-coal advocates raise a troublesome question: If this technology makes such good economic sense, why does it need federal funding? Part of the answer is that clean-coal boosters often find themselves faced with the same attitudes that frustrate the development of renewables.

"Before they make any major investments in new power plants, they have to be absolutely sure they are going to be effective. The Clean Coal Program is absolutely essential because it serves to mitigate that risk." 

Natural gas: electricity's wunderkind

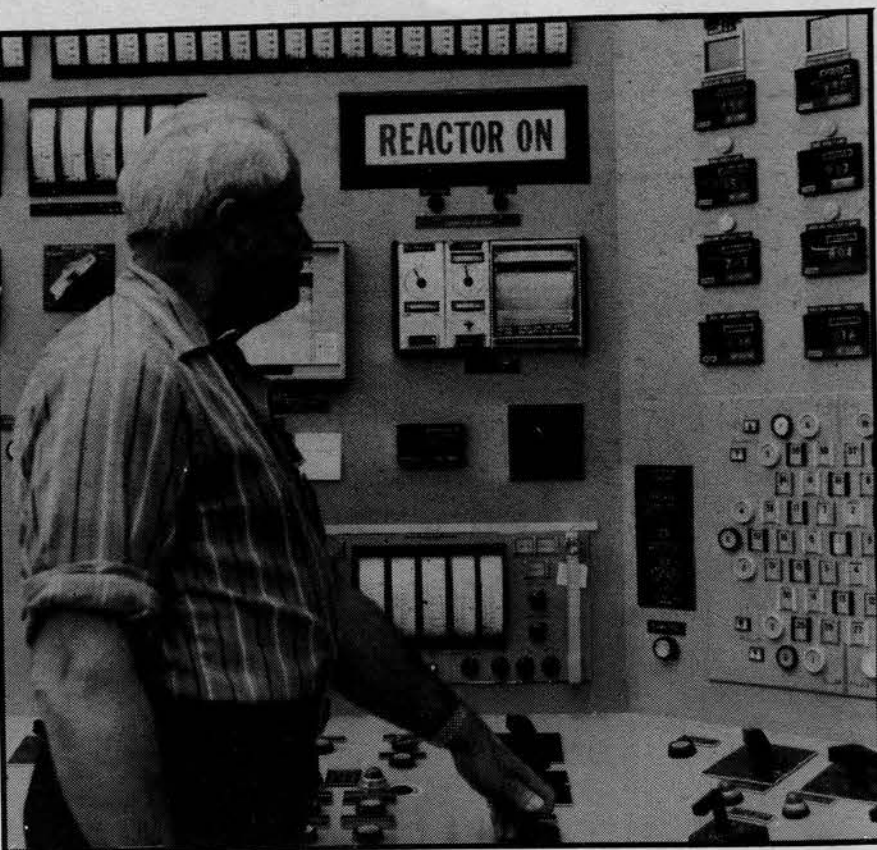
The next decade should be a bright one for natural gas. Of the 73,000 to 104,000 megawatts of new electric capacity to be built in the United States over the next 10 years, as much as one-half will come from burning natural gas, according to reports by the Utility Data Institute in Washington, D.C. In 20 years, the fuel's share of U.S. electrical production will climb from 12 percent to 16 percent.

The reasons are not hard to find. Natural gas is the cleanest-burning fossil fuel. Gas plants emit no sulfur dioxide or fly ash, and much less nitrogen oxide than coal plants. What's more, natural gas releases only 55 percent as much globe-warming carbon dioxide as coal per unit of energy.

Prospects for natural gas also have improved with new, much higher estimates of long-term reserves. Natural gas supplies are now seen as sufficient for 100 to 200 years at current rates of use. A glut has pushed prices almost 50 percent below their peak in the early 1980s, and they are expected to rise only gradually over the next eight years or so.

Gas has also gotten a big lift from a new technology, the combined-cycle gas turbine. Previously, utilities burned gas to boil water. The high-pressure steam then spun a turbine, generating electricity. Such a process is not very efficient: for every 100 units of gas burned, 36 units of electricity are produced.

Combined-cycle turbines increase efficiency by adding an extra electric generating stage. First, the burning, high pressure gas is used to spin a gas turbine. Then the low-pressure but still hot gas is used to boil water into steam, which spins a steam turbine. The new turbines are 47 percent efficient, and can burn gas from any



Public Service Co. of Colorado

The control room of Fort St. Vrain nuclear power station

source, including natural gas, coal gasification or biomass.

Experts at the Department of Energy's Oak Ridge National Laboratories say advanced designs could raise efficiency levels to 55 percent. One experiment uses a precombustion reaction of gas and steam to produce hydrogen and carbon monoxide, which have greater chemical energy than gas by itself.

Finally, gas-fired plants are more flexible than coal plants. They are less expensive, require less lead time and can be built in stages so electrical capacity can be added as needed.

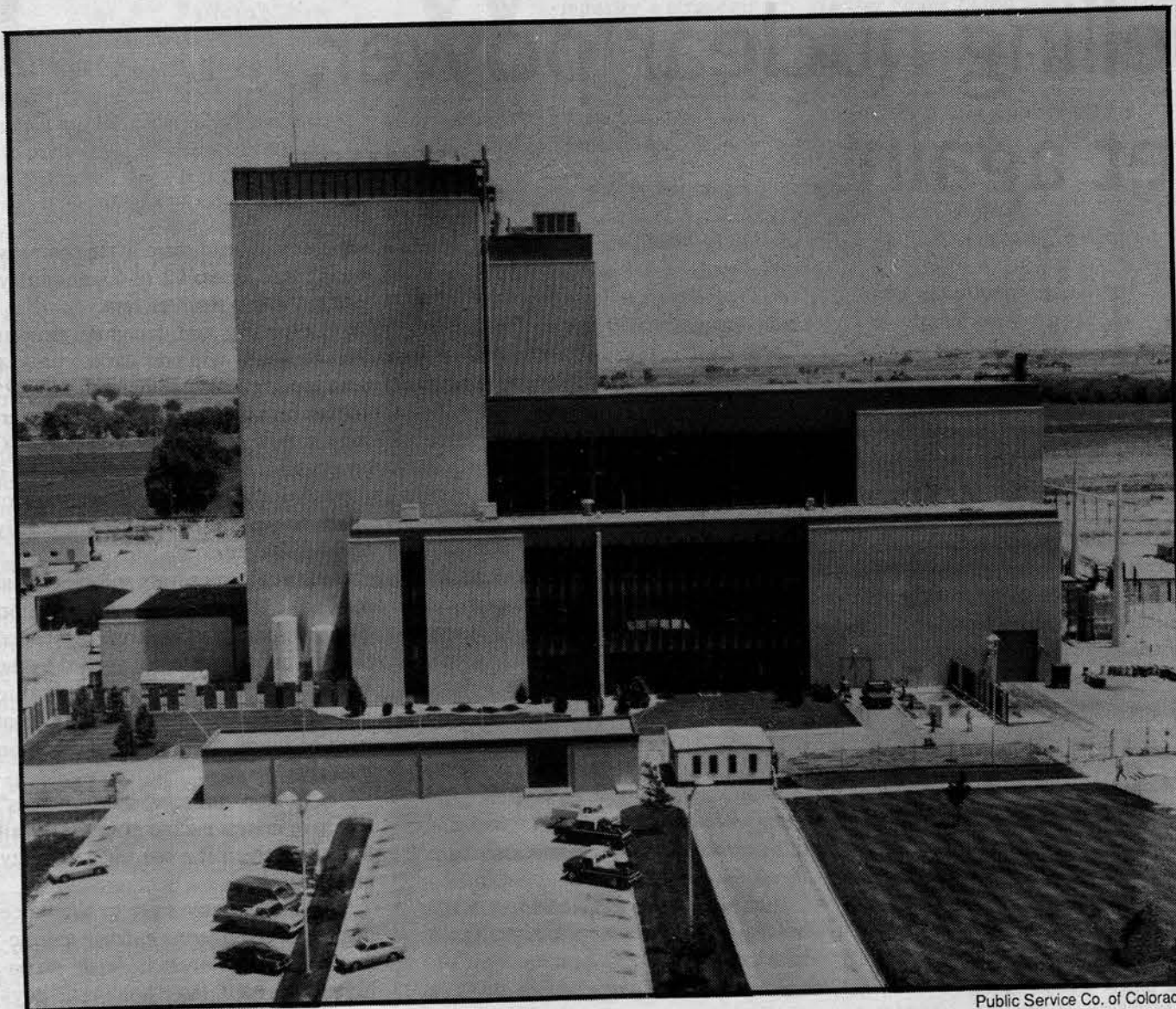
The projects proposed to the Bon-

neville Power Administration last year are a good example of what may dominate capacity additions during the next decade. The vast majority are gas-fired cogeneration and combustion turbines ranging from 30 to 240 megawatts.

Gas is also making inroads in coal-rich Colorado, where Public Service Co. hopes to convert its closed Fort St. Vrain nuclear power station.

"It just never quite worked for us," says company spokesman Mark Stutz. The company plans to turn Fort St. Vrain into a 330-megawatt gas-fired plant. Due on-line in 1998, it would be the firm's first natural gas plant.

—Devlin Odell

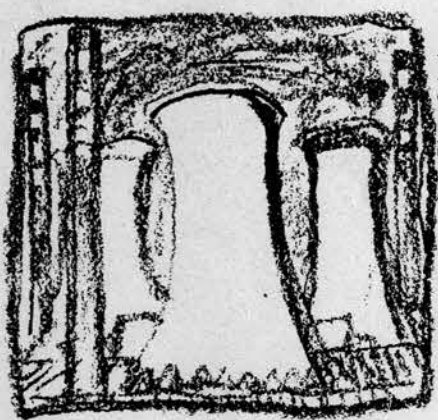


Public Service Co. of Colorado

Public Service Co. of Colorado plans to convert Fort St. Vrain Nuclear Generating Station, 40 miles north of Denver, to a 330-megawatt gas-fired plant

The nuclear power industry sells itself as the cleanest, most abundant energy supply of the future.

While it seems to have convinced Congress, Wall Street may be another story.



Washington Public Power Supply System

A stairway criss-crosses its way up a Washington Public Power Supply System nuclear plant cooling tower

Selling nuclear power, yet again

by Jon Christensen

Nuclear power is dead! Long live nuclear power! Commercial nuclear power may have been pronounced dead on arrival in the energy-glutted 1980s. But the industry hopes to be born again in the 1990s as a cheap, clean energy resource ready to serve an era of growing electrical demand and global warming.

The nuclear industry is campaigning to provide a substantial portion of the new electrical-generating capacity that will be needed by the turn of the century. The industry's strategy hinges on winning political favor in Congress, where nuclear power has often triumphed in the past. And with the recent approval of pro-nuclear bills in both the House and the Senate, the industry is well on its way. However, to succeed, nuclear power will have to prove itself on Wall Street, where its dismal record is still remembered.

This summer, the Comanche Peak nuclear power station near Fort Worth, Texas, will begin test runs, 16 years after construction started. If everything goes according to plan, Comanche Peak will become the first nuclear plant to come

on-line in more than a decade. Nuclear proponents would like Comanche Peak to signal a revival, replacing the nightmare images of Three Mile Island and Chernobyl.

But the dominant image of nuclear power in the 1990s could be the Fort St. Vrain reactor, a nuclear power plant outside Denver, Colo., that is being cut to pieces to make way for a gas-fired generating station. A joint venture between the Department of Energy, General Dynamics and the Public Service Company of Colorado, Fort St. Vrain was supposed to be one of a "new generation" of ultra-safe nuclear power plants when it went on-line in 1979.

Instead, the plant has become an example of nuclear power's liabilities. Fort St. Vrain operated at a very low 14 percent capacity over its 10-year life. Public Service wrote off more than \$30 million a year in losses before shutting it down in 1989. The shut-down halted investor losses that had mounted to \$214 million since 1986, when the plant was taken out of the rate base by the Colorado Public Utilities Commission. The PUC also ordered Public Service to refund \$70 million to its customers. With losses that had been paid by ratepayers now assigned to investors, average earn-

ings per weighted share in the company, which had been \$2 to \$3 annually, plunged to less than one cent.

Defueling and decommissioning Fort St. Vrain will cost the company at least another \$200 million, with only \$25 million set aside to pay for it. Public Service is now wrangling with the PUC over who will pay that cost, even as it fights with the DOE and the state of Idaho to get rid of the plant's highly radioactive core.

Although ratepayers will pick up at least some of the tab for converting Fort St. Vrain, many of the costs associated with the plant have been classified by the Colorado PUC as "unrecoverable expenses" — unwise investments — that must be borne by investors rather than consumers.

It is these "unrecoverable expenses" that have driven nuclear power off Wall Street and given it a bad name in utility board rooms.

"If a company were to announce that it was considering building a nuclear power plant, investors would probably rush to sell their holdings," says Anthony Leness, an energy banker with Merrill Lynch. "The reason is that investors have seen a great deal of the funds they have invested in nuclear util-

ties just disappear."

With cost overruns ranging from 200 to 2,400 percent, utility commissions have decided that a significant portion of investments in nuclear power were imprudent and banned the power plants' owners from recovering their investments by raising electrical rates.

That has had dramatic effects. Of five reactors started in the 1970s by the Washington Public Power Supply System — a consortium of 115 public utilities in the Northwest — only one was completed; the rest were abandoned or mothballed for economic and safety reasons. The utilities defaulted on \$2.25 billion in municipal bonds in 1983, causing a financial disaster which rippled through the country.

Similarly, cost overruns and problems at the Palo Verde nuclear power plant in Arizona have recently put three of its owners — Public Service Company of New Mexico, Arizona Public Service, and Tucson Electric — in dire economic straits. The fourth, El Paso Electric, declared bankruptcy after the Texas Public Utilities Commission denied a rate increase and "disallowed" much of its investment in Palo Verde.

Nationally, Leness says, \$14 billion of nuclear plant costs were disallowed in the 1980s, compared to \$712 million disallowed for non-nuclear plants.

"Investors are concerned," Leness says, "that no matter what the original cost estimate, a nuclear plant built in the future is likely to cost significantly more than estimated and that any cost overruns are vulnerable to disallowance and eventual write-off."

Nevertheless, Leness is bullish on nuclear power. "We must turn to nuclear power as the major energy source of the future," Leness asserts. "But if we are to convince investors to finance construction of the next generation of nuclear power plants, we must find ways to reduce investors' risk."

The nuclear industry has a plan to do that. *The Strategic Plan for Building New Nuclear Power Plants*, published in 1990 by the Nuclear Power Oversight committee, the industry's top lobbying junta, describes how to revive nuclear within the decade. It is a political agenda that follows the strategy that worked for the industry before the spectacular failures of the last decade: convincing the government to again assume the risk.

To do this, the industry must restore the pro-nuclear consensus that existed in communities, board rooms and the halls of government prior to the 1980s. Rather than rebuild confidence from the ground up, the strategy seeks a mandate and funding for nuclear power from the top down.

The industry's plan boasts that nuclear energy is a "perfect match" with President Bush's National Energy Strategy now being debated in Congress. Indeed, making nuclear energy a centerpiece of the president's proposal was the industry's first goal. Winning over Congress was second, and the strategy seems to be working there, too.

While oil and gas interests lost the fight to open the Arctic National Wildlife Refuge to drilling, the nuclear industry won several concessions. For instance, the Johnston-Wallop bill that passed the Senate in March includes a five-year, \$100 million taxpayer contribution to design detailed blueprints for the next generation of nuclear power plants. The effort to develop smaller, standardized and safe plants should give utilities the ability to make firm cost estimates when planning new nuclear power

plants and garner pre-approval for standardized plant designs from the Nuclear Regulatory Commission. The Johnston-Wallop bill also gives an unlimited government commitment to build a demonstration model of this "new generation" nuclear plant, either alone or in partnership with a utility. In addition, the bill wipes out an \$11 billion industry debt to the federal treasury for uranium enrichment. Other key provisions closely follow the industry's strategic plan, including "one-step licensing" for both the construction and operation of future plants.

The House version of the energy bill, passed in May, includes many of the same provisions, including reforms that environmentalists charge will cut the public out of the licensing process.

The industry also stands to gain ground in the fight to open a high-level nuclear waste dump at Yucca Mountain, north of Las Vegas, Nev. Both the Senate and House bills strip Nevada of most of its oversight authority.

The industry plan also calls for a full-court press over the next few years, leading to licensing of the first new "evolutionary" light water reactors by the end of 1993. But the Nuclear Regulatory Commission has already indicated that there will be delays. And industry itself is split. While industry lobbies for standardization of new designs — asserting that custom designs caused many problems in the past — three major nuclear contractors are competing for approval of four different designs for the new plants.

The most important reform is adoption of "rolling prudence" by public utility commissions. Instead of waiting until the plant begins producing energy, rolling prudence would require utility commissions to approve recovery of costs from customers as planning and construction progress.

While some investment advisers find hope for nuclear power in the industry's strategic plan and the National Energy Strategy, others are skeptical:

"I don't expect any new plants will be ordered in the foreseeable future," says Paul Parshley, a former House Energy

Committee staffer who now specializes in rating nuclear utilities for Shearson Lehman. "As for talk of licensing reform," Parshley says, "you can get everyone to agree that the process doesn't work well. But there's no good answer on how to fix it. The proposals on the table now are just rehashings of solutions suggested before."

"The only thing that would cause more orders for nuclear power plants," Parshley predicts, "would be a societal change in favor of nuclear power over the alternatives. It may be that global warming will cause that change, but I don't see it happening."

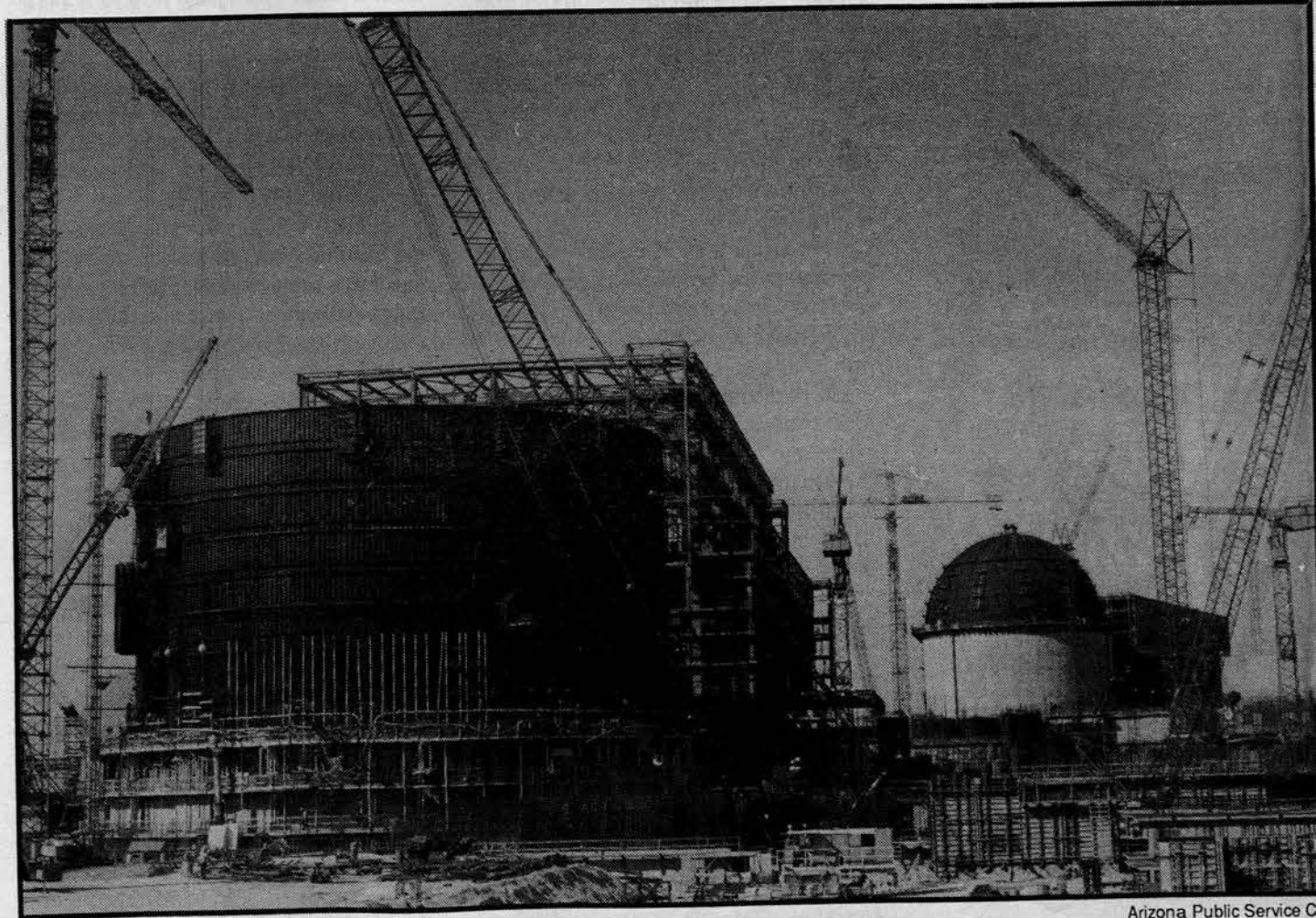
The threat of global warming has been one of the industry's best arguments for a revival of nuclear power, which gives off no carbon dioxide. However, compared to conservation and demand-side management, nuclear technologies are proving expensive. Between 1978 and 1986, the height of the nuclear boom, energy efficiency displaced 13 times as much fossil fuel as nuclear power for a fraction of the price. The Rocky Mountain Institute, an energy think-tank based in Old Snowmass, Colo., says at today's rates, a dollar invested in efficiency will displace about seven times more carbon dioxide pollution than a dollar spent on nuclear power.

"Nuclear power seems fated to be forever at the mercy of forces beyond its control," says Charles Komanoff, a New York economist who has specialized in debunking the industry's rosy predictions.

And some say that Harvard Business School professor I.C. Bupp's caustic assessment of the industry at the end of the 1970s still rings true:

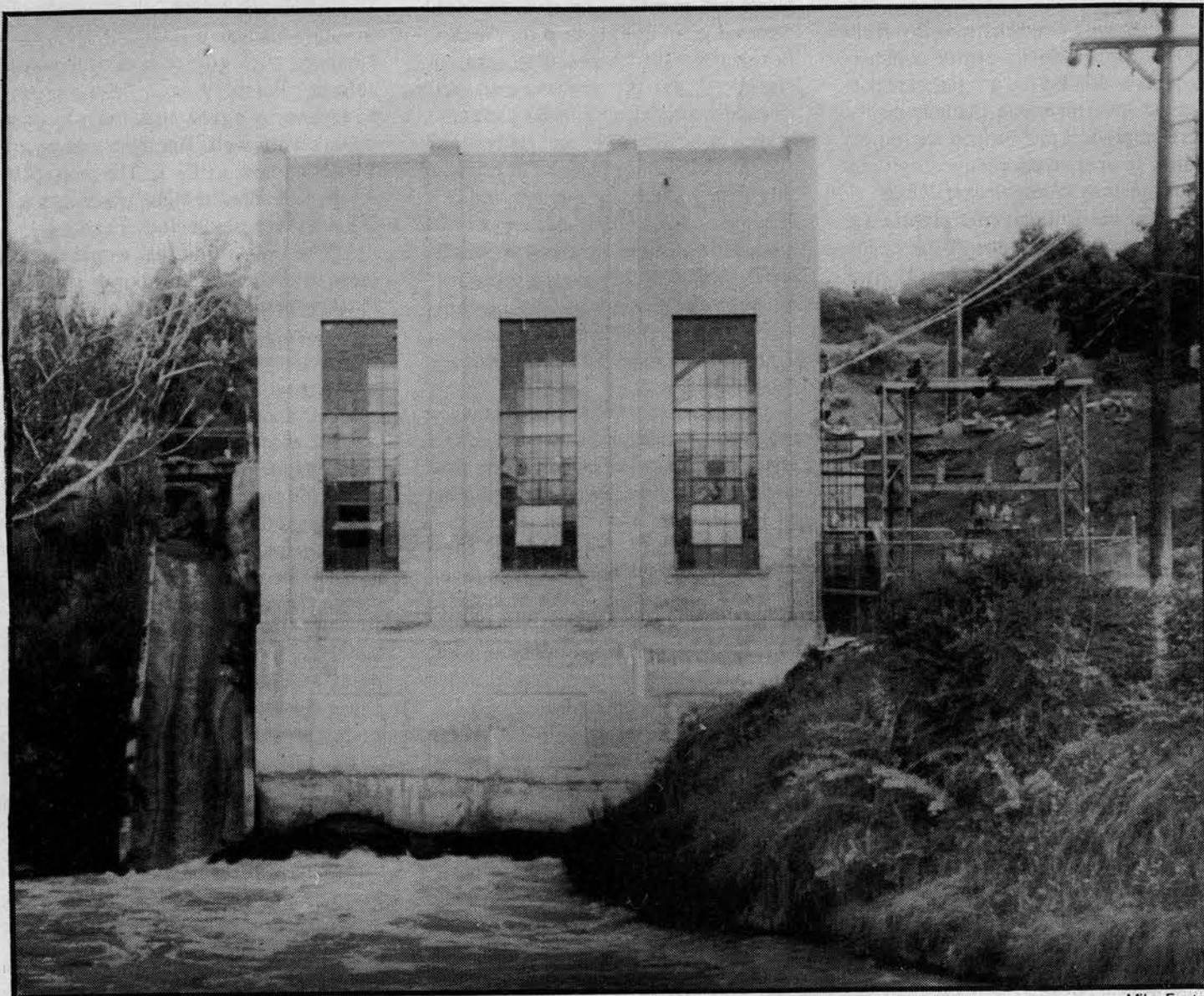
"Systematic confusion of expectation with fact, and hope with reality, has been the most characteristic feature of the entire 30-year effort to develop nuclear power." □

The Strategic Plan for Building New Nuclear Power Plants and the first annual progress report on the plan are available from the industry's public relations arm, the U.S. Council for Energy Awareness, 1776 I Street, N.W., Suite 400, Washington, D.C. 20006-2495.



Palo Verde Nuclear Generating Station under construction in 1979

Arizona Public Service Co.



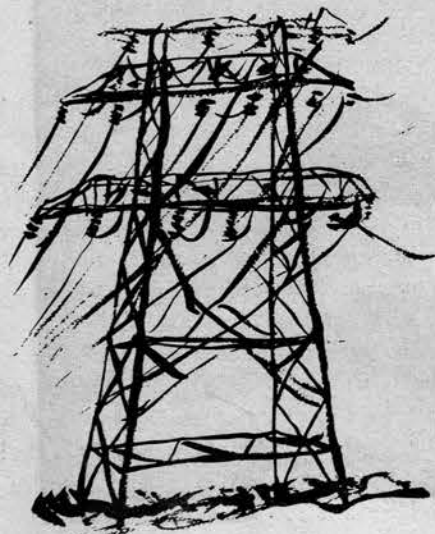
Mike Foster

The Redlands Water & Power Co. in Grand Junction, Colo., installed hydroelectric plants along drops in its irrigation canal and now sells 1.9 megawatts of electricity

Now coming to your back yard: a power plant

by Ed Quillen

Like Germany, the electric power industry has lost the wall that once confined and defined it. The only certainty is that the future will be very different.



Diane Sylvain

The boiler room at the Model Laundry in Longmont, Colo., is an unlikely spot for an electric power plant. But against the back wall a stationary truck engine, powered by natural gas, spins a generator. What comes out is electricity and hot water.

It is not an efficient power plant, since only 30 percent of the energy in the natural gas emerges as electricity. Intricate plumbing, though, uses most remaining calories to heat water for washing sheets.

Producing both electricity and heat is called cogeneration. A cogenerator's small power plant may not be as efficient at generating electricity as a utility company's big plant. But the big utility plant produces thermal pollution — the waste heat dispersed by cooling towers. The cogenerator uses that heat, which makes for greater overall efficiency. Some cogenerators consume all the electricity they generate; others produce a surplus they sell to a utility.

A laundry can get into the electric business because of a 1978 federal law written by the Carter administration. Called the Public Utility Regulatory Policies Act (PURPA), it requires utilities to cooperate with outside power producers.

PURPA turned the Redlands Water Co., for example, into the Redlands Water & Power Co. It installed small hydro-electric plants at drops in the company's irrigation canals around Grand Junction, Colo., and now sells 1.9 megawatts to Public Service Company of Colorado.

There are many other examples:

- The Denver Water Department uses water flowing out of Dillon Reservoir to generate electricity at the east portal of the Roberts Tunnel near Grant, Colo.

- Horn Creek Ranch, a summer church camp near Westcliffe, Colo., heats and lights its cabins with electricity from a small hydro plant next to a steep creek, and sells its surplus to Sangre de Cristo Electric.

- The Boulder County, Colo., Justice Center is heated and cooled with a combination engine, generator, and heat exchanger: the power is sold to Public Service for \$102,000 a year.

PURPA projects are not all small. In the last few years, private energy companies have begun building larger projects, ranging from 20 megawatts to several hundred megawatts, and even a couple of 1,000 megawatt peaking-power facilities. And while natural gas is the usual fuel, PURPA plants also use renewable resources, oil, coal, hydropower, and occasionally burn garbage or old tires.

Nationally, such non-utility power plants generated about 130 billion kilowatt-hours last year — the equivalent of all the electricity consumed in Montana, Wyoming, Nevada, Utah, Colorado, Arizona, and New Mexico. That is 5 percent of total U.S. production, and less than half of what nuclear power plants generate.

However, these new independent generators may be the electricity source of the future. "For several years now," says energy expert Amory Lovins, "we've had more electric capacity added each year from private entrepreneurs than by utilities, and that hasn't happened since World War I."

A provision in the national energy bill passed by the House in May may

further increase the strength of the independents. The bill would allow alternative power producers fair access to the national electric grid, making them more competitive with the utilities that own the transmission system.

The trend is true in the West as well as the nation as a whole. According to the Western States Coordinating Council, which integrates planning and operations for the Western Power Pool, non-utility generators will build 27 percent of the new power plants planned for the West in this decade, including 50 percent of the power additions in California and 36 percent in the Pacific Northwest.

The emergence of this wholesale power market will eliminate the need for many utilities to build new power plants, perhaps forestalling another generation of large coal-fired power plants and their environmental impacts. However, the new generators will have impacts of their own. Rivers will be dammed, old tires and garbage will be burned, and windmills will cover windswept slopes that are now bare.

And, as with the coal plants of the past, many of these new generators may be built in the inland West, hundreds of miles from the people who will use the electricity. Moreover, because independent power producers are exempt from most state utility regulations, these new plants may be built whether local residents want them or not.

Federal law defines independent power generators as "Qualifying Facilities" if they meet one of the following standards:

1. Use a renewable resource, such as

wind, falling water, biomass, geothermal, or sunshine;

2. Burn a fuel that would otherwise be wasted, such as slack coal, old tires or garbage; or

3. Cogenerate, using any fuel to achieve an overall energy savings.

PURPA requires utilities to buy power — if the utilities need power — from QFs at a price called “full avoided cost.”

In theory, “full avoided cost” is the price a utility would pay if it bought wholesale power from another utility, or if it were to generate power from a new plant. If the cost of buying or generating the power is 5 cents per kilowatt-hour, then the utility must pay the QF 5 cents. In practice, it often means the QF uses “avoided cost” as a lever to persuade the utility to negotiate a contract at a lesser, but mutually agreeable, rate.

Few utility companies welcomed the 1978 law or the new power producers.

Consolidated Edison of New York and now-bankrupt Colorado-Ute fought PURPA to the U.S. Supreme Court, which ruled against them in 1983.

The court said the federal government, acting through the Federal Energy Regulatory Commission (FERC), has the power to supersede state regulators and to tell utilities to buy power from outside producers.

The original goal of PURPA was to make “small is beautiful” a national energy policy by providing a market for homemade electricity. Favorable tax laws — rapid depreciation and investment-tax credits — produced the economic incentive. Wind generators sprouted from New England to California. Pelton-brand wheels turned generators at scores of small dams. Any industrial plant which needed steam or hot water found itself besieged by salesmen for cogeneration systems.

Often these were small enterprises in the American tradition of shade-tree mechanics and garage-shop engineering. But if you mix a Carter law, PURPA, with the Reagan appointees on the Federal Energy Regulatory Commission, this can turn into big business.

The changes to PURPA in the early 1980s were incremental. Many utilities had become leery of building new power plants, and so they were willing to consider buying substantial quantities of outside power.

But they complained that the original “avoided-cost” requirement was too rigid, forcing them to buy power at high prices. Further, utilities need power when their customers demand it — not just when the wind blows, or during irrigation season, or when somebody feels like firing up a power plant. If utilities were obliged to buy substantial quantities of outside power, then there should be a corresponding obligation for the outside producers to supply appropriate quantities of power at the proper times. FERC agreed, and ruled that utilities could negotiate contracts with QFs specifying payment rates, delivery times and quantities.

After several years, QF operators had gained enough expertise to chafe at the original 20-megawatt limit. FERC agreed to remove the limit; as long as a power plant met the other guidelines, it could get a federal license. This also exempted the independent power plants — no matter how big — from state utility siting laws. According to FERC, a QF is not a utility plant, but only a supplier to a utility.

There was also a financial question. A utility is a regulated monopoly, and part of that regulation is a limit on how much money it can make — its rate of return. But FERC saw no reason to limit a QF. As FERC saw it, competition

among independent power suppliers would protect utilities and their customers. The utilities need only choose the cheapest power offered to them.

As a result, many utilities which once fought outsiders now look to outsiders for their new power supplies.

“Utilities don’t build power plants any more,” explains Curt Jensen, a partner in Thermal Companies, based in Commerce City, Colo. “Instead, they sign contracts to purchase from independent power producers like us.”

Thermal has installed a 70-megawatt cogeneration plant at the University of Northern Colorado in Greeley. Natural gas is burned to power a turbine which spins a generator. The electricity is sold to Public Service Company of Colorado (PSCo), while the hot exhaust gases from the turbine flow to a boiler to produce steam to heat campus buildings. Thermal plans two similar cogeneration systems: 32 megawatts at a meat-packing plant near Greeley, and 272 megawatts at a Fort Lupton industrial park. PSCo will buy the power.

One reason for utilities’ new attitude is that the demand for electricity is no longer predictable. From 1950 through 1970, demand grew by a steady 7 percent annually. All utilities needed was a slide rule to predict when they would need new plants. They built big 1,000-megawatt plants which came on-line exactly when needed.

Then came the energy shocks of the 1970s. Demand dropped from about 7 to 2 percent, even as many utilities were bringing expensive new plants on line.

“The lead time for a big plant is 12 years,” Jensen said. “That far down the road, you don’t know if you’ll need the power — industries move, more efficient appliances appear, all sorts of things. The lead time for a smaller plant is three or four years, so you can match load with demand more closely.”

So the non-utility power plant is smaller, cheaper, more flexible and generally more profitable. It also has to contend with far fewer financial and environmental regulations, such as state utility siting laws and utility disclosure requirements of the federal Securities and Exchange Commission.

QFs come in all sizes, ranging from the 200-watt backyard wind generator to a 1,000-megawatt cogeneration plant proposed in Michigan. In general, the tiny units, called “minor QFs,” like the

wind plant on somebody’s back 40 or the Model Laundry’s 40-kilowatt water heater, are not a major factor in utility planning. Often all their electric production is consumed on site. If there is an occasional small surplus, the utility may in effect buy it at retail by allowing the customer’s meter to run backward.

On the other hand, large or “major QFs,” backed by PURPA’s guaranteed sales price, can be major money makers.

As a result, by the mid-1980s, “we were inundated with people who wanted to sell us wholesale electricity, much more than we could ever sell at retail,” said Mark Stutz of Public Service Co. of Colorado, the state’s largest utility company. Many other states were in the same fix.

In 1987, the Colorado Public Utilities Commission put a temporary moratorium on major QF proposals and then set limits on how much power the state’s biggest utility had to buy from QFs. Its action was understandable, but the Colorado PUC may have overstepped its authority.

“It’s a gray area,” said Saeed Barhaghi, a PUC senior engineer. “FERC hasn’t told us we can’t set such limits. But even if they (QFs) produce power more cheaply than a utility can, we would fail the public if we didn’t also consider reliability. From our standpoint, a power supply must not only be cost-effective, it must be reliable.”

In other words, if a boiler fails at a factory, it affects only that factory. But if the factory is a cogenerator and a supplier to a utility, then the outage may affect thousands of people. To ensure overall reliability, the Colorado commission told PSCo it only had to buy 20 percent of its power — basically, its reserve capacity — from major QFs. Many other states followed suit and the boom in QFs quieted in most Western states.

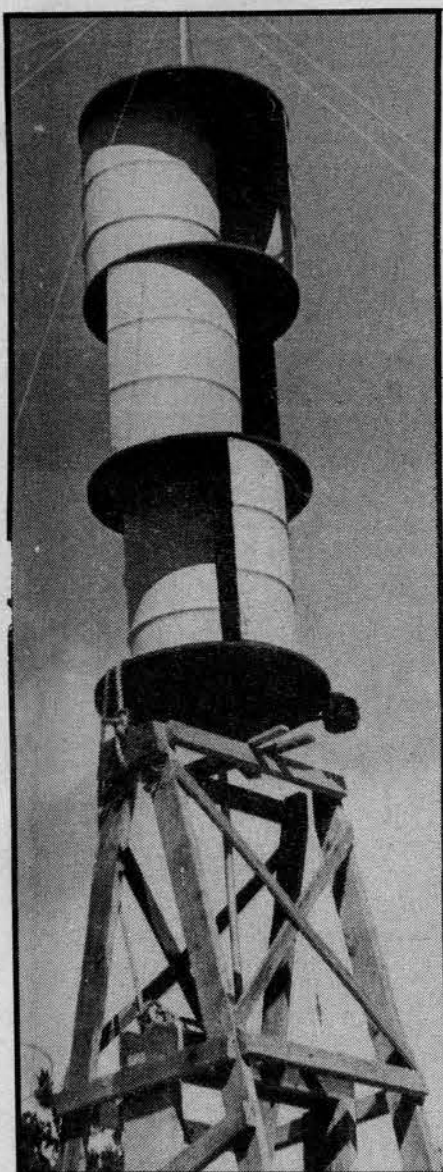
“We have fewer than 20 QFs,” said Allen Girdner, utility economist with the New Mexico Public Service Commission. That’s unlikely to change. “New Mexico utilities have excess capacity, so they’re not in the market for more.”

That holds in the Cowboy State, too. “We currently consume only about 25 percent of what we generate in Wyoming,” explained Frank Smith, a rate engineer for the Public Service Commission. “We have some cogeneration in the trona plants to the west, but they use all they generate; they don’t sell

Continued on next page



Diane Sylvain



Vanessa Naumann
Homemade windmill built after
PURPA passed in 1976

Coming soon to your back yard ...

Continued from previous page

any power to utilities."

"Idaho has the cheapest electricity in the nation," said Gary Richardson, a staffer for the Idaho Public Utilities Commission. Even so, "there were many proposals in the early 1980s, and we have a few small QFs." But at the PUC's current price of 5 cents per kilowatt-hour, there's little interest in more.

In Utah, "we have a couple of tomato greenhouses tied to cogeneration," said Jim Logan of the Public Service Commission staff, "and there's the 45-megawatt Sunnyside Project proposed to burn slack coal." There is little current interest, he said.

On the West Coast, however, the rapid growth in electric demand has triggered a boom. Over half of the new power planned for California are QF plants, mostly natural gas and renewables. With California's strict air and environmental regulations, utilities can no longer build traditional power plants. The Sacramento Municipal Utilities District, for example, is replacing its 900-megawatt Rancho Seco nuclear power plant (shut down by voters in 1989) with power purchased from seven independently owned and clean-burning gas-fired cogeneration plants.

And Pacific Gas and Electric in San Francisco says over the next 10 years it will get two-thirds of its new power needs — about 2,500 megawatts — from efficiency and renewable resources. The rest, about 800 megawatts, will come from gas-fired cogeneration.

In Washington and Oregon, the Northwest Power Planning Council has called for the immediate acquisition of 2,300 megawatts of new power. The first choice is to gain about 1,500 megawatts from efficiency and conservation projects. The second block of power — 650 megawatts — will come from cogeneration. Already the region's largest utility, the Bonneville Power Administration, is preparing to sign new contracts for 50 megawatts of efficiency and 250 megawatts of cogenerated power.

The coast's appetite for power is sending electric shock waves inland, with new power-plant proposals popping up in all sorts of places.

Two Canadian companies are nego-

tiating QF contracts with Sacramento Municipal. The J.R. Simplot company is considering installing a 100-plus megawatt cogeneration plant at its Caldwell, Idaho, potato processing plant. Simplot may also harness its four other processing plants in Idaho, Oregon and North Dakota. Throughout the Northwest, timber mills and timber-drying operations are evaluating cogeneration.

Most of the above projects, which create electricity from an existing industrial plant at an overall energy savings, meet the original intent of PURPA, have few environmental impacts and strong public support. However, the law has also created conflict between power developers and local communities. Because PURPA plant siting is regulated by FERC and not by state utility commissions, and because FERC is notoriously lax about enforcing environmental laws, local residents have little recourse when it comes to a PURPA project.

Concerned about scarce water, a Nevada citizens' group fought a cogeneration greenhouse proposed by a Las Vegas Cogeneration Partnership. Water was also part of the opposition to a Utah company's plan to build a \$100 million pumped-storage plant next to the Red Rock Canyon National Conservation Area in southern Nevada.

Since then, several more pumped-storage projects have appeared. Western States Water and Power, a private company, wants to dam the lower Gunnison River near Grand Junction, Colo., for an 18-megawatt power plant, with a nearby 1,000-megawatt pumped-storage reservoir. If built, the project would flood a proposed wilderness area and submerge endangered fish habitat.

About 100 miles upstream in Gunnison County, two separate 1,000-megawatt pumped-storage projects have infuriated local residents. One, the Union Park project, was first proposed as a water-storage and diversion project; after being stalled by local opposition it has been resurrected as a power project.

The second is at nearby Rocky Point above Taylor Park Reservoir. There, the Natural Energy Resource Co. (NERCO), based in Palmer Lake, Colo., has asked FERC to license a 1,000-megawatt pumped-storage plant. It would consist of a small reservoir 2,300 feet above Taylor

Park Reservoir, with pumps and generators at the bottom, and a penstock in between.

Colorado, however, doesn't need another pumped storage unit. The Bureau of Reclamation's Mt. Elbert Pumped Storage Plant, just across the Divide from Taylor Park, runs at a fraction of capacity. NERCO president Dave Miller said that's not a problem; he has markets in the Southwest for the peaking-power electricity from his \$1 billion Rocky Point Project.

"If anybody around here has said a favorable word about Rocky Point, I missed it," said Lee Ervin, editor of the *Crested Butte Chronicle & Pilot*, a local newspaper. "Everyone is against it for various reasons — more power lines, turning a popular recreational area into an industrial zone, violent fluctuation in the level of Taylor Park Reservoir."

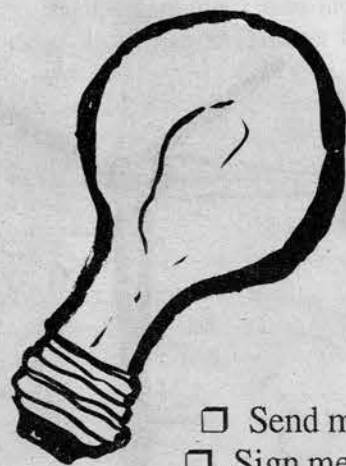
More than 500 Gunnison County residents appeared to oppose Rocky Point at the first hearing last fall when FERC began scoping for the Environmental Impact Statement, required because Rocky Point is on federal land.

However, FERC is more concerned with national need than local interests. It may decide that Rocky Point — or the other dams proposed in the Mountain West — makes sense for Tucson or San Diego because they could eliminate the need for another power plant, or perhaps because they could replace peaking power from Glen Canyon dam and smooth river flows in the Grand Canyon.

Gunnison County might adopt regulations to protect the local economy from federal intrusion. But that works two ways. Other counties have tried to outlaw federal reductions in grazing permits or timber sales for exactly the same reason — to protect the local economy from federal intrusion.

The opposition could also be seen as an extension of the NIMBY (Not In My Back Yard) syndrome.

But like it or not, if current trends continue, that's where the new power plants will be. If they are not precisely in the West's back yard, they will at least be close by — along the local irrigation canal, over what used to be your favorite place to fish, in the campus heating plant, next to a neighborhood greenhouse, in the boiler room of a laundry downtown. ☐



Dams and coal hit the age of limits

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