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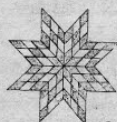
Lander, Wyoming

Friday, August 22, 1980



Photo by David Spear

In the News



SERI'S WORRIES 3

Denis Hayes is trying to put SERI at the forefront of the solar movement, but funding problems and conflicts with its parent agency may push it to the rear.

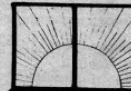
ENVELOPE ENIGMA 4

Do-it-yourself homebuilders who want to heat their abodes with cheap sunlight are putting their money into double envelope homes — even though no one can figure out quite how they work.

Energy	6
Western Round-up	11
Bulletin Board	13
Letters	15
Afield	16
Trackings	16

CELL SURGE 6

Photovoltaic firms are racing to make solar electricity competitive with fossil fuel and nuclear power, but they're still at least a few years away from the economic finish line for most homeowners.



TECHNICAL TREATS 8

For sun book buffs, we serve up thermal shutters, a greenhouse compendium, recipes for passive solar houses and soft-path counties, and a smorgasbord of "shining examples."

2-High Country News — Aug. 22, 1980

Solar pioneer persists, without federal handout

by Dede Feldman

High atop the roofs of several buildings in Martineztown, one of Albuquerque's oldest barrios, there's a growing army of odd, shiny structures of various shapes and sizes. They all have one thing in common — they point south to capture sunlight and reflect into the two large buildings owned by Zomeworks Corporation, one of the nation's earliest solar energy companies.

Founded in 1969 by Californians Steve Baer, Barry Hickman and Ed Heinz, the small company was an outgrowth of dozens of communes whose unusual buildings dotted the northern New Mexico-southern Colorado area in the late 1960s.

Some of those buildings were called "zomes" — or "deodecahedral structures" for the geometrically inclined. Others were heated in a simple way with what became known as "passive" solar heating.

Ten years later Zomeworks has moved to a newly renovated showroom (once the home of Martineztown dance hall) and left behind its early emphasis on zomes. But Zomeworks staffers say they have not left behind simple, low-cost solar solutions.

DEEP BLUE SIDE

The company's new home is, itself, evidence of this. The entire south side of the masonry building is painted a deep blue to absorb solar energy. Inside are skylights to provide heat and light during the day. Removable styrofoam

panels insulate many of the windows at night.

The panels are attached to the windows by small magnetic clips. The clips are only one of the passive solar devices developed by Zomeworks and its chief inventor, tinkerer and president, Steve Baer. Many other Zomeworks ideas such as the row of black 55 gallon drums behind a glass wall (the "drum-wall") have now become classics in the solar field.

And what is more, the devices are cheap. A thermosyphoning solar water heater made in Zomework's Martineztown shop, for example, costs less than half as much as most solar water heaters.

A solar pre-heater — which heats water before it goes into a regular gas water heater — is even less. The company also manufactures more intricate — and expensive — hardware including "skylids" (insulated shutters for skylights that open and close with the sun) and "beadwalls" (double-paned windows that fill and drain with styrofoam beads to let the sun in or keep the cold out).

"But," says Baer, "it's more satisfying to develop and manufacture less expensive items which pay for themselves. It makes me sleep better at night." Baer says that movable insulation, movable reflector shades and the company's newest product, "Big Fin" water heaters, can justify their cost, even at today's prices.

THE COST-EFFECTIVE

The Big Fin can be placed inside a greenhouse or other glass enclosed area. After its copper pipes have been heated by the sun, the water inside flows to an elevated holding tank by means of natural convection, and the cool water at the bottom of the tank flows back into the pipes. There's no electric pump.

The cost of the water heater is approximately \$850.

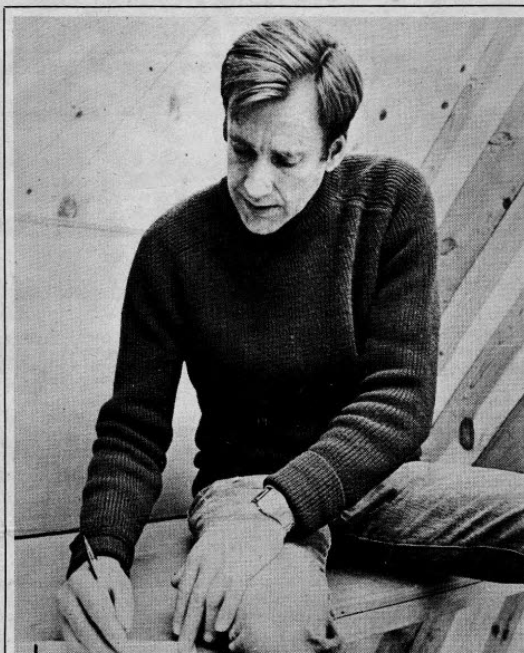


Photo by Jim Fisher

STEVE BAER, inventor and president of Zomeworks: The government should stay out of the solar field, abolish the Department of Energy, stop setting overall energy goals.

stay out of the solar field entirely, abolish the Department of Energy, stop setting overall energy goals. Baer's laissez-faire beliefs are backed by his company's policy.

Unlike most other solar businesses, Zomeworks Corporation does not take government grants. A sign near the entrance to the showroom proudly reads, "ZW is a privately owned corporation. We are not supported by federal grants. We depend on your business for support."

In some cases this policy has meant considerable sacrifice for the company and its employees whose salaries pale in comparison with those at federal research labs.

As for President Carter's goal of fulfilling 20 percent of the nation's energy

needs with solar by the year 2000, Baer says, "These people don't know what they're talking about."

Baer says that solar energy is already supplying a large proportion of our needs through daylight, which makes the use of electric lights during the day unnecessary, and in agriculture, where it enables the production of food. Yet this kind of "unreclaimed" solar energy is not even counted in the statistics.

"You don't need to have a (energy) policy," says Baer, "there already is a policy — it's each individual's policy. We need the government for some things like the armed forces, but not in the marketplace."

Could the government's energy pol-

icy, flawed as it is, have the effect of encouraging conservation of scarce oil and gas?

"We don't have a shortage of fuel," responds Baer, "gas is still cheap and we have an abundance of coal and uranium. The goals might encourage energy conservation — but it would aid in energy conservation if we all dropped dead, too. Energy conservation is not an end in itself — no one really gives a damn about energy conservation — it's happiness people are concerned with."

"We've gone too far in letting the government into our affairs," says Baer.

According to Baer, who is perhaps best known for his inventions, the best solar ideas come from people who are taking a chance — "and not just draw-

ing a salary."

"I care about the spirit of innovation," says Baer. "I'm an inventor, but it's a bad time for people to do that. Many of us who developed the ideas behind direct gain heating — and have been successful — our ideas have been co-opted by the government, and it's disappointing that the government does not now turn to us for new ideas."

"They're stacking the decks against the little guy," he says.

Dede Feldman is a free-lance writer in Albuquerque, N.M. This article first appeared in the Albuquerque News.

High Country News

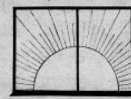
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Zomeworks has left behind its zomes, but not its emphasis on simple, low-cost solar solutions.



"The future of solar energy is in cost-effective items," says Baer, "unless the whole idea of cost-effectiveness is thrown out by our great leaders and their (solar) tax incentives."

In some states, Baer says the government will finance 80 percent of a solar system. "This makes people shop less carefully," he says.

"The tendency is not to care about spending somebody else's money — so even at this time when we're supposed to be conserving energy we're instituting policies that make people conserve less."

ABOLISH THE DOE

Baer believes the government should

Solar center's bright future now clouded

by Michael Moss

GOLDEN, Colo. — When plans to use solar technology in the support facilities for the proposed MX-missile system came forth from the Pentagon earlier this year, the obvious candidate to do the legwork was the Colorado-based Solar Energy Research Institute.

A major contractor with the U.S. Department of Energy, SERI is charged with leading the federal government's efforts to research, develop and demonstrate solar energy.

But the current director of SERI, Denis Hayes, initiator of the first Earth Day and a long-time social activist, balked at the idea of becoming involved with the controversial MX. As a result, most of the work was channeled to other contractors, with SERI playing only a minor role. "We didn't show the requisite enthusiasm," says Hayes.

The case illustrates some of the unsettling aspects of the federal government's approach to solar: the intimate connection between the departments of energy and defense; the potential application of solar systems for such incongruous uses as nuclear weapons systems; the swarm of contractors eager, and not so eager, for a piece of the federal solar pie.

Most notably, the MX affair was one of the few instances SERI has been able at least superficially to rebuff a Department of Energy decision. In most other cases, DOE has navigated a course for SERI that most solar advocates, including some on SERI's staff, say leaves the technology adrift.

The institute and the department, in fact, have been at odds since SERI's inception in 1977, a fact that often puts the institute in the unenviable role of an unwanted stepchild asking for candy.

Solar advocates in the private sector, as a result, have curbed their expectations for SERI's contribution to making solar a major near-term energy source, whether for MX missile systems or backyard greenhouses. They are looking elsewhere for solutions.

Just turned 40, Denis Hayes is the nation's youngest head of an institute the size of SERI, directing some 800 largely professional staff persons.

He is spritely and energetic; photographers are warned of his gaunt appearance. He has a reputation as a bril-

liant speaker. And despite many reasons to feel otherwise, he seems sure of where he is and where he is going.

Hayes is just back from Washington, where he interrupted his scheduled business to personally lobby a House minority leader over dinner, probably touching on the subject of the Colorado office building in which he is now relaxing. SERI is still temporarily housed in an office complex on the edge of Golden, just west of Denver. Ironically, the complex is shared by numerous coal and oil development firms.

A permanent facility was to have opened its doors in the early 1980s. But a \$10 million 1981 budget request to begin construction was slashed to \$1 million in the Carter administration budget. The funds may or may not be restored by Congress.

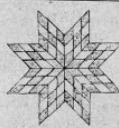
The SERI facility was originally conceived as an international alternative energy showcase with an array of demonstration systems. But the complex has long since been stripped down to its basic solar cells, and even the building plans Carter refused to fund are strictly bare bones.

For SERI staff, the new facilities represent sorely needed operations space, especially outdoor testing facilities, and the funding hassles are demoralizing.

For other solar advocates, the proposed facilities are symbolic of a serious obstacle facing solar energy today: the continued reluctance of the Carter administration to adequately fund solar development and commercialization programs.

A recent analysis of the federal energy budget by the Institute for Ecological Policies in Fairfax, Va., concludes: "A

"The exciting action is on the local level, where communities are taking solar into their own hands."



close look at the DOE budget and programs makes it clear that DOE is only tipping its hat to solar and conservation, while serving as little more than an adjunct to (the Defense Department) and a puppet to the nuclear industry...."

the 1980 budget. (Administrative functions in DOE received almost as much money this year.)

The future prospect for solar program funding through the middle of this decade is even less encouraging for solar advocates.

A May 17 memorandum to top DOE officials from Secretary of Energy Charles Duncan, Jr., calls for major increases in spending for nuclear programs, while reducing outlays for solar. As much as \$175 million would be cut from the presently proposed \$3.6 billion solar budget from now until 1985.

The funding scheme is still tentative, pending further suggestions from DOE officials. But Duncan stressed in the memo that further funding additions without offsetting reductions elsewhere in the same programs "will only make our task more difficult later."

MISDIRECTING WHAT IS GIVEN

There are two reasons solar efforts are not getting adequate funding, says Richard Munson, head of the 35,000

member advocacy group, the Solar Lobby. Solar energy does not have a large enough constituency in Washington to compete with the political clout of the trade associations for conventional energy sources. And the conventional wisdom remains steadfast for solving our energy situation through the old standbys—coal, oil and nuclear power.

Hayes agrees that the funding levels for solar efforts are low. "I'm saddened by the content of the Duncan memo," he says, but he blames probable "flaws in the briefing" Duncan was given rather than a deliberate policy change in the administration.

"I don't know why the numbers are so low," he says. "I wasn't part of the process. But (Duncan) sat down and in two or three minutes tried to figure out how to carve up \$10 billion over five years and an awful lot depended on the exact choice of words people used to persuade him to do this or that."

The budget analysis by the Virginia group also found fault with the quality of DOE's funding, concluding that most of the money, even solar funding, goes to "giant corporations which benefit from large-scale, capital-intensive defense and energy projects."

Over two-thirds of the 1979 DOE budget went to 20 contractors, each receiving more than \$100 million. The largest was the University of California, which got \$900 million to operate its Lawrence Livermore and Los Alamos laboratories. Others in the top 20 included Union Carbide Corporation, Sandia Laboratories, Westinghouse Electric and Dupont, E.I.

Funding directed to the private sector in chunks less than \$10 million accounted for less than one-tenth of the total DOE pie.

DOE critics carry the bankroll issue one step farther, contending that the

(continued on page 10)

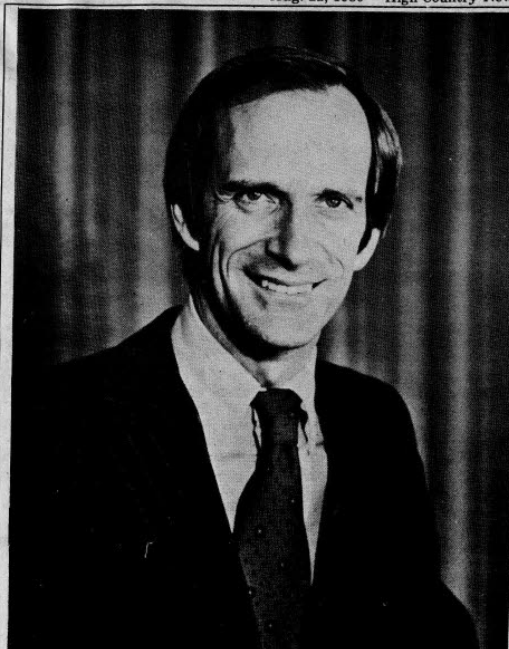


Photo courtesy of SERI

DENIS HAYES: Despite many reasons to feel otherwise, he seems sure of where he is and where he is going.



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4-High Country News — Aug. 22, 1980

The latest solar 'dreamhouse'

Double envelope homes wrap a pleasant puzzle

by Geoffrey O'Gara

LANDER, Wyo. — It snowed last weekend in Yellowstone — summer is nearly over, and maybe autumn, too. Rising early to drive to James North's house, I had to pull on a sweater before I left the bedroom.

But North, when he greeted me an hour later in the morning shadow of his riverside home, was in shirtsleeves.

He expects to wear fair-weather clothes indoors all winter, and rarely fire up the stoves in his 2,000 square foot house. He does not have a furnace.

North is putting his faith in the latest fad in energy-efficient houses: the "double envelope" house.

North, who is building the house himself, is modest about his accomplishment — he asked that his real name and location be withheld so his house would not become a local curiosity. But he and his houseguests, sipping coffee in the long, glassed living room, were clearly proud of how comfortable the house felt on a cold and windy morning after three days with little sun.

There are now at least 100 occupied houses like North's around the country; estimates vary, but as many as 1,000 are believed to be under construction.

The numbers are uncertain because many of the houses are being built by their owners — often, as in North's case, without the aid of an architect. Mainstream architects still shy away from the double envelope design (also called "convective loop" housing) because it's only been around for a few years, and data on its performance is scarce.

But the experts, even those who favor other styles of home-building, agree to a greater or lesser degree that double envelope houses seem to work pretty well. What the experts can't agree on is how they work.

Nor do those who've studied such houses speak with a single voice about their value. William Shurcliff, a respected Harvard physicist who has studied energy-efficient housing, calls double envelope houses "pretty disappointing," and champions another fashionable new approach, "superinsulation." But at Ekose, the California

firm that pioneered double envelope houses, the method is still "the best there is," and plenty of its clients agree.

NO ONE KNOWS HOW

David Young stands on the pine boards with which he floored the south-facing greenhouse of his new home near Riverton, Wyo. Holding his hand over the one-quarter inch gap between the boards, he can feel a gentle upward flow of air.

That airflow is the driving force of the double envelope. The two-story Young house has an inner and an outer shell. The Youngs live inside the inner shell, which contains bedrooms, a kitchen and a living room.

Surrounding that shell is a second enclosed airspace — it includes the greenhouse on the south side, a crawl space beneath the house, a 12-inch gap inside the north walls and an attic.

In principle, it works like this: On a cool day, sunlight comes through windows on the south side and heats the air in the greenhouse. That air rises into the attic, pushing the air ahead of it down the north wall and into the crawl space or basement beneath the house. There, now-cool air is forced up into the greenhouse, heated there, and the cycle begins again.

In cold weather, the inner house is kept pretty well shut, wrapped in a river of convection that carries the solar-heated greenhouse air around to the normally-cold north wall, and even underfoot. Most envelope houses also have glass panels on the inner shell facing the greenhouse, to absorb more of the sun's warmth. The house's temperature comes from the walls, rather than a centralized source.

In order to cool the house during hot weather, most envelope houses have a duct that runs from the basement or crawl space underground to a spot about 50 feet away from the house. Vents are opened in the attic, releasing warm air. This creates chimney-like suction, which pulls earth-cooled air through the underground duct.

REVERSING THE FLOW

At night, the flow from greenhouse to attic to north wall to basement is supposed to reverse: The air in the greenhouse becomes very cool, because

there is only glass between it and the cold outdoors; it sinks to the crawl space. There, in principle, heat stored in the earth from the daytime cycle warms the air and causes it to rise within the north wall to the attic. Then it cools and passes back down through the greenhouse.

That's how Ekose's founder Lee Porter Butler used to explain the process. But Porter is less vocal about it now — a spokesman said that "nobody really knows" how the house stays warm during cold spells. It just does.

Ralph Jones, an architect, has done research on the double envelope house for Brookhaven Laboratories of New York under a grant from the Department of Energy. He is now in the second year of testing an Ekose's house in Rhode Island, and he says the heat is not being stored in the ground below the crawl space. He adds, with irritation, that despite Ekose's claims that his work proves a double envelope house can warm and cool itself without backup heat, the results were quite the opposite. "It did require some auxiliary heat," said Jones.

"(These designs) are the bed from which all future houses will spring."

— Jim Berk, solar designer



According to Jones, the warm-weather "thermal syphon" works fine, moving envelope air at a rate of about five feet-per-second during the daytime. But at night, the reversed flow at the Rhode Island house was negligible. He believes the house stays warm at night much the way a superinsulated house would — by providing a thick buffer zone between the indoors and the outdoors. "You've got a good thermal envelope, that's about all," said Jones.

Jones still thinks it's a good house — but he criticized the big claims that have been made for it, and notes that the owners of the Rhode Island house had installed electric heating in the basement to supplement two wood stoves.

There are other theories about what makes these houses work — and work they apparently do. Even skeptics like Jones and Shurcliff will acknowledge

that a double envelope house is up to 80 percent more efficient at holding heat than a conventional house.

Butler now theorizes that there may be numerous air flows in different directions in the envelope, forming an insulating barrier. Phil Henshaw, a solar designer in Denver, Colo., studied an envelope house and found little heat-storage in the dirt or rock under the crawl space.

WHY THEY DO IT

Given the uncertainties about how the process works, it's surprising that double envelope houses are in such vogue. The cost can be considerable.

Malcolm Lillywhite, whose Domestic Technology Institute in Evergreen, Colo., helped pioneer solar greenhouse construction in the Rocky Mountain region, has kept his activities in the double envelope field quiet, though his involvement predates the current craze. "We've laid very low, and I'm still not confident we would stand out and make statements on it like we did on greenhouses," said Lillywhite.

"People came to me and asked me to design them a double envelope house," said Lander architect Roger Potratz, who has worked on several Wyoming houses. "I didn't suggest it to them. And most of them do the building themselves."

Ekose's is fairly aggressive in selling its designs and counseling in the field — but in most cases, it's the homeowner who hears about the design and wants to try it.

In North's case, a friend at Michigan State sent him a copy of a *House Beautiful* article about a Lake Tahoe double envelope house. It made more sense to him than the other approaches he was considering and it could be done with conventional building materials, so he went to work.

The design is so young that only a few such houses have been lived in through a harsh winter. The reports are promising: The house that started it all, Tom Smith's Ekose-designed Lake Tahoe home, burns only about two-thirds of a cord of wood during the winter for supplemental heat. Jim Berk, who publishes "Convection Loops Magazine" in California, is ecstatic, calling double envelopes (along with superinsulation and earth-sheltered housing) "the bed from which all future houses will spring."

Most others think such paeans a bit premature, but there are some attributes of double envelope houses on which most critics agree:

— The houses are wonderfully quiet. Because there are two layers muting outside noises, and no furnace or blowers within, people living in double envelopes say noise is peacefully absent.

— The south side of the outer envelope can house a jungle of a greenhouse. This helps freshen air throughout the structure, too.

— The estimates vary, but propo-

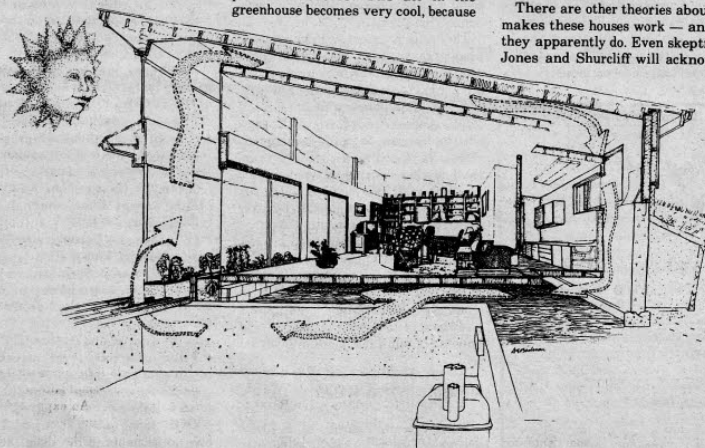


Diagram from *The Double Shell Solar House*, published by Community Builders, Canterbury, N.H.

nents say this is one solar house that does not have to cost over a few thousand dollars more than conventional housing. Extra costs for glass, building materials and labor are offset by savings on a furnace.

PROBLEMS

That's one side of the coin. On the other, there are numerous problems that might make a builder hesitate.

— The design needs testing. For every Phil Henshaw who thinks he knows how it works, there are a dozen who say nobody does. This makes it difficult to answer questions about necessary back-up systems, optimum size, and other considerations.

— Heat tends to settle in the upper part of an envelope house, according to the Brookhaven study of the Rhode Island house. This could make an upstairs bedroom uncomfortably hot, and opening windows to cool it could break the convective flow.

— Because little outside air penetrates the two shells when vents are closed, air quality must be considered — though this is more a problem in superinsulated houses than double envelopes (see sidebar).

— Shurcliff says he would find greenhouse-generated humidity in a double envelope house intolerable. However, in dry climates the extra humidity might make the house more comfortable.

— There is some concern that the chimney effect, when vents are opened in the outer envelope to release hot air, might encourage the spread of fire. However, fire dampers that would close automatically and a fire-insulated envelope lining would mitigate that risk. When the system is closed, a fire would use its oxygen and then die, according to Berk, and he notes that a double-envelope house has fewer fire sources (such as furnaces).

— Lillywhite contends that the insulation, glass and carpentry work for a wood-constructed double envelope house will drive the cost of building at least \$10,000 over what it would be otherwise. Lillywhite's concern is echoed by few others. He recommends using a special kind of brick that would allow the convective air flow. In addition, builders concerned about cost may find that loan requirements or building codes add some costs, such as back-up heating and cooling or fire dampers.

SUPERINSULATED HOUSES

When critics of double envelope houses are asked for their favored alternative, they usually mention superinsulated houses.

Superinsulation is really very simple — so "intuitive," said one proponent, that it should have been tried much sooner. As it is, superinsulated houses are at about the same stage of development as double envelope houses: There are 100 or more occupied, and about 1,000 going up.

In a superinsulated house, the walls are almost as thick as the double envelope's airspace — about nine inches, Shurcliff recommends, made up of 2 X

4's, gypsum sheetrock, and fiberglass or cellulose insulation.

The insulation must be "thick and thorough," to quote Shurcliff, with thermal shades on windows, and insulation around electrical outlets, door and window frames, and sills.

Superinsulated houses do not have the window space typical of houses that collect passive solar heat. Nor do they have the thermal mass (Trombe walls, water-filled drums) often used in passive solar houses to store heat inside.

Like the double envelope, a superinsulated house's extra costs are offset by the savings of eliminating a furnace, proponents claim. Some have back-up electric heating or wood stoves. The heat they hold comes from everything from human bodies to electric light bulbs.

The National Center for Appropriate Technology in Butte, Mont., has been working on superinsulated houses, stressing their "buildability" and trying to keep costs to an absolute minimum. NCAT's Bob Corbett agreed with Shurcliff that a homebuilder might be better off filling his or her outer envelope with insulation.

NCAT is exploring different approaches to thickly insulating small houses and has come up with two methods: A double stud wall enclosing fiberglass insulation between the studs; and regular 2 X 6 wall with fiberglass, sheathed on the outside with gypsum, fiberglass, styrofoam and an interior sealing material. The latter approach would save on construction costs.

"Double envelope is a lot sexier," said Corbett, "but it's technically a much vaguer concept for the general public, and I don't think most people know how it works."

PHILOSOPHIES

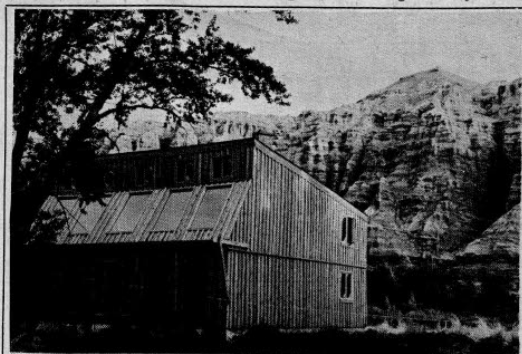
Indeed, some of the criticism of double envelopes seems to have arisen from subjective tastes: Shurcliff says in his book that he has no experience or interest in greenhouses, and he makes a point of what he considers the lack of privacy in a house with a lot of windows.

"It's almost a philosophical debate now," said Jones of Brookhaven Labs. "Someone who likes a heavily-built, cave-like, superinsulated house says the double envelope is a lot of balderdash. The West Coast envelope people rhapsodize about the holistic approach — with glass you can see out and you're more in tune with your environment."

Jones thinks a builder's choice should be tied to where he or she lives. If they're up north, have no view, or don't like modern designs, they would lean towards superinsulated houses. A warmer climate, or a better view, might favor the double envelope.

The philosophical debate — and the natural competitiveness of designers — sometimes obscures what may lie in the future: A fusion of the two design styles.

Lillywhite proposes "a combination of the two" in which air flows in the outer shell, but the north, east and west



A HOUSE IN northwestern Wyoming uses the double envelope design to keep it warm during the cold winter and cool during the summer.

walls are also superinsulated. Lillywhite would rather keep the air in the envelope somewhat cooler than that reported in most double envelope houses, so that the greenhouse will not be overheated.

In the meantime, there are a lot of reasons to wait, read and look. Brookhaven will continue its efforts to unravel the mystery of how a double

envelope works; so will other researchers around the country. NCAT and other groups are studying ways to retrofit existing houses for superinsulation.

Jim North, who read and looked but didn't wait, scans his unfinished living room with a pleased smile, but makes no promises. He invites a visitor to come back again in February.

Supertight can be supertoxic

A supertight house can help shrink heating bills, but it can also, without some precautions, turn your house into a thermos bottle of poisonous gases. In a really tight house, the impermeability of the seal locks in toxic gases given off by building materials, underlying bedrock, cooking and heating.

Carbon monoxide and nitrogen oxides from furnaces and stoves, some of them odorless gases, can build up to dangerously high levels. Formaldehyde, emitted by foam insulation, plywood, particle board, and adhesives in many building materials, can cause dizziness, nausea and rashes. Soot is another problem. So is cigarette smoke. And radioactive radon gases can accumulate in houses built on granite outcroppings or uranium-rich soils.

While the health effects of household concentrations of these substances are largely speculative at the moment, they likely include both acute reactions and chronic illnesses, such as lung cancer. As scientists' knowledge of such environmental hazards expands, lists of indoor air pollutants may do the same.

If gases from household materials can produce serious side effects in the average structure, which undergoes one complete air replacement per hour, the pollution problem could be greatly exacerbated in a superinsulated house, which reduces that exchange rate by a factor of five to 10.

Adequate ventilation, then, is as essential to superinsulation as the insulation itself. But how can you flush toxic gases without paying the price in heat loss? One solution, used widely by industry in Europe, is now appearing in this country: an air-to-air heat exchanger, a system of air ducts connected to the outdoors, designed to allow the warm air leaving to heat the cold air coming in.

Twenty-five commercially available models are being tested by the Lawrence Berkeley Laboratory in Berkeley, Calif. Most hold from 50 to 75 percent of the heat from departing air, and have been found to greatly reduce the

levels of radon, carbon monoxide and formaldehyde.

Still, air-to-air heat exchangers are not without their own problems. In the winter the units can freeze up, as many times as once an hour for a \$200 Japanese model tested under the frigid conditions of the Canadian plains. Some models tend to leak, which means that the ducts just recirculate old waste-filled air back into the house.

Various solutions to these problems have been proposed, including the application of solar collectors to keep the entrance duct thawed.

The cost of buying a commercially built air-to-air heat exchanger can be steep — as much as \$25,000 for some European models. Many models cost between \$400 and \$700, however. American manufacturers now beginning mass production may further shrink the expense.

The alternative is to do it yourself. Professor R.W. Besant of the University of Saskatchewan has tested and developed a design costing about \$150 that uses a plywood frame and a plastic duct system.

One limitation to the air-to-air heat exchanger that cannot be designed away is its reliance on the individual. The effectiveness of the system hinges as much on owner maintenance as it does on the actual model. Forget to turn it on, or let your heat exchanger remain frozen, and you could pass out from carbon monoxide poisoning. And you may not feel any early symptom signals from other pollutants. Until some of the epidemiological studies are completed for the radon, formaldehyde, nitrogen oxide and other home byproducts, the health risks posed by these materials will be mere guesswork. Conclusive data may still be years away.

As people become more aware of these odorless hazards, they may choose to install air-to-air heat exchangers in conventional homes, as well as supertight ones. An expanded market could bring about significant design improvements in the fledgling industry.

FURTHER READING:

Superinsulated Houses and Double Envelope Houses by William A. Shurcliff (\$10 from Shurcliff, 19 Appleton St., Cambridge, Mass. 02138.)
Convective Loop Housing: Our Architectural Future by Jim Berk (\$5 postpaid from Berk, Solar Climate Design, Box 9955, Stanford, Calif. 94305). Berk also publishes a design manual and "Convection Loops Magazine."
The Double Shell Solar House by Don Booth. (\$15 from Community Builders, Shaker Rd., Canterbury, N.H. 03224.)
How to Build a Superinsulated House by Ed McGrath. (\$4 from McGrath, Project 2020, Box 80707, College, Alaska, 99708.)
Energy Producing House: Handbook Case Study of a Passive Solar House by Tom Smith and Lee Butler Porter. (\$18.50 from Ekose's, 573 Mission St., San Francisco, Calif. 94105.)
A consumer brochure on superinsulation followed by blue prints and technical data for small, low-cost superinsulated houses, will be available later this year from the National Center for Appropriate Technology, P.O. Box 3838, Butte, Mont. 59701.

6-High Country News — Aug. 22, 1980

Energy

The silent generator's cost comes down to earth

by Joan Nice

Twenty years ago, solar power was relegated to those bald folks in sleek space suits that pushed buttons for a living in the Sunday comics. For the biscuit-baking homemaker next door, it was pure science fiction.

Today solar electricity is running, among other things, a remote refrigerator, a radio repeater, a national park building and a backwoods out-house in the Rocky Mountain states. Six years from now, the U.S. Department of Energy predicts that solar cells will be cheap enough even for the average biscuit baker.

But today the devices are, at best, 10 times more expensive than utility power. So what's fueling DOE's optimism?

Photovoltaic cells, as they are called, are already competitive with power derived from batteries or gasoline generators.

— Due to increased demand for solar cells, the industry has more orders than it can fill — a six-month backlog, according to DOE. This may permit more research and automation — and significant cost cuts.

— Photovoltaic companies are just beginning to tap a large foreign market.

— The price of cell arrays has come down steadily and dramatically from \$300 a peak watt in 1974 to as low as \$6 a peak watt today, according to DOE.

DOE has set declining price goals for the industry, which Andrew Krantz, of the agency's photovoltaics division, is "80 percent" sure will be met. According to DOE, mass production techniques should bring the cost of cells down to \$2.80 a peak watt by 1982. Research on making cells cheaper and more efficient should bring them down to 70 cents a peak watt by 1986, which would make them competitive with most power from the utility grid.

SEMI-CRYSTALLINE SQUARES

Claiming to be the largest independent firm in the business, Solarex of Rockville, Md., had sales in the \$10 million range last year, about a third of

which came from the federal government.

"If anybody makes the DOE goals, it's going to be us," boasts Martha Bozman, assistant to the company's president.

Solarex is placing its bets on "semi-crystalline" silicon squares that are "comparable in efficiency" but much lower in cost than their single-crystal circular cousins. Since silicon processing accounts for half the cost of commercial cells, the square cell could be considerably cheaper, according to Bozman. It also could be packed more tightly in an array, leaving less wasted space. The new product is now "commercial on a pilot basis," she says.

A host of other cost-cutting angles are being scrutinized. While perhaps insignificant in themselves, they could add up. Among the schemes are:

— producing silicon in thin "ribbon-s," rather than in bologna-shaped crystals, which must be sliced;

— alternatives to silicon, such as gallium arsenide, which could make a more efficient cell, and cadmium sulfide, which could make a cheaper one;

— lenses and reflectors to boost output by increasing the amount of sunlight that hits a cell;

— different ways of packing the cells into an array to avoid wasted space;

— and even photovoltaic shingles.

As the price of producing power with cells gets closer to that of coal and nuclear-generated power, announcements from industry about "break-throughs" in these areas are viewed with increasing interest. Veteran observers maintain their skepticism, however.

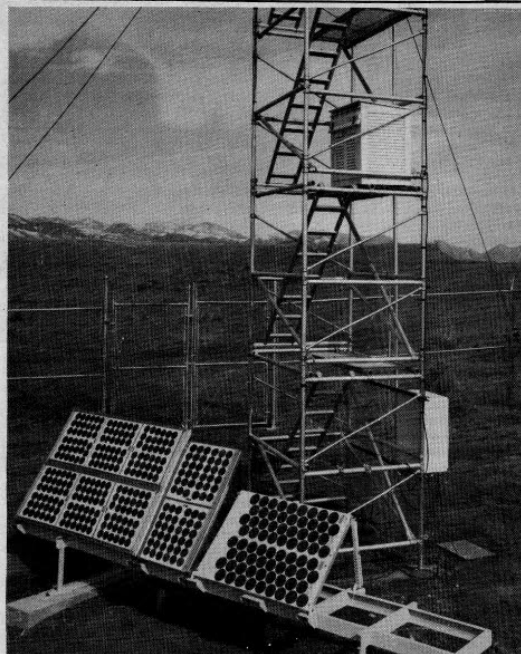
"Most of the thousands of 'big developments' in the electronics field are publicity," says electrical engineer and former Solar Energy Research Institute executive George Warfield.

What the cell of the future will look like and cost is hard to predict, Warfield says. "Cells are now where the electronics industry was in 1920."

CLOUDY DAYS

Ingenious schemes to improve and lower the cost of solar arrays are only part of the current technological push. There's also the difficult problem of how to provide power when the sun isn't shining.

Photovoltaics marketing experts would like to avoid the problem altogether by using utility power, when it's available, at night or on cloudy days. The utilities wouldn't be overtaxed by a scheme like this until about 15 percent of their consumers were using solar cells, according to DOE. If clouds caused a large percentage of its customers to call for more power at once, the utility could come up short.



PHOTOVOLTAIC CELL ARRAYS are cheaper than ever, but they still can't compete with coal or nuclear-generated power. Photo courtesy of SERI

So if the use of photovoltaics is ever to become widespread, the ability to store some solar-generated electricity and retrieve it for use when the sun isn't shining is essential. But bigger arrays (to generate an excess) and batteries, pumped storage, hydrogen or some other means of storage or backup would send solar power into the realm of the impractical again — at least for most applications at today's prices.

People in the market for a domestic solar electric system today could easily spend \$150,000. That figure is based on the average U.S. home's demand of 700 kilowatt hours of electricity each month which would require a 10 kilowatt system, according to an article by Ced Currin in the July New Mexico Solar Energy Association newsletter. Since such a system would require 1,200 square feet of good sun-collecting space, it would sprawl well beyond most homes' roofs. For most people, it's not even a remotely practical idea.

On the other hand, an "energy conscious" family could get by for much less, according to Currin. A .5 to one kilowatt system would be enough for homeowners who are "willing to control electricity usage without giving up essential elements of contemporary lifestyle and who live in a region with ap-

preciable sun during winter months." A one kilowatt system would require only 120 square feet of sparkling solar cells on the rooftop. It would cost about \$16,500 with storage batteries and about \$12,000 without, Currin says. The cost of fuel ever after, of course, would be free.

THE PIONEERS

An installation at Natural Bridges National Monument in Utah is the world's largest photovoltaic array. Dedicated in June, it was greeted with derision by some citizens concerned about government spending. The system provides 100 kilowatts of peak power or enough to supply about 15 homes. It cost the National Park Service \$3 million.

Cells are also being used on a radio repeater in the Oquirrh Mountains near Salt Lake City, on a toilet facility in the Custer National Forest in Montana, to power an irrigation unit at the Mead Field Lab in Nebraska, to run a refrigerator for the Papago Indians in Sil Nakya, Ariz., and in many other locations around the country.

In Third World countries, where the technology doesn't have to compete with existing power plants, the possibilities are even greater. There, photovoltaics are already often the cheapest alternative available. The foreign market is about 10 times the size of the domestic one, according to the Solar Energy Research Institute.

"To go after this Third World market, several U.S. solar-cell companies are hooking up with French companies that have a strong marketing presence in Africa and the Middle East," according to a recent story in *Business Week*.

TOXIC SUBSTANCES

Almost all the cells on the market now are made of silicon. While government researchers are still studying the

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problems that could develop with widespread use of silicon cells, "There are no showstoppers," DOE's Krantz says. "But we're an infant technology and we should be very careful."

The environmental problems of photovoltaics generally pale beside those posed by the alternatives.

"While it is wrong to say that photovoltaics is environmentally benign," says DOE's Krantz, "compared to the Four Corners coal plant photovoltaics is infinitely better."

An article in the June *Atlantic* scolded environmentalists for downplaying the technology's weak points. Author Terry Kidder warned, "The prospect, albeit an unlikely one, of several million houses, each containing two dozen lead-calcium batteries in its basement to store the power from a photovoltaic roof, ought to worry environmentalists."

Kidder also raises the specter of potential problems in the arrays themselves. Two promising raw materials for solar cells incorporate cadmium, a deadly substance, and the famously lethal arsenic.

The *Atlantic* article implies that environmentalists should curb their enthusiasm about the technology long enough to give it a critical eye.

Oil companies are the target of an article on photovoltaics in the September-October issue of *Mother Jones*. The story alleges that oil companies are buying the industry's future but stifling its present to protect their market for fossil fuels. Four of the larger photovoltaics firms have been bought out by majors. The magazine asks, "Are solar investments by oil companies designed to retard solar development rather than stimulate it? The author can't prove it, but he clearly suspects that the answer is yes."

The accusations mount. Among them is the idea that the DOE's goals are overly ambitious. But meanwhile, as the price of photovoltaics drops, the market expands. The goals are tantalizingly close. If they are met, you could be firing up your toaster with solar cells before the end of the decade.

Of course there's also a chance that photovoltaics will remain an alluring but impractical energy possibility for a long time — forever. But most experts are betting against that.

Warfield says, "A lot of people are convinced that the future of solar is in photovoltaics — and I'm one of them."

Idaho ponders lukewarm solar sympathy

Summer on the southern Idaho desert is as hot as a frying pan, and the days are so unfailingly clear that the U.S. Air Force tests its F-111 airplanes there. What more likely place for a solar energy boom?

Yet the Idaho Public Utilities Commission says the state is one of the slowest in the West to embrace solar energy development. With that paradox in mind, the PUC held hearings last month to determine why solar has not caught on.

Representatives of solar companies, utilities and independent consulting firms spent three days debating whether climate, economics or the solar industry itself are to blame.

Utilities and solar advocates agreed economical solar space heating and hot water systems are a possibility in southern Idaho, where Boise and the majority of the population are located.

Ed Jewell, an engineering consultant, said a \$3,000 solar hot water system could warm enough water for a family of four in Boise during summer months, and could meet 30 percent of its supply needs in winter.

A representative of the Utah Power and Light Co., which serves part of eastern Idaho, said the "payback" period for a space heater would be 13 years. A payback period is the amount of time it takes to make back an investment, in energy savings, taking into account initial cost, maintenance expense, tax credits or deductions, finance charges, and an escalator factor for the rising price of energy.

Solar consultant William Kingrey said the payback period for a solar hot water heater in northern Idaho, where there is less sunshine than in the south, would be 15 years.

But a witness for the Washington Water Power Co., which serves northern Idaho, said solar power is not economical in its service area. The hydroelectric-based utility has the lowest rates of any private utility in the country. Solar power would cost three-and-a-half to five-and-a-half times as much as WWP's current basic rates of

1.7 cents per kilowatt hour, the witness said.

Solar experts challenged the figures. Steve Baker, who holds consulting contracts with the Bonneville Power Administration and the University of Oregon, told the PUC northern Idaho "appears not much different in terms of performance than other areas of Idaho." Washington Water Power countered that Baker based his judgment on weather in Spokane, Wash., across the Idaho border.

Baker argued that the utility based its conclusions on today's power costs, without considering likely future rate increases.

A member of the PUC said later the company's new power plants will cost eight times as much as its existing ones.

PUC officials said cheap hydroelectric energy rates are a big factor in solar's disappointing progress in Idaho. Power rates range from Washington Water Power's 1.7 cents per kilowatt-hour to 4.8 cents for Utah Power and Light. Commissioners said future rate increases, as utilities switch from hydro to greater reliance on coal, will spur solar investment.

But the Idaho Conservation League warned that it won't happen without financing programs. ICL said it polled banks and solar experts, asking why solar development is doing poorly. "The answer was unanimous," the group reported. "Financing."

Hot Line



GREAT SALT COOKER. Water with lots of salt in it is great for storing solar energy — so it shouldn't be surprising that scientists, politicians and consumers are casting a hungry eye at Utah's Great Salt Lake. In a salty brine, sunlight tends to heat the lowest, saltiest water to near boiling. The idea is to build a salt water pond on the edge of the Great and stick a heat exchanger into it to create steam and run power turbines. Right now the plan is for a small facility on the northeast shore of the lake — big enough to meet the electrical needs of about 5,000 people. Prodded by Rep. Gunn McKay (R-Utah), the House Appropriations Committee has voted to spend \$1.2 million to design the plant. If the legislation survives the full House and Senate, the plant could be running by the mid-1980s.

NUCLEAR WASTE SITES. In its search for places to dump radioactive wastes produced by nuclear power plants, the Department of Energy has contacted Utah, New Mexico, Nevada, and four other states. At the same time, Congress is considering nuclear waste legislation, and the National Governors' Association has come out favoring state control over the location of six to eight regional dumping sites. The governors' task force suggested the federal government should pay states that agree to host the wastes.

All respondents agreed "some kind of subsidy or financial assistance would be required if the industry is to grow more rapidly."

A witness for the Idaho Power Co., the state's largest utility, said energy users won't invest in solar technology until they are convinced it works. The company asked the PUC's blessing for a two to five year experimental program of installing heat and hot water systems in 20 homes.

"Until a valid study is undertaken in our service area, consumer confidence will probably remain low," Idaho Power predicted.

But a PUC staff member said the program would be like "reinventing the wheel," since solar is in use in other areas of the country.

The PUC plans further hearings, focusing on whether utilities should help finance solar installations. The companies could be required to make solar loans to pass along that cost to customers, said PUC officials, or utilities could absorb the costs as an offset for the money they would save from not building new generating plants.

Lonnie Rosenwald is a staff writer for the *Idaho Statesman* in Boise. This story was paid for by the HCN Research Fund.

OLD TIRES NEW USE. Most worn tires aren't recycled; they are left at the dump. So it's good news that inventor Kurt Wasserman, editor of *Solar Age*, has found new life in old tires. He claims that because they absorb heat very quickly, rubber tires are perfect for collecting heat and for insulating water heaters and space heaters. Wasserman says his experimental heater yields 120 degree water in the winter.

FUSION FUTURE. Scientists dedicating the nation's first and only particle beam fusion accelerator this month told the *Associated Press* that power production from nuclear fusion was still at least six years away. The machine they dedicated at Sandia Laboratories in Albuquerque, N.M., will be able to fractions of a second to "create more than 10 times all the power now used in the United States," a DOE official told AP. Fusion power is considered by many the greatest hope for a "clean" energy source in the nuclear field. Officials said the machine would primarily serve for energy research, but also would supply some study for advanced weaponry.

'THIN-SKIN' SOLAR CELLS. One of the lower-cost options to conventional silicon photovoltaic cells is the "thin-film" cell, which is composed of a variety of metals. Boeing Co. recently announced a big advance in "thin-film" technology: an efficiency rate of 9.4 percent. ("Efficiency rates" in solar cells measure the percentage of sunlight a cell can convert directly into electricity.) Though silicon cells are as high as 15 percent efficient, thin-film cells do not perform as well: The Department of Energy has set a goal of 10 percent efficiency for thin-film cells under its National Photovoltaic Program.

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FICTION and FACT from ETSI'S ALMANAC

FICTION: There is no valid reason why Wyoming water could not be returned in a recycle pipeline after it has moved coal to its destination.

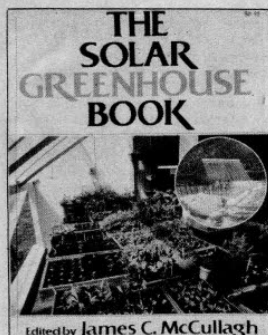
FACT: Technically, this can be done. But economically, a recycle line is unfeasible. The cost benefits that favor coal pipelines so dramatically would be wiped out in such an unnecessary violation of Nature's hydrologic cycle which obviously is based on solar energy. Environmentally, a recycle line wastes steel, energy and dollars as it contradicts the growing Conservation Ethic in America.

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8-High Country News — Aug. 22, 1980



Edited by James C. McCullagh, Rodale Press, Organic Park, Emmaus, Pa. 18049, 1978, 314 pages, paperback \$8.95.

The solar greenhouse my husband and I built in 1975 has brought us many tomatoes that our Wyoming creek-bottom site would normally not allow.

But it's not all it could be. The fiberglass on the outside is yellowing. Plants grow very slowly inside. The cover we made to shield it from excess heat loss on cold winter nights is a shambles.

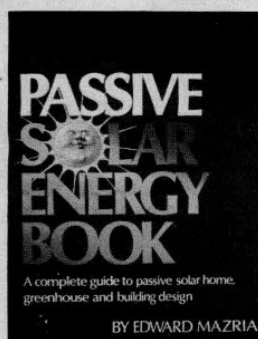
If we were building today, we'd do things a bit differently. We'd be aided in our efforts by a book that consolidates the knowledge gained by earlier experiments, *The Solar Greenhouse Book* published by Rodale Press.

There's nothing flashy about the book's approach. After an extensive outline, five authors take turns discussing their various fields of expertise, including greenhouse design, construc-

tion and horticulture. At times the multiple-author approach seems as full of repetition and confusion as a poorly moderated panel discussion. But hearing many voices also has its advantages: It allows experts in the fields of solar architecture, physics, mechanical engineering, and horticulture to speak directly to the reader, highlighting personal opinion and experience.

None of the case studies included in the book are from the Rocky Mountain region. But there is extensive discussion of greenhouses in other sunny, cold-weather areas from which Rocky Mountain greenhouse owners could draw much useful information.

While we wouldn't go so far as the book's editor James C. McCullagh, in saying "there is a solar greenhouse for every home, every climate, and every need," this is an important research update for cold-country gardeners and passive solar heating buffs. — JN



by Edward Mazria, Rodale Press, Emmaus, Pa., 1979, \$10.95 paperback, 448 pages.

People used to build passive solar houses just as Grandma used to make biscuits — with a handful of this and a dash of that and some skillful, diligent handiwork. Sometimes the process worked, and sometimes — in the hands of the uninitiated — it didn't.

We may never be able to figure out exactly what went into Grandma's most mouth-watering successes. But, with the publication of *The Passive Solar Energy Book*, we are offered a tantalizingly clear recipe for comfortable solar houses. In these well-written and attractively illustrated pages, architect and teacher Edward Mazria gives readers the rules of thumb and the figures they need to make a solar-heated contraption a home.

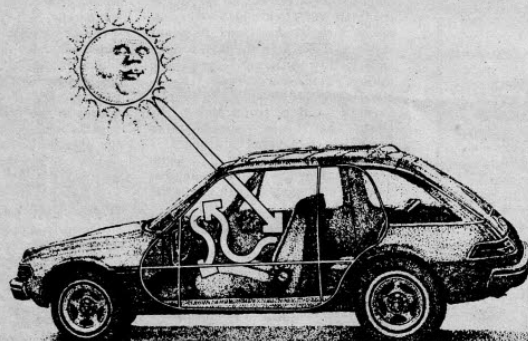
A passive solar home is one in which the sun's energy is collected and transported by non-mechanical means. According to this text, one no longer needs to be hardy enough to endure 40 degree temperature swings to live in such a

house. Mazria's tips are designed to produce a dwelling that ranges from a comfortable 75 to a slightly brisk 60 or so.

The author evaluates direct, indirect and isolated gain systems, using such devices as masonry floors, Trombe walls, roof ponds and greenhouses to collect solar heat. He explains how your choice of system should affect your house design. If you want to collect heat in a greenhouse, for instance, you need three times as much wall area as you need window area if the sun comes directly into your house. If you are collecting the heat in a Trombe wall, you need twice as much glass.

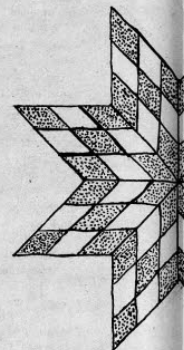
The book also discusses shutters, freestanding greenhouses, cooling, cloudy day storage and movable insulation.

While a couple of the newest ideas in passive heating — envelope and superinsulated houses — aren't discussed here, Mazria can hardly be faulted. It's a very fast-moving field. If you're serious about a solar house, *The Passive Solar Energy Book* is the place to begin your research. — JN



An automobile on a sunny day demonstrates the greenhouse effect in a diagram from *The Passive Solar Energy Book*.

Books



County Energy Plan Guidebook

Creating a Renewable Energy Future

by Alan Okagaki, with Jim Benson, Institute for Ecological Policies

by Alan Okagaki, with Jim Benson, Institute for Ecological Policies, 9208 Christopher St., Fairfax, Va. 22031, 1979. \$7.50 for individuals and public interest groups, \$15 all others.

What if 3,000 counties decided to take energy matters into their own hands? What if they examined their present energy use and potential for conservation and renewable energy production?

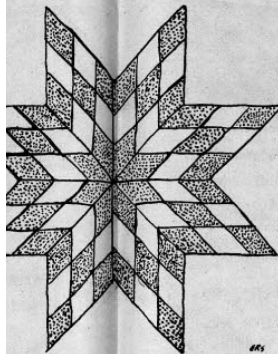
Would we have begun a smooth transition to a solar future? Could we avoid fossil fuel and nuclear perils?

That's the hope of the Institute for Ecological Policies, the group that published *County Energy Plan Guidebook: Creating a Renewable Energy Future*.

In most people's minds the county is the governmental entity that collects trash and property taxes. It's a little hard to see most county commissions working to shape a community's energy future. They might not be receptive to the idea. They might not have the money, the information or the clout.

Nevertheless, the authors argue that local levels of government are where

Books



County Energy Plan Guidebook

Creating a Renewable Energy Future

by Alan Chang, with Jim Benson
Institute for Biological Policies

Jim Benson, al Policies, Fairfax, Va. individuals ups, \$15 all

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taken at the local level, including:

- mandatory thermal efficiency standards implemented through building codes or requirements for sale, resale, or lease;
- property tax incentives;
- home energy audit services;
- low-interest-rate financing or grants for weatherization;
- sales tax credits and exemptions;
- energy restrictions on construction permits;
- energy restrictions on use of any federal or local funds dispersed by local governments to manufacturing companies.

This is a workbook, not an entertaining intellectual diversion. It includes instructions on how to analyze energy use and how to develop and implement a plan. Work sheets, tally sheets and energy consumption data are all included.

Since **The Guidebook** was published in 1979, 100 studies have been completed. That's a far cry from the 3,000 they hope to inspire, but the effort is still young.

The authors make no bones about their Amory-Lovins-soft-path bias, which may irritate energy planners with a different vision. But the method they suggest for arriving at an action plan can't be faulted: Put the soft path on trial — gather the facts, show them to the people and let them decide.

— JN

Center for Renewable Resources, 1001 Connecticut Ave., N.W., Washington, D.C. 20036, 1980. Paperback, \$4.95.

Shining Examples operates on the smorgasbord principle of persuasion: the idea that a good look at the possibilities will inspire most observers to indulge.

In this case the table is laden with the accomplishments of communities and individuals that are using renewable resources to satisfy their energy demands.

The Center for Renewable Resources located 1,800 such achievers last year, and has highlighted 150 in this book.

For each project, the book provides a concise description, including cost figures. It does not offer the critical analysis I'd like, but it does give what I'd need to ask my own questions — the

project's address and phone number.

Among the Rocky Mountain projects listed are:

- a North Dakota potato farmer's alcohol plant, which makes cull potatoes into fuels at a cost of 50 to 60 cents a gallon;
- a Wyoming resident's wind-powered oil pump;
- Community College of Denver's solar installation training course;
- Montana's New Western Energy Show;
- Montana's \$700,000 renewable energy development program funded by its coal severance tax;
- Boise's geothermal system, which will heat homes, businesses and government buildings;
- the country's largest solar greenhouse, built by volunteers in Cheyenne, Wyo.

— JN

Aug. 22, 1980 — High Country News-9



by William A. Shurcliff, Brick House Publishing Co., Inc., 3 Main St., Andover, Mass. 01810, 1980. 238 pages, paperback.

If you're one of those energy misers who has already purchased sweaters, turned down thermostats, insulated walls and ceilings, plugged leaks and installed storm windows, the next step may be William Shurcliff's new book, **Thermal Shutters and Shades**. Because for you or your builder, as a colleague of Shurcliff puts it, "The wolf isn't at the door, he is at the window."

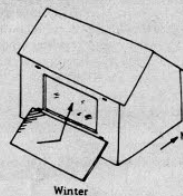
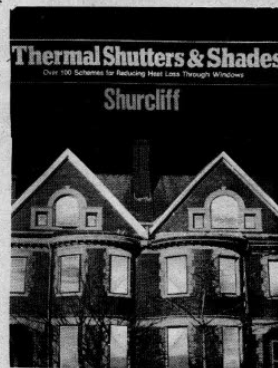
If you live in a typical house in the northern U.S., whether well insulated or not, 15 to 35 percent of your heat loss is through windows. If you live in a passive solar house, heat loss via the windows is probably even greater.

Shurcliff, an inventor and honorary research associate at Harvard University, can help you evaluate various commercial and home-built aids for

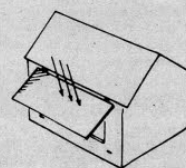
your energy wastrel windows. Among his more than 100 schemes Shurcliff seems most enchanted with the ingenious, low-cost ideas that you can build yourself — especially those using rigid foam or roll-up shades. But if you're determined to go the commercial route, Shurcliff evaluates those solutions, too, and shows you how to calculate whether your intended purchase will save enough fuel to justify its cost.

The book covers a broad range of solutions in a cautious, detailed manner. While the number of options may leave you feeling slightly dazed, the book is well organized: you needn't dawdle over a do-it-yourself rig using aluminum pizza pie pans if you plan to buy commercial shutters. Then again, Shurcliff's mental tinkering is infectious. You may want to daydream about the pizza pans for awhile as you work toward a cheap, appropriate solution of your own design.

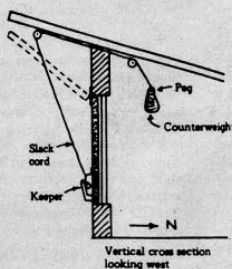
— JN



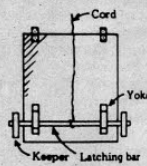
Winter



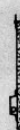
Summer



Vertical cross section looking west



Full view, looking north



Vertical cross section of shutter alone

Two important daytime uses of an extra-wide reflective shutter that can be hinged at bottom or top

SERI....

(continued from page 3)

meager funds that are appropriated for solar programs are misdirected.

A recent Office of Technology Assessment analysis of DOE solar energy programs found that "confusion exists" regarding the appropriate and effective methods to commercialize solar technologies, both within the department and Congress.

"The federal government has been notorious about trying to keep solar in the laboratories and restrict efforts on commercialization," says Munson.

It's in this gray area — between research and development, and commercialization — that SERI and other federal solar programs staff have the most trouble delineating clear roles.

THE SERI MISSION

SERI was born out of the Solar Energy Research, Development and Demonstration Act of 1974. From the start, it drew more than its share of controversy.

A vicious battle was waged over the location of the facility, with congressional delegations from several states playing hardball politics to lure the institution and its accompanying federal dollars.

The foothills of Colorado's Front Range were finally chosen, largely through the efforts of the state's Sen. Gary Hart (D) and Rep. Timothy Wirth (D). But in a politically-inspired compromise to spread the federal bucks, four regional centers were also established. Their relationship to SERI continues to cause organizational confusion.

Meanwhile, some 18 months after SERI opened its rented doors in the summer of 1977, its first director, Paul Rappaport, had attracted a raft of criticism that forced his resignation.

A series of *Denver Post* investigative articles charged that the institution had failed to get beyond the point of compiling literature surveys and second-hand research reports.

Hayes, who took over the directorship some 15 months ago, defends those early efforts as necessary first steps. "That era is now past," he says.

"It's taken us a long time to get good laboratory materials installed," he says. "But we are now engaged in a variety of research and development that is beginning to have a significant national impact."

While a contractor itself, SERI in turn subcontracts out some two-thirds of its research work — a percentage Hayes wants to eventually reduce, but which makes sense for now, he says, because those firms were doing business long before SERI was founded and still hold the lead in technical capability.

Of the research at SERI, Hayes and other staff point most proudly to the passive solar and biomass production systems.

JUST HOW PRACTICAL?

But SERI continues to draw criticism for not sufficiently contributing to the immediate needs of regional and local energy planners, solar designers and architects, and homeowners and renters.

Rich Heinemeyer, an architect with Crowther and Associates, which has

completed some 75 major solar projects since 1967, says his firm has had a lot of contact with SERI, especially through workshops.

"But much of our technical assistance comes from other laboratories, such as the one in Los Alamos," he says. If SERI ceased to exist tomorrow? "It wouldn't affect us a bit," says Heinemeyer.

Normally strident solar advocates become reserved and soft-spoken when asked about SERI. Many are friends of Denis Hayes.

"It's all we've got," said Dennis Holloway when asked about the institute. Holloway is a professor of architecture with the Colorado University at Boulder, a private solar architect, and a minor SERI contractor.

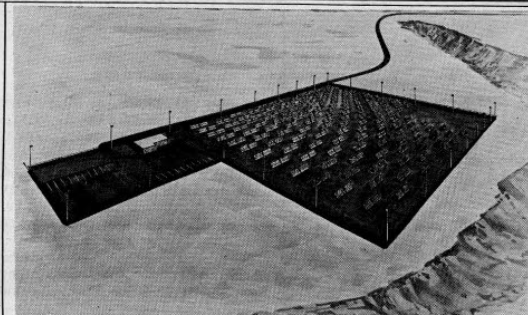
Holloway admitted, however, that what most excited him about the institute was its potential. Today's SERI, he said, has not cultivated a market for simple systems, such as solar water heaters, that are already commercially economical. Holloway added that he saw very little original research coming out of SERI.

Hayes defends SERI's work by stressing that "so much of our mission is visionary and won't have visible effects this year or the next." The legislation creating the institute, he argues, directs it to perform both near- and long-term research, with the former defined as producing results by 1990.

For the potential solar user in the field, that can be a frustrating wait.

Jim Benson, a former mid-level DOE employee and now head of the Institute for Ecological Studies, says SERI's mission is misdirected. "It should be an advocacy agency," he says, and "they should be concentrating on the most rapid commercialization of inexpensive passive solar systems possible."

SERI staffer Pat Binns agrees that



SERI is consulting with Saudi Arabia on what will be the world's largest photovoltaic cell installation. Photo courtesy of SERI

application. "I don't see SERI's role to be the direct commercialization of solar energy," she says. "That belongs to the regional centers."

WESTERN SUN

In downtown Portland, Ore., 58 people work in the Pacific Northwest's only passively solar heated and daylighted office building. Their job, according to their boss, Donald Aitken, is to promote similar solar-powered structures throughout 13 Western states.

But it's a job they are not doing, Aitken admits.

The staff in Portland, along with 29 other workers scattered in 15 regional offices, make up the Western Solar Utilization Network, or Western SUN, another DOE-funded venture.

"We're supposed to be promoting public acceptance of the solar industry," Aitken said in a phone interview. "But DOE prohibits the main tool of any such promotion campaign — paid advertising."

Western's SUN's budget was \$5 million this year, a figure Aitken says is

the cracks at both SERI and its regional offices?

Western SUN's Aitken says money is the problem — and the solution. "Congress has shown some willingness to reinstate budget cuts," he says, "especially when they're shown that higher levels are needed to meet the president's own goals for the year 2000."

The Solar Lobby's Munson agrees that one of the main obstacles to solar energy is financing. To overcome the problem, the federal government should simply "equalize the subsidies that go to conventional versus solar technologies," he says.

"The federal government has a particular role and it shouldn't be exaggerated," he says. "The exciting action is on the local level, where communities are taking solar into their own hands."

The Solar Lobby is one of a number of public interest groups conducting local and regional solar programs. Another is Jim Benson's groups which initiated a nation-wide community energy program last year with the publication of the *County Energy Plan Guidebook*.

"The fact that we've been able to start over 100 programs in the last nine months is indicative that people are not waiting for the federal government," Benson says.

"On the other hand, you ignore the enemy at your own peril," he says. "In many ways the DOE is the enemy of energy conservation and local renewables. The pressure shouldn't be let up for a second in resisting DOE policies and trying to improve them."

BACKS TO THE SUN?

There are many uncertainties surrounding the federal solar role, which could be affected this year by a change in administrations, a change in the present administration's policy, or increased support in congressional budgets.

But the federal trend seems clearly away from the sun. Federal money probably will be scarce, and a substantial portion of it is likely to generate paper — not technical prowess.

Nevertheless, Hayes retains his optimism. "Deeply in my heart, I don't care how much Washington does to help the solar transition, as long as Washington doesn't stop it. And I don't think D.C. can stop it."

"The key here is that the overwhelming bulk of money that is going to be spent on solar energy over the next 20 years is not going to be spent by the federal government, it is going to be spent by the private sector. What we need to do is figure out ways to leverage that money in the private sector towards solar as much as possible."



"In many ways the DOE is the enemy of energy conservation and local renewables."

there is "insufficient attention" being given to providing immediately usable information. At the same time he defends the need for SERI to focus its efforts on doing more research.

"Once you get beyond the simplest passive heating systems," he says, refinements are needed before many other alternative energy systems can be safely given the green light.

Lorna Wilkes operates Wind River Energy Consultants, a firm that is currently assisting a three-county region in Wyoming in developing a solar- and conservation-based energy plan.

Wilkes, also a friend of Hayes', says that while SERI has been useful to her in some ways, the institute's data has been hard to tap: It is difficult even to obtain reports, she says.

SERI's Binns blames DOE regulations for the problem, noting, for example, that the institute can only print 100 copies of each research report or study, and after those are distributed, purchasers must go through "a complicated process" involving a national document center in the East.

Wyoming consultant Wilkes, however, disagrees with Benson's belief that SERI should focus more on solar

about one-third what he needs.

One-third of that \$5 million was divided up among the 13 states, one-third went to contractors, and one-third remained for the Portland office and its programs.

With that kind of money, Aitken says, "we simply can't afford to pay for demonstration projects. So what we are doing is overseeing a number of existing federal, state, county and city solar programs that are plopped all over the West. And we're trying to integrate them into a coherent effort, state by state."

While his budget is "ludicrous," says Aitken, what he has been able to do is closely coordinated with SERI. These programs include workshops, speaker services, and some information distribution.

But he admits, neither he nor Denis Hayes is doing the kind of demonstration projects necessary to promote existing solar technologies. Fewer than 10 of SERI's 800 employees are directly involved in solar promotion activities.

IF NOT SERI, THEN WHO?

Why has the job of promoting existing solar technologies slipped through

Western Roundup

Senate passes Alaska lands bill; future uncertain

On Aug. 19, the Senate voted to set aside 104.2 million acres of Alaskan lands as national parks and wildlife refuges. The compromise bill that finally passed, 78-14, would preserve more than the original Senate Energy Committee bill, but less than the 127.8 million acres in the bill passed by the House early last year. The next step is for the House and Senate to work out their differences.

Sen. Henry Jackson (D-Wash.) and Sen. Paul Tsongas (D-Mass.) were key sponsors of the bill, which aimed at balancing demands for preservation and development of Alaskan minerals, oil and timber resources. Passage followed a 63-25 vote for cloture, a parliamentary device invoked to cut short the delaying tactics of Sen. Mike Gravel (D-Alaska), who opposed the measure as too restrictive.

Voting "no" to final passage of the bill from this region were Sens. Jake Garn (R-Utah), Orrin Hatch (D-Utah), Barry Goldwater (R-Ariz.), and Harrison Schmitt (R-N.M.). Sens. Frank Church (D-Idaho), James McClure (R-Idaho) and Alan Simpson (D-Wyo.) were absent.

Affecting lands that add up to an area larger than the state of California, the bill would designate 43 million acres National Parks and 55 million acres National Wildlife Refuges. Other lands would be protected in the National Wild and Scenic Rivers and Wilderness systems.

Thomas Kimball of the National Wildlife Federation calls the compromise bill a "definite improvement" over the bill that emerged from the Senate Energy Committee. However, Charles Clusen, chairman of the conservationists' Alaska Coalition, says that the Senate bill falls short of adequate protection for the Misty Fjords, Admiralty Island, and the William O. Douglas Arctic Wildlife Range. "We now look to the House of Representatives to improve this bill," he said.

In upcoming weeks legislators will attempt to resolve some of the differences between the Senate and House bills. The House bill not only includes more acreage, but also places more re-

strictions on development. Rep. John Seiberling (D-Ohio), one of the sponsors of the House-passed bill, says that he is "not about to take the Senate bill without trying to get something more," according to a *New York Times* story.

President Carter lauded the Senate's

passage of the bill, and said he hoped that a House-Senate agreement could be reached. "The Alaska lands question is the most important conservation measure to come before any Congress or any president in this century," he said. Should the bill be sent to a House-

Senate conference committee, however, Jackson and Tsongas predict that it would be killed on its return to the Senate by a Gravel filibuster. Gravel said that the bill goes "far beyond what is reasonable...in locking up oil and other resources."

'Free access' slips across in Senate bill

by Louisa Willcox

With the crescendo of activity in the Senate last week over Alaska preservation, few senators or lobbyists took notice when an amendment, added quietly by Sen. John Melcher (D-Mont.) to the Alaska lands bill last October, rode by on the coattails of the compromise Alaska bill.

The bargaining over Alaska acreages eclipsed discussion of the proposal, which would guarantee "free access" across public lands to owners of private property surrounded by U.S. Forest Service and Bureau of Land Management lands.

Melcher's concern was not Alaska — his amendment was designed to protect Burlington-Northern Railroad's interest in private timber holdings that lie amidst U.S. Forest Service lands in Montana.

BN has obtained a special permit granted by the Forest Service allowing the company to construct two logging roads into the 290,000-acre Taylor-Hilgard Wilderness Study Area, in the rugged Madison and Gallatin ranges. If completed, the roads would effectively bisect the study area and greatly reduce chances for congressional protection as wilderness.

The Montana Wilderness Alliance, the Madison-Gallatin Alliance and the Wilderness Society are seeking a preliminary injunction blocking the permit from the federal district court in Butte, Mont. BN's roadbuilding has been halted since July, when the Montana Department of Health and Environmental Science obtained a restraining order after discovering stream turbidity in the Buck Creek-Yellow Mules Creek area had risen above state standards.

Adoption of the Melcher amendment would change the complexion of the fight over the wilderness study area. It would also reverse a far-reaching opinion issued earlier this summer by U.S. Attorney General Benjamin Civiletti, which permitted the Forest Service to deny road access to private landholdings, "if such denial will protect the public interest in the land to be traversed." (See HCN 7-11-80).

Montana environmental groups argue that the stakes are greater than the area affected by the BN controversy. Thousands of inholders, caught in the tangled web of private-federal ownership in the West, could insist upon access across surrounding public lands. Many other potential wilderness areas could be dissected by access roads. In the past, the Forest Service and Bureau of Land Management have held discretionary power to implement alternative solutions to the inholding-access problem, such as purchasing or exchanging lands.

Under the Melcher amendment, potential environmental impacts — erosion of critical grizzly or eagle habitat, the disruption of watersheds, the scar-

ring of potential wilderness — would not have to be considered.

Wilderness Society Montana representative Bill Cunningham questioned whether Sen. Paul Tsongas (D-Mass.), co-sponsor of the Senate-passed bill, understood the implications of the amendment. Nor did environmental lobbyists in Washington try to stop it.

The survival of the Melcher proposal now rests with the House, which passed an Alaska bill last year with no such provision. The two versions must be reconciled in a House-Senate conference.

This is not the first time the Montana senator has sponsored legislation affecting the checkerboard railroad holdings bequeathed by federal land grants in the nineteenth century. Two years ago, Melcher attached an amendment to a National Parks and Recreation bill that required congressional approval for any land exchange of over 6,400 acres. That effectively nixed a planned exchange of 179,000 acres of BN land in the Gallatin and Beaverhead National Forests. If the trade had gone through, some of that land might have been included in the proposed 500,000-acre Lee Metcalf Wilderness.



Photo by Rick Graetz
HILGARD BASIN, part of the Taylor-Hilgard Wilderness Study Area, is one of the areas which may be affected by the "free access" amendment.

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STATE OF WYOMING

Financial Statement of Insurance Companies which are Authorized to do business in Wyoming.

Published in High Country News
Aug. 22; Sept. 15, 29; Oct. 3, 17, 31,
1980

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Aviation Underwriters, Inc.,
Attorney-in-Fact for
National Insurance Underwriters
10534 Natural Bridge Road, St. Louis, Mis-
souri 63134
Lambert Field, P.O. Box 10155, St. Louis,
Missouri 63145

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

GROSS PREMIUMS RECEIVED \$288,656

Losses Paid Deducting Salvage 623,116

Losses Incurred 1,110,354

Total Admitted Assets 11,388,675

Liabilities 9,366,240

Capital Stock Paid Up

Surplus 2,022,435

Income during year ending December 31,

1979 3,170,092

Expenditures for year ending December 31,

1979 3,402,796

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

THE NATIONAL INVESTORS LIFE INSURANCE COMPANY

Home Office: Second and Broadway Streets,
Little Rock, Arkansas 72201

Mailing Address: Post Office Box 3668, Little
Rock, Arkansas 72203

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$-0-

Gross Premiums Received 51,903

Direct Benefits and Losses Paid 14,887

Direct Benefits and Losses Incurred 2,488

Total Admitted Assets 167,684,963

Liabilities 156,630,838

Capital Stock Paid Up 2,000,000

Surplus 9,054,124

Income during year ending December 31,

1979 57,133,721

Expenditures for year ending December 31,

1979 53,761,707

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

NATIONAL OLD LINE INSURANCE COMPANY

(Mail) P.O. Box 2900, Little Rock, Arkansas
(Home) Capitol 9 Woodlane, Little Rock, Ar-
kansas 72201

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$7,111,000

Gross Premiums Received 236,542,655

Direct Benefits and Losses Paid 109,130,566

Direct Benefits and Losses Incurred 114,926,90

Total Admitted Assets 232,945,629

Liabilities 206,075,151

Capital Stock Paid Up 5,601,449

Surplus 22,178,028

Income during year ending December 31,

1979 61,187,888

Expenditures for year ending December 31,

1979 52,480,149

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Fidelity Life Insurance Company
1002 Walnut Street, Kansas City, Missouri
64102

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$44,648,633

Gross Premiums Received 1,641,979

Direct Benefits and Losses Paid 296,350

Direct Benefits and Losses Incurred 304,614

Total Admitted Assets 227,332,226

Liabilities 206,619,101

Capital Stock Paid Up 3,125,000

Surplus 17,588,125

Income during year ending December 31,

1979 82,209,959

Expenditures for year ending December 31,

1979 76,961,590

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

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ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Guardian Life Insurance Company
2 East Gilman Street Madison, WI 53703

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$111,164

Gross Premiums Received 9,327

Direct Benefits and Losses Paid 2,862

Direct Benefits and Losses Incurred 0

Total Admitted Assets 204,243,117

Liabilities 190,840,383

Capital Stock Paid Up NONE

Surplus 13,402,734

Income during year ending December 31,

1979 42,150,146

Expenditures for year ending December 31,

1979 40,554,145

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National General Insurance Company
P.O. Box 10155 Lambert Field, St. Louis,
Missouri 63145

10534 Natural Bridge Road, St. Louis, Mis-
souri 63134

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

GROSS PREMIUMS RECEIVED \$146,319

Losses Paid Deducting Salvage 158,343

Losses Incurred 160,962

Total Admitted Assets 21,375,313

Liabilities 15,513,070

Capital Stock Paid Up 1,512,000

Surplus 4,350,243

Income during year ending December 31,

1979 18,364,325

Expenditures for year ending December 31,

1979 17,016,501

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Fire Insurance Company of
Hartford

Mail — CNA Plaza — Chicago Illinois 60685

Home — 270 Farmington Avenue,
Farmington, Connecticut 06032

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

GROSS PREMIUMS RECEIVED \$90,829

Losses Paid Deducting Salvage 4,205

Losses Incurred 24,323

Total Admitted Assets 614,756,946

Liabilities 493,565,556

Capital Stock Paid Up 5,000,000

Surplus 116,187,389

Income during year ending December 31,

1979 231,928,242

Expenditures for year ending December 31,

1979 219,294,424

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Liberty Life Ins. Co.
MAIL: Valley Forge, PA 19493

HOME: Liberty Park, Fraser, PA 19355

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$-0-

Gross Premiums Received 29,198

Direct Benefits and Losses Paid 15,076

Direct Benefits and Losses Incurred 14,528

Total Admitted Assets 71,962,290

Liabilities 53,791,636

Capital Stock Paid Up 1,500,000

Surplus 16,660,653

Income during year ending December 31,

1979 56,206,886

Expenditures for year ending December 31,

1979 46,787,902

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

NATIONAL INDEMNITY COMPANY
3024 Harney Street, Omaha, Nebraska
68131

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Gross Premiums Received \$241,977.00

Losses Paid Deducting Salvage 140,922.00

Losses Incurred 108,298.00

Total Admitted Assets 409,798,815

Liabilities 192,035,504

Capital Stock Paid Up 5,500,000

Surplus 212,263,311

Income during year ending December 31,

1979 125,636,554

Expenditures for year ending December 31,

1979 105,564,354

Pursuant to Section 26-3-129 (b), Wyoming

Insurance Code, I certify that to the best of my

knowledge and belief, the insurer above

named is in all respects in compliance with

the laws of this State relating to insurance,

and it is duly authorized to transact the busi-

ness of insurance in the State of Wyoming.

Dated Aug. 21, 1980

s. John T. Langdon

Insurance Commissioner

DEPARTMENT OF INSURANCE

STATE OF WYOMING

National Independent Life Insurance Co.
Room 810 Illinois Building Springfield, ILL.
62701

Liberty Park, Fraser, PA

BUSINESS IN WYOMING FOR THE YEAR

ENDING DECEMBER 31, 1979

Insurance Written \$230

Gross Premiums Received 1,062</



Bulletin Board



STAKE YOUR CLAIM

If you own unpatented mining claims on federal land, you must complete required annual work on the claim for the 1979-80 assessment year by noon, Sept. 1, 1980. Proof of the assessment work done must then be filed with the Bureau of Land Management in the state office where the claim is located. A claimant who has not performed annual work can file a notice of intention to hold the claim as proof that she has not abandoned the claim, though this would not protect the claim from other prospectors. Miners who staked their claims during the 1980 calendar year do not need to file until 1981.

SOLAR ENERGY SOCIETY

The International Solar Energy Society has been around since 1954, promoting the advancement of solar technologies with conferences, publications, and competitions. Its membership doubled after the Arab oil embargo in 1973 — now it is looking for more members. By joining the American Section of ISES, one can receive Solar Age Magazine, attend workshops and conferences, and be eligible for low-cost group life insurance. For more information, contact the American Section of the International Solar Energy Society, Inc., Research Institute for Advanced Technology, U.S. Highway 190 West, Killeen, Tex. 76541. Full membership costs \$25.

RECLAMATION ADVANCES

An 80-page report on advances in strip mine reclamation techniques is available from the U.S. Bureau of Mines. The report includes seven articles covering new earthmoving equipment, "terrace pit" mining, rock-removing equipment for topsoil, new methods for removing salts, clays and toxic substances that might hurt reclamation efforts, and methods for safely disconnecting draglines. Send for Information Circular 8823, "Surface Coal Mining Reclamation Equipment and Techniques," to Publications Distribution, Bureau of Mines, 4800 Forbes Ave., Pittsburgh, Pa. 15213.

COLLECTOR GUIDE

The Solar Energy Industries Association has published a book that compares the performance of various solar collectors on the market. For more information contact SEIA at Suite 800, 1001 Connecticut Ave., N.W., Washington D.C., 20036.

EXPORT SEMINARS

Various federal agencies are getting together to educate solar businesses on the art of exporting their products. The departments of Energy and Commerce, joined by the Solar Energy Industries Association, will review markets overseas, Commerce Department export-related services, and try to promote an interest in solar export. A meeting in Denver will be held before HCN goes to press; subsequent meetings will be in San Francisco, Sept. 9, and in Boston, Oct. 23. The fee is \$25 per person, including lunch. For more information contact the Conference Group, Solar Energy Research Institute, 1617 Cole Blvd., Golden, Colo. 80401, or call (303) 231-7361.

WESTERN SUN

A report on "the current state-of-the-science of solar development in the Western states" is promised at Western SUN's 1980 Solar Update conference in Salt Lake City Sept. 25-26. Practical presentations on the design, construction, maintenance and cost of solar projects will also be featured. The \$50 registration fee should be sent to: MCC Associates, Inc., 1533 Red Oak Dr., Silver Spring, Md. 20910. Western SUN is a joint program of the U.S. Department of Energy and the Western states.

THE SOLAR FILM

The Solar Film is a nine-minute celebration of the sun. Its message: solar energy technology is available now and its potential is immense. The 16 mm color film costs \$30 to rent and \$225 to buy. The video version is \$195. Contact Pyramid, Box 1048, Santa Monica, Calif. 90406, (213) 828-7577. Robert Redford is the film's executive producer.



SOLAR CENSUS

A solar sourcebook for professionals in the energy field is available from astat publications. The 500-page, \$45 book includes information on manufacturers, architects, engineers and researchers active in solar development. Write to astat publications, P.O. Box 7119, Ann Arbor, Mich. 48107.

SOLAR LAW REPORTER

The bimonthly Solar Law Reporter discusses technology, legislation and politics. The target audience is not only lawyers, but also architects, bankers and legislators. Subscriptions to the Solar Energy Research Institute publication are \$12 a year. Write to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

API STRIKES BACK

Apparently, the rumor that oil companies are trying to suppress the growth of the solar energy industry has reached enough people that the American Petroleum Institute decided it was time to strike back. The oil companies' side of the solar story has been published in a March 12, 1980 report entitled: "The U.S. Solar Energy Industries and the Role of Petroleum Firms." The 92-page document, which discusses both the photovoltaics and the solar heating and cooling industries, is available from The American Petroleum Institute, 2101 L St., N.W., Washington, D.C. 20037.

SOLAR BUYERS' CATALOG

The Peoples' Solar Sourcebook boasts that it is "the world's largest and most comprehensive buyer's catalog of solar energy products." Collectors, photovoltaic cells, fuse dampers, heat exchangers, controls, storage tanks, T-shirts and solar powered calculators are among the listings. The 1980 edition is \$5 from Solar Usage Now, 450 E. Tiffin St., Bascom, Ohio 44809.

MID-AMERICA UPDATE

A three-day forum on technological, social and political advances in the solar field will be held Sept. 8-10 at the Radisson Saint Paul, Saint Paul, Minn. Sponsored by the Mid-American Solar Energy Complex, the conference will concentrate on issues affecting the north-central part of the country, including North and South Dakota. The registration fee is \$58 per person; mail to Mid-America Solar Update '80, 8140 26th Ave. South, Bloomington, Minn. 55420.

SOLAR RETROFIT

The Energy Extension Service of Northeastern Colorado is sponsoring a conference on solar retrofitting of residences, Sept. 20-21. Conference topics will range from add-on collectors to tax incentives to insulation. A free products trade fair will be open to the public. The conference is set for the Lincoln Community Center in Fort Collins, Colo. For more information, contact the Energy Extension Service of Northeastern Colorado, 425 N. 15th Ave., Greeley, Colo. 80631.

PASSIVE COMMUNITY CONFERENCES

It's billed as the largest solar event ever assembled: the fifth National Passive Solar Conference, this year at the University of Massachusetts at Amherst. Sessions during the week of Oct. 19-26 are expected to attract over 4,000 people and a variety of groups, including the American Section of the International Solar Energy Society and Women in Solar Energy (WISE), who fly under the banner "Active Women, Passive Solar." Tuesday's agenda features an all-day Double-Shell, Air Envelope Workshop, an intensive study of a new passive design concept. For the details, contact Passive Solar 1980, Box 778, Brattleboro, Vt. 05301.

A conference called "Taking Charge: Community Energy Strategies for the '80s" will precede the passive conference. Contact: The Center for Renewable Resources, 1001 Connecticut Ave., NW, Suite 510, Washington D.C. 20036.

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BLACKIE: Alright, rune-ripper, cut the crap. I want my black light, my kimono, and my Louie Armstrong 78s back, pronto. Come across or talk to my lawyer, you prolix swizzlestick. **CUMQUAT.**

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UTAH ENERGY MEET

Tar sands, oil shale, coal, geothermal steam and gasohol will be discussed at Utah's fourth annual State Energy Conference Sept. 11. Sessions will focus on research under way at the Utah Engineering Experiment Station. Gov. Scott Matheson is the keynote speaker for the event, which will be at the University of Utah.

NEED MONEY?

The state of Montana is looking for people who need money for renewable energy projects in the state. Funded through Montana's coal severance tax, the state's Renewable Energy Program has made 159 grants since 1976 to farmers, ranchers, teachers, businesses and nonprofit groups. The program's goal is to lessen the state's dependence on fossil fuels. "We hope that 20 percent of Montana's energy will come from renewable sources by the year 2000," says the state director of the Department of Natural Resources and Conservation, Ted Doney. For details contact the DNRC, 32 South Ewing, Helena, Mont. 59601, (406) 449-3647.

RETURN TO RETURNABLES

Environmental Action and the National Wildlife Federation are building a network of groups and individuals interested in expanding the number of states with laws requiring beverage container deposits. Presently, six states have laws designed to encourage the recycling of bottles by requiring that a few extra cents be paid on purchase to be redeemed when the empty container is returned. If you want more information, write to the National Wildlife Federation, Return to Returnables, 1412 16th St., N.W., Washington, D.C. 20036. For a T-shirt with a green or white "Return to Returnables" emblem, send a \$4 contribution and indicate your size.

CERT TO MEET

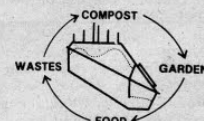
The Council on Energy Resource Tribes has scheduled its annual board meeting for Sept. 4 and 5 at the Mayflower Hotel in Washington, D.C. The organization, which provides technical expertise and advice to member tribes interested in controlling development of natural resources on their lands, has scheduled educational workshops, guest speakers, and other activities. For more information contact Terri Aronson, (202) 466-7702, or write to CERT, 1000 Connecticut Ave., NW, Suite 610, Washington, D.C. 20036.

STATE OF WYOMING PUBLIC NOTICE

The Wyoming Environmental Quality Council will hold a public hearing on Thursday, September 18, 1980, in the City Council Chambers, Rock Springs, Wyoming at 7:00 pm. The subject of the hearing will be proposed modifications to Wyoming Water Quality Rules and Regulations, Chapter VI, entitled: Salinity Standards - Criteria for the Colorado River Basin. Persons wishing to comment on the proposed regulations must submit comments on or before September 18, 1980, to: Mr. Lee Keith, Chairman, Wyoming Environmental Quality Council, Equality State Bank Building, Cheyenne, Wyoming 82002. Persons making oral statements at the hearing should prepare a written copy of their statement for presentation to the hearing officer. Persons with questions or comments should contact Mr. John F. Wagner, Water Quality Division, Wyoming Department of Environmental Quality, Equality State Bank Building, Cheyenne, Wyoming 82002.

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14-High Country News — Aug. 22, 1980

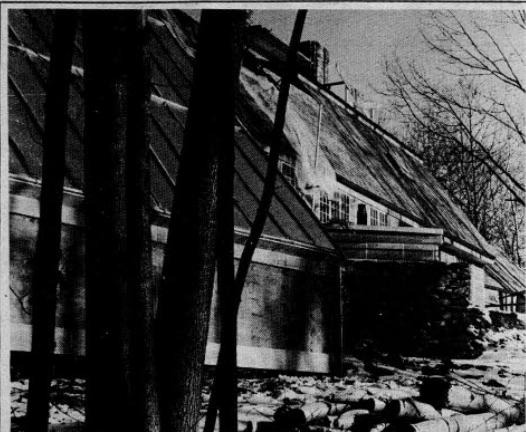


Photo courtesy of Solar Age

SITE-BUILT SOLAR SYSTEMS could make solar space heating affordable. The 500-foot collector shown in the photo above will double as a roof for this Massachusetts residence.

Guest editorial

Solar heaters at half the cost

by Bruce Anderson

It's no secret that federal solar programs have heavily supported factory-built components and systems. Site-built systems were considered a second-rate approach to supplying buildings with heat and were given few, if any, resources. The theory was that if solar equipment could be created in the image of an appliance — like heat pumps, for example — rapid consumer adoption would follow. This approach has proven to be an effective one for water heating and this market is taking off.

However, the growth of active solar space heating is stagnating. Why? Because space heating systems work only half the year and produce only half the energy for a given collector area as do solar water heaters that produce all year long. Thus, for space heating systems to be as cost-effective as water heaters, they must cost half as much per square foot of collector.

Site-built systems are just that. According to thoroughly documented fi-

has meant "thrown together by backyard inventors and do-it-yourselfers" to many people. In fact efficient and durable site-built systems require as much engineering and development work as factory-built systems — not less. They also require educated and trained builders — not construction neophytes.

The opportunities of site-built are enormous. The collector can be readily integrated into conventional walls and roofs. New architectural design possibilities arise because site-built collectors blend more readily into the other construction details of buildings. There is less redundancy of materials between the collector and the skin of the building than with factory-built collectors. Site-built is for builders who can plumb a straight wall or install a furnace. And the mark-up by and profit for the builder are liable to be higher than for factory-built systems — indeed an incentive for the trades.

But best of all, site-built offers the opportunity for solar space heating to get back on track and to reach levels of

When is a jet not a jet? When it flies to Jackson

When is bourbon not bourbon, or a steak not a steak? Never, to the palate; but if the two ever become illegal, there will be a change. Your Jim Beam will be called lemonade, and your sirloin a leghorn, and the law will look the other way while you indulge.

That kind of lexical distinction is now being made in the skies of Wyoming. Since the National Park Service won't allow the noise of Frontier Airline's commercial jets landing at the Jackson Hole Airport — which lies within Grand Teton National Park — the promoters of tourism have turned to their dictionaries. If commercial jet service is not allowed under the law, well then, the Jackson Hole Ski Corporation will fly in private charters this winter.

The naive observer down here on the ground may think he is seeing Frontier Airline commercial 737 jets landing and taking off at the foot of the Tetons — but he would be wrong. Those planes have inspired an ongoing squabble between the Park Service on one side and the Federal Aviation Administration and the airport board on the other, and the Park Service has banned them.

What the observer will be seeing, courtesy of the ski operators, are "private charters" carrying tourists from Denver and Salt Lake City to the ski slopes. They may look like big jets, but they're not so large they can't fly through a loophole.

The Department of Interior has been going out of its way to avoid asserting itself, and so far has failed to respond to this challenge. Once the planes start landing, it will be doubly difficult to get them to take off for good. And even those of us who know the difference between bourbon and lemonade will be hard pressed to distinguish between "private charters" and "commercial jets."

— GOG



Dear Friends,

In case some glare-blinded reader failed to notice, we've dedicated this end-of-the-summer issue to the sun.

The idea was planted months ago, when we realized we had a batch of solar-type stories ready to sprout. There was a little resistance at first — we worried about touching our usual bases and keeping our story "balance." But the leads we had on sun stories were legitimate, the appropriate technology bookheap was gaining altitude, and we began to get excited about the challenge of a "theme" issue.

We actually started to work before our August vacation. Michael, who had already packed his bags for three months in Europe, put aside his German dictionary long enough to write us the SERI piece in English. The rest of us sandwiched some solar research in with our hiking and fishing plans.

Ultimately, we found ourselves with a fat file of stories. We tried to cull the promotional news releases, the hypocritical pitches, and the just-plain-

tedious topics. And we half-heartedly tried to touch all the bases — but ultimately settled on the stories we thought were most important and interesting. As always happens when you look at a field this closely, we kept stumbling across new ideas — so there will be plenty more stories on sun-related topics to spread throughout our regular issues over the next year.

Between the rows of our solar crop, we planted a little of our regular fare — a story on "free access" to public land inholdings, a comment on a new proposal to fly jets to Grand Teton National Park.

So we've done something a little different. But with Betsy trying to get a last-minute consensus on a front-page photo and the editors searching for a missing outline, press day seems just about the same.

— the staff

Opinion



gures in a recently published site-built construction manual funded by the Department of Energy, a 200-square-foot, wall-mounted collector without storage can be built for \$14.40 per square foot. A 384-square-foot roof collector with the complete system, including storage and water heating, costs \$21.10 per square foot. In side-by-side measurements at a solar testing center, their performance is comparable to, if not better than, factory-built collectors.

Why has it taken so long to discover these facts? Simply because site-built

activity comparable with solar water heating and passive systems. Heating bill reductions of 50 to 80 percent with conservation and passive solar do not go far enough. We can go even further with site-built, at costs that are reasonable both for the building owner and for the country.

Bruce Anderson is executive editor of *Solar Age* magazine, where this editorial first appeared. It is reprinted with permission of *Solar Age*, Church Hill, Harrisville, N.H. 03450.



One of the things that keeps us going at HCN is your letters. We get hate mail, love letters, quips with quills, and wisdom in the rough. They often lead to a story, or a re-thinking of our position, or an argument among the staff. Keep them coming.

UNJUST COMPARISON

Dear HCN,

Your July 11 article, "State, Courts, Cutbacks put pressure on strip mine agency," inaccurately quotes me as describing mining regulations in the West to be less stringent than regulations in the East. This comparison is unjust to western operators and regulators alike.

The error, I'm sure, was one of omission. What I told Geoff O'Gara in a telephone interview, was that the number of OSM violations cited in the West have been fewer than in the East because there are fewer mines in the West—mines which have been in existence a shorter length of time and which have been permitted under more rigorous standards. This is because Wyoming and Montana had strong mine reclamation programs in effect before the Office of Surface Mining was even created. During the same period in the East, such programs were more the exception than the rule.

We believe that OSM has exerted a tremendous effort toward striking a balance between environmental protection and coal production in Region V. Further, OSM has tried to produce a climate in which states can assume a primary role in mining and reclamation.

OSM is not avoiding its responsibilities. Rather, it is doing a remarkable job of trying to create a reasonable, rational basis for implementing an extremely complicated set of regulations.

John F. Larson
Public Affairs Manager
NERCO, Inc.
Portland, Ore.

(GOG replies: I stand by the Larson quote used in the story, which was: "Enforcement in the West appears to be less stringent than in the East." While Mr. Larson and I discussed many other aspects of surface mine regulation—including the high quality of some state programs and the number and quality of western mines—he did not qualify or refute that statement.)



Dear HCN,

Don Snow summarized his five-page work in fiction perfectly on page 4: "Today I will search out tales about Utah's newest energy colony..." (See HCN 7-25-80). From the title ("Squeezing the daylight Out of Zion") to the closing sentence ("Trouble is, I'm not sure where it will be"), the article is a masterpiece in fiction. It has done absolutely nothing to explain Utah's poor environmental stand.

I count 27 separate instances of poor research in the article. I cannot help but assume that Brother Snow went out to find the information he wanted for his masterpiece. Some examples include: "The Mormons faced a land of startling severity, where the only recorded plant was the hearty sunflower" (They actually found grass growing over 10 feet high in Salt Lake Valley); "The very spiritual teachings of the Church lead its members toward ownership, consumption and opposition to environmental causes" (If there are any spiritual teachings in these areas, they are anti-materialistic to the end that members might be less stingy with their donations); "In the Mormon mind, the earth as we know it is a temporary state of affairs, soon to be cleansed 'in the twinkling of an eye' by the redeemer. If industry makes a mess of air and watersheds, that's of little consequence" (There is no one Mormon mind on any environmental subject—Mormons don't think any more about the environment than most Americans, which is almost not at all); and "They are squeezing the daylight out of Mother Nature because Father God, apparently in a Brooks Brothers suit, told them it was the only way to achieve perfection" (Our salvation depends on how we care for our stewardships—both temporal and spiritual). This type of inaccuracy permeates the article.

Snow tries to pinpoint Mormonism as one of the roots of Utah's deplorable environmental stand. His method of argument is totally lacking in supporting historical evidence. I maintain that any group of people, who have experienced what the Mormons have and who keep their heritage as close as they can to the front of their minds, will still think of themselves as pioneers in the same way that Utah Mormons do. Utah Mormons do not want to believe that the frontier is really gone. They want to keep on living the old pioneer ideal of living off the public domain—a seemingly endless public domain.

The other reason for Utah's pro-industry fanaticism is the fact that Utahns perceive industry as having been good to them. Moab is overjoyed with the Atlas Minerals uranium mill. Utah does not have a TMI, a Love Canal, an Appalachia...or at least Utahns don't perceive such as existing in their state. Utahns do not see any reason to fear growth. This is not because of the Church, but rather because of their unwillingness to investigate. Blissful ignorance abounds in Utah.

Snow's article would have been great if he had gone all the way and used fictitious names and noted that any resemblance to actual institutions or states was purely accidental.

Rodney Greeno
Provo, Utah

UTAH FICTION



SUCCUMMING TO TIRADE

Dear HCN,

You had to succumb, didn't you? For years I've admired your objectivity and generally firm resistance to sectarianism, mawkish, sentimental and insupportable environmental tirades, relying instead on rational approaches. With Don Snow's ambivalent piece on returning to Utah you blew your cover—especially with the page one head, "Squeezing the daylight out of Zion," a really asinine line.

Previously you have seemed to encourage and applaud solar applications. Here a subdivision uses the sun and draws energy from Utah miners want to work, Snow seems to question their intellect and morals, never mind that most Utah coal is low-sulfur, mining is underground and does not disturb the surface (unlike certain other states whose mining surfaces resemble the moon), but which Snow ducked completely.

His attempts to somehow blame hearsay and out-of-context Mormon doctrine and work ethic for real and imaginary environmental lapses were laughable. Utahns have a fine record of living in harmony with nature—minus perhaps the proportionate share of help-yourself macho lunatics with which all Western society seems afflicted. Salt Lake area canyons accommodate more visitors than many national parks, yet the canyons retain a pristine quality. And despite the heavy Wasatch Front population, hillsides show far fewer two- and four-wheel scars than many small Western towns.

If Don Snow so prizes the simple agrarian lifestyle, perhaps he should move to India, or head back to Pennsylvania's horse-and-buggy "Dutch country," there to start an apricot tree.

While Utah may invite industry, it is not yet so job-hungry that it invites the MX project—unlike an adjoining state, the one from which you publish!

While I'm on the line, permit me to comment on Michael Moss's June 13 story on Bear Lake, with which I'm quite familiar. It was generally a fine piece—but I would appreciate a map showing where Bear River winds crazily through Colorado. Such an error compromises the whole piece.

Cheers to your noble efforts, but please steer clear of sectarian dissertations and curbstone analyses neither you nor your writer know much about and which have no real bearing on your purpose. I've lived in Utah long enough to know such divertissements are counterproductive.

J.H. O'Hart
Bountiful, Utah

Aug. 22, 1980 — High Country News-15
VOLCANO REFRAIN

Dear HCN,

"Popular Realities" (HCN 6-24-80) in contrast to the center section "The breath of Mt. St. Helens—" Now, you really have objective reporting: the pro and con. Would sunsets be beautiful if a power plant caused them, or the orange juice rain be more or less acidic?

Ed Ambler
Riverton, Wyo.

SEEKS SENSE

Dear HCN,

As a regulator (I am a member of the Colorado Air Quality Control Commission), I try to understand our parameters as for us to understand theirs. Adversarial proceedings are not the way to go—a little common sense does much better. And I feel that HCN is reflecting this approach more and more.

Thanks.

Vicky Gow.
Denver, Colo.



BADLY MANGLED CAPTIONS

Dear HCN,

In the course of my career as a pathologist I have encountered some badly mangled accident victims, but even so I am somewhat taken aback by the picture in the bottom left hand corner of page four of your edition of July 25, 1980. If the two cheerful appearing workers in the photograph are, as stated, removing the body of an accident victim from the Winter Quarters Mine, one must assume that the mortal remains are contained within their two white enameled lunch pails, and that makes it sound like an exceedingly gruesome case.

Actually, the other picture involved in the caption switch, on page one, came out pretty well too, with the miner becoming a "political counterweight" as he is carried on the makeshift stretcher.

I enjoy reading High Country News, and I hope you'll take these comments in the spirit of fun in which they are intended.

John T. Decker, M.D.
Fort Collins, Colo.

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16-High Country News — Aug. 22, 1980



by Mary Back

Up on Shale Mountain there is mighty rough country, but no shale. Piled all around are broken blocks of granite, some the size of houses. You don't walk, you leap from rock to rock. Steep little meadows the size of handkerchiefs, crooked strips of paper toweling and blankets soften the spots between the rocks. At the edge of the snowfields, which are melting rapidly, is some kind of gray, cobwebby algae or lichen, its strands pierced by sudden bright flowers.

Also at the edge of the snow are birds — active, sparrow-sized creatures, busy eating something. These are the black rosy finches we have climbed to see.

The black rosy finch, *Leucosticte atrata*, is among the world's rare birds, yet in my home town of Dubois, Wyo., it's the most abundant winter bird. It gathers by the hundreds, flying from coral poles to treetops to badlands to sagebrush slopes in tight little flocks, dipping and rising. The birds' winter range is restricted to the mountain valleys of western Wyoming, northern Utah, Idaho and southwest Montana. Most of them summer high in the Te-



Black Rosy Finch

ton, Absaroka and Wind River mountains.

Early summer is their nesting season, but where are the nests? This is the mystery we want to solve. Very few nests have ever been found.

Most of the birds we see are males, blacker black and pinker pink than females. They don't act like responsible family members, but more like a bunch of carefree bachelors. They eat, flit about, visit, and fight a little — fluttering up against each other for a couple of feet in the air, then dropping. We try to spot a female slipping away where we can follow, but in vain. Norman French and Dick Johnson, who have both published research papers on rosy finches, say that nests are in rock niches, either high up vertical cliffs or in rough talus like this broken granite, and that the nests are made of grass, protected by a rock roof or overhang.

So we examine hundreds of such places. We scare up a pipit and find her grassy nest, roofed over by a branch of

flat-growing willow. It holds six olive eggs with brown spots. Rosy finch eggs are white.

Our short hours in the high country are soon over and no nests.

This is my eleventh annual try. Every year we have found the birds at about 11,000 feet, always right at the edge of snowbanks, feeding. If the winter snowfall is light and the spring comes early, they may be as high as 11,500 feet. If the snow is heavy and spring comes late, they may be as low as 10,000 feet.

This year they were eating seeds from last summer's blooms of alpine aster. Last year they were picking up little green tree-hoppers — hard-backed green bugs smaller than your smallest fingernail. I pick one up and he looks dead in my hand, but after a minute of warmup he wiggles his legs and begins to crawl.

On June 26, 1979, Gary Keimig and I almost found a nest, near where we looked this year. At least we found a female who didn't want to be driven from her spot, a six-inch ledge where grass and sedges were growing. It was sheltered by a big rock roof, and the grass was piled high with extra loose grass. Carried there? If only we could have come back the next day and the next.

In 1981, we'll find out more.

Mary Back is an artist in Dubois, Wyo.



A message to writers, neath- er artists, and ichthy- ologists:

If the energy companies can tap the minerals and fuels on public lands, we at HCN figure we ought to be able to quarry the public's mother lode of outdoor experience.

Hannah Hinchman has gone east for a while, so we'd like to invite you to help us fill the "Afield" column with your words and drawing. We can't promise we'll publish what you send. But if you can open a window for our readers to the world in your backyard or on top of Mt. Evans, we'll pass it along. And we'll send you \$10 for whatever we use.

Write: "Afield," HCN, Box K, Lander, Wyo. 82520. (Manuscripts with a self-addressed, stamped envelope will be returned.)

Trackings

followups on previous stories

Churchrock spill

(see HCN 8-10-79 for previous story)

Navajos who allege they have lost water, livestock and grazing land as a result of the Churchrock, N.M., uranium tailings spill in July, 1979, have filed suits in Navajo Tribal Court against the United Nuclear Corp. and its subsidiaries.

Each of the individual plaintiffs is seeking \$25,000 in actual damages and \$75,000 in punitive damages. Stephen Harvey, an attorney with DNA (the People's) Legal Services, which is representing the Navajos, says as many as 300 individuals may file suits.

United Nuclear Corp. officials say their attorneys have seen only a few of the complaints and haven't determined their response. The company may question the Navajo Tribal Court's jurisdiction. Harvey, however, said the court's authority to consider such civil (as opposed to criminal) cases involving non-Indians is clear. United Nuclear's mill and tailings pond are on private land, but its mine is partially within the reservation's boundaries.

The plaintiffs say the company's negligence led to the accident on July 16, 1979, in which 100 million gallons of

radioactive wastes spilled into the Rio Puerco. The state of New Mexico now recommends that the water not be used for domestic purposes or livestock.

United Nuclear has supplied alternative water for livestock at tanks in the area, as well as drinking water available at the mill site, at a cost to the company of about \$10,000 a month. However, the plaintiffs say the water is delivered sporadically, is not sufficient to meet their needs and is as far as 15 miles from their homes.

Harvey says that 80 percent of the plaintiffs, who depend on livestock for meat and money, have had to pawn personal property to get by. Some of the best grass was typically found in the Rio Puerco wash, but this grass cannot be used. Other plaintiffs own parcels of land that straddle the wash but can't use the land on the opposite side of the wash from their homes.

The Navajos claim they have suffered mental and emotional distress, possible adverse health effects, loss of livestock and loss of income, since local buyers won't purchase sheep or cattle from the Rio Puerco area.

The company has 30 days to respond to the suits, which are being filed in two tribal court jurisdictions — Windowrock in Arizona and Crownpoint in New Mexico.

— Marjane Ambler

Garrison wins

(see HCN 6-27-80 for previous story)

A coalition of environmentalists, Canadians and North Dakota farmers lost its fight in Congress this summer to block funding for the Garrison Diversion Project. The project received \$9.7 million in appropriations for this fiscal year, despite a last minute effort by Sen. Larry Pressler (R-S.D.) to stop the action.

Pressler and Sen. David F. Durenberger (R-Minn.) labeled the appropriation for Garrison a "going away gift" for retiring Sen. Milton R. Young (D-N.D.), a long-time advocate of the project.

Pressler's amendment, which was defeated 62-26 in late June, would have banned the construction of Garrison facilities that would send Missouri River water from the project into South Dakota. The amendment would have effectively killed the project. Instead, Garrison will stay alive for the remainder of this year, and the fight for next year's funding is expected soon after Congress returns from its recess for the Democratic convention.

Young, 82, will retire in January after 35 years in Congress.

Casey Dinges, a National Audubon Society specialist on Garrison, said that markup on the fiscal year 1981 energy and water appropriations bill that includes Garrison and other projects probably will take place by the end of August. Young and North Dakota's other senator, Quentin Burdick (D), also an advocate of Garrison, are both on the Energy and Water Development appropriations subcommittee.

From the subcommittee the bill will go to the full Senate Appropriations Committee and then to the Senate floor. The House has allocated no new money for Garrison for 1981, but has asked that \$3 million that was removed from the project's budget be returned.

— Ann Schimpf

