

First in the U.S.

Oregon includes solar in state building codes

SALEM, Ore. — The concept of a statewide mandatory solar building code became a reality here on March 1. "Oregon now has the only solar building code in the U.S.," said Larry Beardsley, deputy administrator of the Building Codes Division, Oregon Department of Commerce.

The new code is based upon U.S. Department of Energy (DOE) guidelines and standards for installation of solar systems. Oregon's building code was incorporated into the DOE document, Beardsley said, and then amended to meet the Oregon State Building Code.

"We boilerplated about 90% of that document because there's already been a lot of work done there. We have also been working very closely with the solar industry so that we are not providing regulations that are unrealistic," he said.

The code is the product of 18 months work. During public hearings and forums, Beardsley said he and his staff members listened to legislators, builders, solar manufacturers, government agencies, and the public before developing the code.

Beardsley conceded, however, that the code is not perfect and said he anticipates some changes after it is used in the field. "Solar technology is not new, but the enforcement of solar codes is," he said. "We plan to put on various programs around the state to let inspectors and others know about the new code."

The Oregon Department of Commerce is currently organizing programs to educate building inspectors on the new regulations. It is planning seminars, along with offering correspondence courses.

Solarex breeder factory to mass produce solar cells

FREDERICK, Md. — Solarex Corp., Rockville, Md., has begun construction of its 26,000-ft² solar breeder factory which will use a 200 kW array of photovoltaic cells to produce more solar cells.

The building, located on a 95-acre site, will get all of its electricity, including power for lights, air conditioning, and production lines, from nearly 225,000 silicon cells.

The cells, each 4 in. square, will be enclosed in 2-ft by 4-ft glass panels which will cover the 27,000-ft² south facing, sloping factory roof. According to Solarex president Joseph Lindmayer, the concept of using existing cells to breed new ones will "dispel misgivings" about the feasibility and practicality of photovoltaics.

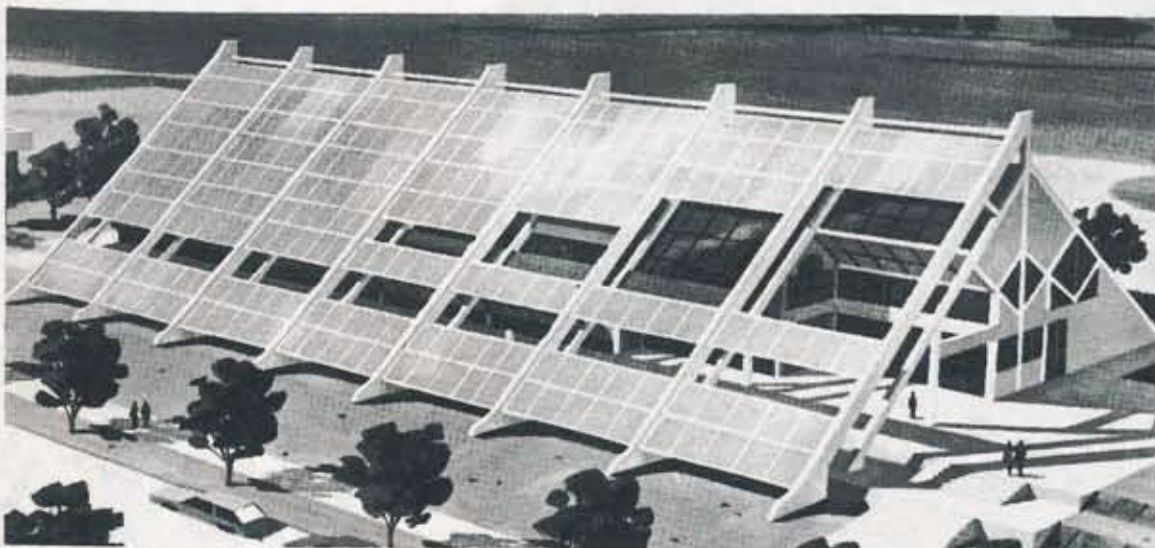
The building will also have solar thermal collectors and

solar thermal storage for heating. A diesel-powered generator will provide backup power in case of an emergency. Lead-acid batteries will have the capability of storing enough electricity to run the factory for four days.

According to Lindmayer, "This project does not involve any federal dollars. Instead, it is an excellent example of the free enterprise system at work, with an excellent cooperation between industry, state, and local government."

The building, designed by Roy F. Johns Associates, Pittsburgh, Pa., and under construction by Perini Construction Inc., Hagerstown, Md., is expected to be completed in August.

For more information contact: Solarex Corp., 1335 Piccard Dr., Rockville, Md. 20850. Telephone: 301-948-0202.



SOLAREX CORP. will use nearly 225,000 silicon cells to power the lights, air conditioning, and production lines at its solar breeder factory now under construction in Frederick, Md. The factory will be used to produce more photovoltaic cells. Pictured above is an artist's rendition of the solar breeder facility.

Solar is a cost-effective asset to Genesis heat pump system

FORT WAYNE, Ind. — Genesis Energy Systems has developed and is distributing a comfort system which makes solar energy application not only feasible but cost effective. A typical single-family retrofit installation will cost between \$10,000 and \$12,000, but, because of tax benefits, the pay-back period can be as short as three years.

Claiming a coefficient of performance (COP) of more than 3, the system includes an array of solar collectors manufactured by

U.S. Solar Corp., Hampton, Fla., plus an "Earth Energy" heat pump manufactured by Command-Aire Corp., Waco, Texas, and adapted for closed loop operation by Genesis.

The solar system provides domestic hot water. The heat pump, which provides cooling in the summer, rejects heat to the ground loop where it is absorbed by the ground itself. During the winter, the heat pump uses heat stored from the solar system and from the ground to provide space heating.

Even if the solar system is not operating, the loop will only reach the minimum temperature the ground can maintain (approximately 30°F in Indiana) which is still enough to heat the home. When little sunlight is available, a desuperheater, operating in conjunction with the heat pump, is used to provide domestic hot water.

The system can be installed with or without solar assist. However, the solar assisted systems operate with temperatures (Page S-6, Please)



GENESIS ENERGY SYSTEMS, Division of A. Hattersley & Sons, Inc., Fort Wayne, Ind., installed one of its solar assisted, earth coupled, closed loop heat pump systems at this home in Avilla, Ind., in the fall of 1980. The sealed casing containing the closed loop was installed vertically 320 feet deep. The six 4-ft by 8-ft solar collectors heat the swimming pool in the summer and the cased storage-heat exchanger tube in the winter. Heating, cooling, and domestic hot water are provided by a 3-ton Command-Aire heat pump tied to the solar assisted closed loop.

SERI reorganization, land transfer completed

GOLDEN, Colo. — Three hundred acres of state land here have been officially transferred to the U.S. Department of Energy (DOE) to be used as a permanent site for Solar Energy Research Institute (SERI) testing and research.

The South Table Mountain

parcel was signed over to the federal government by Colorado Governor Richard D. Lamm. Funds for the permanent SERI facility, totalling \$14.9 million, were appropriated in fiscal years 1979-1981.

Approximately 100 acres will be used for laboratory space, and the remaining 200 acres used as experiment sites. Construction of a new 70,000-ft² building, which will include high bay and general purpose laboratory space for solar fuels and chemical research, is expected to begin this month.

DOE granted a 15-month extension, to June 30, 1983, for operation of SERI. Having undergone a major reorganization, as well as staff and budget cuts, the institute will now concentrate its efforts on research that private companies cannot afford to do.

According to Dr. H. M. Hubbard, who replaced Denis Hayes as SERI director last June, "The redirection emphasizing research will lead SERI into the exploration of new ideas and research and development ac-

(Page S-4, Please)

Giant windmill provides power



STANDING 20 STORIES HIGH, this giant windmill will generate 6 million kWh this year, the energy equivalent of about 10,000 barrels of fuel oil. It converts wind energy into electricity for as many as 1,000 homeowner customers of Southern California Edison Co. The Louis Allis synchronous alternator which converts the rotating energy into usable power was produced at the company's Beloit, Wis., facility.

Genesis heat pump system--

(Continued from Page S-1)

about 10°F warmer than the nonsolar systems. Without solar, the system will operate over an entire season at temperatures averaging from 30°F to 35°F, while solar systems will operate at temperatures of 40°F to 45°F.

A standard Genesis system has a COP of about 2.5. That includes all pumping and blowers. With the collectors, it's over 3, representing an operating saving of about \$100 per year. "Not only do we pick up a half point on the COP, but now we can add in \$300 to \$400 per year of purchased energy cost for domestic hot water for an average family. So the solar package does have additional annual savings," according to Dan Ellis, founder of Genesis.

With collector panels, the system will generally run \$10,000 to \$12,000 installed. However, because the system qualifies for both federal and state energy tax credits, the customer gets back \$6,500 to \$7,000 on that investment, making payback periods average three to six years.

New construction

On new construction, the payback really looks good. While a conventional system might run \$5,000, one of these systems, with ductwork, costs about \$14,000, of which the customer gets back about \$7,000. His net cost is \$7,000, only \$2,000 more than a conventional system. "If the system cost is added to the mortgage, and the customer takes the credits back, he will save enough to exceed the additional mortgage payment right off the bat," Ellis said.

Ellis began installing this type of system as a dealer when he formed Genesis in 1980. However, there were a lot of problems to overcome. "Being a dealer, I had to get parts from about 12 different manufacturers from all over the country. I had parts coming in from New Jersey, Texas — parts were backordered, and freight costs were ridiculous," he said.

"If I made a sale, it was at least four weeks before I could actually get out and install it unless I wanted to stock. Most

dealers can't afford to stock," he said, "especially not knowing what type of system you're going to install next. When I needed help, there was none as far as engineering goes. I had to get what information I could from manufacturers, but they don't usually know a lot about what people out in the field are doing with their equipment. They have a general idea," he said, "but they don't have the nuts and bolts knowledge."

In February, 1981, Ellis' company became a division of A. Hattersley & Sons, Inc., a local mechanical, electrical, and commercial refrigeration contracting firm established in 1965. Hattersley said it believed in what Ellis was doing and had the means to provide capital to turn the dealer organization into a distributing company.

The company spent the months of February to May, 1981, researching the market and laying the foundation for its dealer network. In the first eight months of operation, it grossed \$300,000 and expects to at least double that volume this year.

Minor adjustments

According to Ellis and other distributors of similar systems — such as Jim Partin, GEOsystems, Stillwater, Okla., and Bob Lamson, Alten Northwest, Seattle, Wash. — the Command-Aire unit is the only heat pump that can be put in the field to operate with the closed loop with only minor adjustments.

Most others, Ellis said, require insertion of accumulators which means breaking the refrigerant system, recharging it, and voiding the warranty. Also, he said, the average heat pump on the market will have liquid floodback to the compressor at low evaporating temperatures.

Some of the advantages of using closed loop systems over ground water systems, Ellis said, are that there is no problem with inadequate water supply; with trying to drain the water either off the site or back down a return well; or with mineral problems which can cause corrosion and fouling.

"Also, we can go into subdivisions, or even small lots in town, where it would be impossible to install wells or drains because of ordinances against them. As far as cost goes, if you have to drill a well, you can put in a loop for the same cost," he said.

The "Geopipe" closed loop is made of polybutylene and filled with a water-propylene glycol solution to prevent freezing at low operating temperatures. According to Ellis, polybutylene is more flexible and has a wider temperature range than PVC or polyethylene, which was previously used for similar applications. "You can actually freeze it and it won't break. It can expand even when it's below zero. It can swell up so that it can take the ice without cracking," he said.

The length of the closed loop, which can be installed vertically or horizontally, is dependent upon climate and application. "We work individually with our dealers on those lengths," Ellis said.

Depths for installing the loops will also vary, depending on what's on the site. "Normally we go down 5-6 feet on horizontal loops. On vertical loops, we go down as far as drilling is cheap.

"For example, if there's rock 80 feet down, it doesn't pay to go down any deeper and start drilling into the rock. That's when drilling costs go up substantially. We would just drill more 80-foot holes. Generally, though, 100 to 200 feet is as deep as you would want to go, for ease of putting the pipe down," he said.

Split system

Using the Genesis system, the collector area, operating at ground loop temperatures, will put out the same number of Btu for space heating in winter that double the collector area would if used directly for heating in an air-to-air system. "For space heating, you might have to average 100°F or better and the collector can't begin collecting until the temperature reaches over 100°F. With the ground loop," he said, "the collectors will begin collecting when the temperature reaches just over 30°F. Therefore, they will collect diffuse energy almost every day," he said.

Genesis also distributes a split-system Command-Aire unit adapted for closed loop operation. It's basically the same system but, instead of using a completely self contained unit, a coil is installed in the duct of, say, a gas furnace. Ellis said the split system is being offered as a replacement for air-to-air heat pumps because of a higher seasonal COP and much less maintenance.

"We've only had one compressor failure in an operating system," Ellis said. "They're operating at lower head pressures and located in a warm environment so they don't have to experience the extreme ambient operating conditions that the compressor in an air-to-air unit does," he said.

During the three or four months of the winter when there is not sufficient solar energy to provide domestic hot water, desuperheaters, which



FOR VERTICAL PLACEMENT of the closed loop, a hole is dug with an ordinary drilling rig. The plastic or steel casing is then inserted, with the polybutylene piping making a loop within the casing. The casing is then capped, or pressurized. At this installation in Avilla, Ind., the loop was installed 320 ft deep.

utilize superheat from the hot gas side of the compressor, are used to provide hot water. "That increases system efficiency and provides all of the hot water while the heat pump is running," Ellis said.

Since information was not available elsewhere, Genesis set up a testing laboratory to determine what would happen to the equipment under various operating conditions. "No manufacturer we know of provides operational data on its equipment below 40°F. Neither do they say how glycol mixtures will do at these temperatures," he said.

Testing lab

The company said it has tested every Command-Aire unit in its lab on water-glycol loops with temperatures ranging from less than 20°F to 60°F. "All of the sensing of the refrigerant system — the superheat, subcooling, evaporating temperatures, and pressures — are monitored so we know exactly what's happening within the unit," Ellis said.

"Now, by having all of that information, when a dealer throws his gauges on he can tell if the unit is operating properly or not. Before, we didn't know how the unit should operate at those temperatures and had no way of knowing if it were operating properly or not."

The company also uses the testing laboratory to train its staff and dealers. Limited space in the lab provides for more one-on-one training, the company said. Currently, Genesis, GEOsystems, and Alten Northwest are working together to produce a training and installa-

tion manual for closed loop systems. Genesis also has a computer program for its dealers. The dealer can call in heat loss information and other specifications, and Genesis will run a computer analysis, with both the dealer and his customer's name on the print-out. It can be sent to the dealer the same day the information is phoned in, Ellis said.

Ellis said that on a dealer's first system, "we go out in the field and actually help them install the system so that they understand why we do things the way we do and so that all of their technical questions can be answered. That way, we know his first system is going to go in right and he's going to be happy with it. Hopefully, he will continue in the same fashion so that they all go in right," he said.

"If not, we have refrigeration service people that can be sent out to a job for backup. If the dealer reaches a point where he just doesn't know what to do — we do, and we send someone out there," he said.

Ellis also said that Genesis "sizes the loop length, heat pump, collector area, storage, piping, and pump so that basically all possible errors are taken out. Premade wiring boxes, to avoid field wiring problems, are also part of the system. "The places where dealers were making mistakes in the field, we began shop fabricating," Ellis said.

For more information contact: Dan Ellis, Genesis Energy Systems, division of A. Hattersley & Sons, Inc., 3939 Mobile Ave., P.O. Box 5366, Fort Wayne, Ind. 46895. Telephone: 219-483-7974.



GENESIS ENERGY SYSTEMS not only installed the collectors for the system in Avilla, Ind., it also built the rack they sit on. The collectors are used to heat the swimming pool in the summer and the cased storage-heat exchanger tube in the winter, as well as to provide domestic hot water.



A GENESIS INSTALLER begins making the connections that will tie the cased closed loop into the heat pump itself.

SERI--**Inspector tests solar cells**

(Continued from Page S-1)
 tivities in solar technologies that show the most promise of contributing to a strong mix of economically viable energy production technologies."

SERI's four areas of emphasis include solar electric conversion, solar fuels and chemicals, low and intermediate temperature thermal processes, and materials, along with support research.

In addition, SERI will continue to provide the dissemination of technical information to the scientific and technical community. It will also handle some subcontracting, as appropriate, to support its primary research areas.

A national research laboratory is not the place to set energy policy, according to Hubbard and John McKelvey, president and chief executive officer of the Midwest Research Institute (MRI).

"We'll produce the technology," Hubbard said, "and let private and public sector decision-makers know it is there. This mode of operation is more consistent with the way MRI has operated throughout its history — presenting research findings on which policy makers base their decisions."

Don't miss the
NEW Service for readers
 on page 13



A QUALITY ASSURANCE INSPECTOR tests one of the 80 solar cell arrays which are part of an experimental solar plant nearing completion in Phoenix, Ariz. Being built by Arizona Public Service Co. (APS) at the Sky Harbor International Airport, the facility will be capable of producing 225 kW of electricity directly from the sun. Each array contains 272 solar cells, which receive concentrated sunlight through special lenses. When the plant is completed this spring, APS will begin a two-year testing program to collect data on its performance. Most of the \$3.93 million needed to construct the facility came from the federal government. The facility, one of the largest in the world, will be capable of supplying enough electricity to meet the needs of 40 average-size, Phoenix-area homes.

Acre collection field**San Diego high school installs huge solar plant**

SAN DIEGO, Calif. — University City High School here claims to have the largest solar system ever to be installed in a school. Its \$1.3-million solar energy plant incorporates three different banks of solar collectors, forming a heat collection field that is nearly an acre in size.

The 340-ft by 125-ft heat collection field includes two banks of parabolic collectors, according to the system's designer, Carter Engineers. One bank tracks the sun in the sky, and the other is fixed. The third bank consists of fresnel lenses which track the sun and concentrate sunbeams on a water receptacle.

Collector arrays are placed on a south-facing hillside at an angle of 32°. Water, which is heated to as high as 240°F, is pumped to heating coils in rooftop air handling units where air is warmed and circulated within the buildings.

For cooling, the solar-heated water is pumped through absorption chillers. The hot water activates a chemical reaction, cooling other water to 45°F. The chilled water is then pumped through separate cooling coils, explained Hugh Carter, president of Carter Engineers.

Excess hot water is stored in three underground tanks having a total capacity of 89,000 gal.

The water is tapped as needed for the heating and cooling systems and other domestic needs. When sunlight is inadequate to provide sufficient hot water, gas-fired backup boilers take over.

The system is designed to heat and cool 138,000 ft² of classroom and administrative space, as well as provide 3,339 gal/h of hot water for showers and other domestic uses. At peak operation, it is expected to produce energy cost savings of 50% to 80%, Carter said.

Its operation will be monitored for the next five years by the U.S. Department of Energy (DOE), which supplied \$392,740 toward development of the system. Actual on-site readings and information gathering will be done by San Diego United School District.

The school district's data acquisition system will measure water temperature and flow through the collectors, permitting comparisons of energy output. The system which delivers the most Btu will be deemed most efficient, Carter said.

Manufacturers of different portions of the system include Acurex Corp., Mountain View, Calif.; Energy Design Corp., Memphis, Tenn.; and Northrup Inc., Hutchins, Texas. University Mechanical Constructors here, with Honeywell as a subcontractor, and Trempte Construction Co. as general contractor for the school, installed the equipment.

WHOLESALE SUPPLIES

SOLAR • GEOTHERMAL • SPECIALTIES

WE STOCK THESE LINES AND MORE . . . ALL READY FOR IMMEDIATE DELIVERY.
 PACKAGED SYSTEMS • STATE OF THE ART PRODUCT SPECS • NUTS & BOLTS INFORMATION
 • AUTHORIZED DEALERSHIPS AVAILABLE IN MANY AREAS •

**EAGLE SUN SYSTEMS**

The Finest Solar Products You Can Buy
 Eagle Sun™ Drainback Systems Are No. 1
 In TVA Performance Tests

**COMMAND/AIRE CORPORATION**

EARTH ENERGY HEAT PUMP SYSTEMS

ABSORBER PLATES
 COLLECTOR PANELS
 U.S. SOLAR CORP.
 SUNGLO SOLAR (POOL)
 CONTROLS
 U.S. SOLAR CORP.
 INDEPENDENT ENERGY
 FLOWMETERS
 BLUE-WHITE INDUSTRIES



genesis
 energy systems

division of a. hattersley & sons, inc.
 3939 mobile ave. • p.o. box 5366
 fort wayne, in. 46895 • 219/483-7974

HEAT TRANSFER FLUIDS
 DOW FROST PROPYLENE GLYCOL
 GROUND LOOP PIPE
 VANGUARD POLYBUTYLENE
 HEAT EXCHANGERS
 TRIANGLE TUBE-SHELL & TUBE
 TRIANGLE TUBE-FINISHED COPPER
 HEAT PUMPS
 COMMAND/AIRE CORP.
 VERTICAL-HORIZONTAL
 CONSOLE-ROOFTOP
 HYDRONIC SPECIALTIES
 VARIOUS MANUFACTURERS

PIPE INSULATION
 NOMACO THERMA-CEL
 PUMPS
 GRUNDFOS
 TACO
 SPACE HEATING COMPONENTS
 SUNSTRAND DUCT COILS
 TURBONICS CHILL CHASERS
 STORAGE TANKS
 U.S. SOLAR CORP.
 DESERT SUN MODULAR FIBERGLAS
 FABRICO CUSTOM LINERS
 VALVES
 ASCO BRASS SOLENOIDS
 RICHDDEL PVC SOLENOIDS
 DOLE FLOW CONTROLS

For More Information In These Areas

Northwest Area

1134 Poplar Place South
 Seattle, Wash. 98144
 (206) 329-9692

Southwest Area

GEOSYSTEMS inc.

3623 N. Park Drive • (405) 372-6851
 Stillwater, OK 74074

LOOKING FOR BUSINESS OPPORTUNITIES?

Invest your time wisely
 by checking NEWS
 CLASSIFIED ADS!

**TAX CREDITS ?
 LOWER FUEL BILLS ?
 LONG TERM ENERGY
 SUPPLIES ?**

**Solar Energy
 simplified**



**the HT-3
 Triple Pass
 Heat Exchanger**

**The ONE package
 which works like
 TWO!**

QUICK EFFICIENT INTERFACE
 of SOLAR
 HOT TUBS or SPAS
 SWIMMING POOLS
 DOMESTIC HOT WATER
 WATER SOURCE HEAT PUMPS

SOLAR DESIGN
 ASSOCIATES INC.
 205 W. JOHN
 CHAMPAIGN, IL 61820
 217-359-5748