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CURA reporter

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ENERGY . . . AND THE UNIVERSITY

What activity does not have implications for energy use? The lilies in the field represent a small bit of the flow of solar energy which sustains us all and upon which we will always be dependent. Industrialized agriculture, which the University of Minnesota has played no small part in developing, is essentially a mechanism to convert petroleum and natural gas into starch and protein. A significant part of the activities of our barristers is related to our energy-intensive modes of transportation. Medical practice, as distinguished from health care delivery, is becoming more and more dependent on energy consuming devices . . . only a few weeks ago many of the faculty of the University were invited to respond to a request for proposals on development of means to utilize available energy consuming machines to aid in our classroom activities. The list could be expanded, but it might be sufficient to support the claim, should anyone care to advance it, that energy considerations are really the province of all and that virtually everything going on at the university relates, if not responds, to the intense concern with energy policy.

With that recognition, some of the activities going on at the University of Minnesota which relate to energy are briefly set forth in this issue of the CURA REPORTER. The lists below are not complete, either as to the full spectrum of activities with which the University – as an institution or the individuals making up that institution – is engaged.

The traditional roles of a university include teaching, research and public service. In addition, the University is a corporation, a builder of buildings, an operator of heating plants, and a consumer of a vast range of goods and services. In all of these roles there are programs which relate directly to the resolution of the energy dilemma. Following in this issue of the CURA REPORTER are descriptions of but a few of the current programs. The section on Internal University Energy Conservation describes briefly some of the ways in which the University as a corporation is responding through physical planning, through operation of the physical plant which constitutes the bricks and mortar of the University, and through the decisions influencing the products which the University consumes.

Two of the University's current research programs are described in Research and Study Opportunities: Prospects for Energy Alternatives and Ouroboros: Modern Low Energy Housing. The research being done under the direction of Professor Jordan (a project being conducted jointly by Honeywell and the University), on utilization of solar energy promises to be extremely significant in making commercially available the solar energy flows to the production of electricity, now essentially totally dependent on the diminishing stocks of fossil energy. Project Ouroboros, the construction of an experimental house under the direction of Professor Dennis Holloway in the School of Architecture is likewise concerned with the demonstration that energy conservation in the broadest sense is not only possible, but also available with savings that go well beyond energy conservation.

The Agricultural Extension service has expanded its activities by providing information, readily available in the technical and scientific literature, to its clients. University staff has contributed to the work of the state agencies and the following Information to the Consumer points out but one of the recent studies done by the State Planning Agency on energy consumption patterns in Minnesota.

But these activities, impressive as they may be, are but a small part of the total University activities. Courses are taught at all levels – from extension through graduate seminars – in various aspects of energy technology and of energy policy. In addition to those courses which have energy in their title, there are energy implications associated with other courses ranging from those that deal with environmental topics to those dealing with production methodology.

There are also many other energy related research programs currently underway at the University. Some of those which relate directly to energy supply or demand can be mentioned. Professor Blackshear in the Department of Mechanical Engineering is directing a study of the utilization of solid wastes – both urban and agricultural – as a source of energy. Professor Vernon Albertson is conducting research directed at utilization of solar energy for the production of electricity using a somewhat different conceptual framework than that study directed by Professor Jordan and his colleagues. Professor Hans-Olaf Pfannkuch in the Department of Geology, working with faculty colleagues and students, is investigating the potential for thermal energy storage in the ground.

Faculty in the Department of Agricultural Engineering are doing research on the opportunities for utilization of waste heat from electrical power generating plants. Recognizing that of all fuel burned in electrical generating plants, only about one-third appears as useful energy in the form of electricity, and that two-thirds is presently discharged to the environment in the form of waste heat, the potential for energy conservation via utilization of this waste heat is immense.

There is also an energy research program, the Minnesota Energy Study, being conducted by one of the CURA affiliated groups, the All-University Council on Environmental Quality. This study sponsored by the State Planning Agency is directed at assembling, in a Minnesota Energy Atlas, data on supply, distribution, and end uses of energy in Minnesota. This project is also attempting to determine the energy use by schools, hospitals, sewage treatment facilities, and other "essential public services" in Minnesota. Studies are also underway to determine the energy utilization, both direct as fuels and electricity purchased on the farm and indirect, for example, by the energy represented in fertilizers, for the various major agricultural crops in Minnesota.

Turning to the public service role of the University one also finds considerable activity. Unlike research and teaching activities, there are no summaries of the public service activities of the University staff. It is known, however, that University faculty are serving the community at all levels from participating in discussions with PTA's and other community groups to membership in advisory committees of federal agencies, major industries, and national citizens organizations involved with energy matters. University faculty members serve at the State level on such bodies as the Governor's power plant siting task force, on the Minnesota Energy Policy Task Force and on the Minnesota Emergency Energy Committee. At the federal level, University faculty are members of advisory committees to the Federal Power Commission, to the new Federal Energy Office, and serve as members of the Atomic Energy Commission's Atomic Safety and Licensing Board and the Advisory Committee on Reactor Safeguards.

A short time ago there was widespread concern with the "environmental crisis"; today it is the "energy crisis". The response of the University of Minnesota was not to establish new degrees in "environmental studies" with the resultant implications of a new class of "experts" to whom we could look for solutions. Rather it was the prevailing judgment that there were serious environmental problems, that there was an environmental component to virtually all activities, and that opportunities should be provided to incorporate the concern with environmental implications into existing activities.

Today we find a similar situation with almost manic concern being given to the "energy crisis". There are energy policy implications associated with most of our activities and with most of our decisions.

Also the concerns with the "energy crisis" have emphasized, rather than detracted from or supplanted, the concerns about the "environmental crisis".

It is impossible to make rational energy policy decisions without facing squarely the resulting environmental impact, just as it is impossible to entertain the various energy policy options before us without consideration of the economic, employment, foreign policy, equity, and other considerations.

So it is. The activities mentioned above at the University of Minnesota are representative of the range of these activities. All are important, and the various classes of activities all lean upon one another and are supportive of the other. Research is significant, but without the experience gained in consideration of public policy, gleaned in part through participation in public service activities, research might be misdirected. To attempt to teach about "energy" or "energy policy", without participation via research or the deliberations which characterize advisory committees and other such activities, would be less than maximally effective.

Dean Abrahamson
Chairman, All-University Council on Environmental Quality

Dir., Ctr. for Studies of Physical Environment

INTERNAL UNIVERSITY ENERGY CONSERVATION

Concern for wise energy use has come to a head with the "energy crisis". The University of Minnesota has shared this concern as well as others – conservation of natural resources, abatement of air and noise pollution, and the enhancement of environmental quality. Much work has been accomplished and planning done in resource conservation by the University in both the academic and administrative sectors.

This has been carried out through a process of self-education. Personnel have attended national, regional and local meetings to identify and discuss environmental issues. Knowledge and resources of Federal and State agencies has been drawn upon. Conferences have been conducted in an effort to learn more about environmental problems and the means to handle them.

What specifically has come out of this in relation to conservation of energy and resources? The endeavors of the Energy Conservation Program, begun at the University of Minnesota in 1972, will be broken down into Maintenance and Operations and Physical Planning.

MAINTENANCE AND OPERATIONS

Immediate and tangible results have been effected in this area which aims to achieve maximum resource conservation consonant with cost, convenience, and capability.

The first steps toward a formal approach to energy conservation were taken in 1961, when the Physical Plant installed control and automation centers. Today the Building Systems Automation Center, a centrally located unit, monitors, analyzes and programs heating, ventilation, and air conditioning equipment in many of the Twin Cities Campus buildings and in a few outstate campus buildings. Electrical and fuel energy is saved by centrally regulating these operations, energy required to operate the machinery itself is conserved, and savings is achieved in manpower and costs.

A second major area of conservation involves lighting fixtures and more flexible switching arrangements. Experimental lighting in two Minneapolis campus classrooms have demonstrated a reduction of up to 50% in electrical demand.

Faculty, students and staff are involved in wise energy use. Reduction of heating and lighting has been effected by their efforts to close windows, shut off radiators, and turn out lights when rooms are not in use.

In addition to reducing unwanted heating and cooling, the heating plant has worked to increase its own efficiency. Recapturing lost heat to preheat water for the boilers and air for the burners has increased efficiency by about 10%.

Each day, 4½ tons of wastepaper are collected at the University and sold to a paper reclaiming firm. Construction of a solid waste resource recovery and energy system in the Cedar-Riverside area is being studied by Hennepin County with the cooperation of the University. The project calls for solid waste collection by truck and by pneumatic tube from the local residential and institutional community. Waste will be incinerated and the energy obtained will be returned to the community. Development of the project will be staged over the next twenty years.

The University is placing greater emphasis upon exploring and developing alternative solutions to campus traffic. An express bus system continues to receive prime attention. Computer car pooling has been initiated. Parking regulations designed to curtail use of cars are in effect and an experimental program of bike lanes was created.

PHYSICAL PLANNING

More far-reaching though less immediately tangible efforts are made in the area of Physical Planning. Future conservation of resources through better design and procedures is the aim of this sector of operations. Much is said but little is known about the means, technology, and results of resource conservation. The University has researched assembled data and has attended extensive conferences, meetings and symposia with specialists. The result has been the creation of a program and a series of action and documents.

One such document concerns Life-Cycle costing. Frequently, initial costs for building design and equipment utilizing energy conserving principles are greater but over the life of the facility there is considerable savings in maintenance costs and energy consumption. Utilizing performance standards and life-cycle costing methods, planners consult frequently with architects, engineers, building committees, administrative officials, and future users of the building in order to apply energy conserving techniques in the design, construction, and operation of University facilities. Buildings with large, non-structured open areas suitable for multi-use are inherently more economical from the perspectives of initial construction and long-term operations than cubically structured spaces.

The Continuing Education Facility was selected to be the first major project in which special attention would be given to employing energy conservation in building design and construction. The approach has been to design the building from the beginning to take advantage of all feasible, proven means of resource conservation within cost limits. There will be a minimal amount of exterior glass. Spaces requiring high levels of temperature control do not directly abut on exterior surfaces. Walls and ceilings are heavily insulated. The ventilation system is designed to respond quickly to changes in internal building conditions. Interior rooms are supplementally heated with heat from the lights. Variable switching permits proper lighting to match demand without overlighting. Building control systems have been designed to accommodate reasonable loads and safety factors. The net amount of energy saved using these techniques compared to a building not employing energy saving methods is approximately 25%.

Other notable projects include Johnston Hall, which is the target for energy conservation improvements and will provide a model for future resource conservation improvements in older buildings of this type.

The Planning Office is participating in the University Area Transit Study currently being conducted by the Metropolitan Transit Commission with the cooperation of the Minnesota Highway Department, the Metropolitan Council, and the cities of Minneapolis and St. Paul. Study goals are to maximize accessibility to the Twin City Campus; provide optimum movement of people and goods between campuses and surrounding residential and business areas; and to provide a circulation and distribution system that has expansion flexibility. Mass transit is an important part of this planning. It is desired that any such system use only a fraction of the energy per passenger-mile that conventional transportation modes consume and only less critical types of energy sources be used.

The University has responded to the policy established by the Board of Regents to consider natural resources in all University physical planning. In order for the University to continue to provide leadership in resource conservation, its own conservation efforts must be increased. "A damaged environment can be restored, resources can be conserved, and fiscal gains can accrue through wise planning and greater use of energy saving techniques and technology."

(Resource Conservation Report, University of Minnesota, January 1974.)

NOTE

A questionnaire has just been sent out to those of you on our mailing list. Your responses will help us to serve you. Please fill it out and return it to us promptly.

RESEARCH AND STUDY OPPORTUNITIES

Research programs and study opportunities in environmental matters abound in the academic sector of the University. Environmental instruction and research pervades most of the program of the Institute of Agriculture; is found to a large extent in the Health Sciences, Technology, and Liberal Arts; to a smaller degree in Education and Law. Problem-oriented, multi-disciplinary courses and seminars are taught at both the undergraduate and graduate levels. Programs are also developed by individual students at their own initiative.

There are a variety of administrative frameworks and programs to accommodate the multidisciplinary requirements of environmental research and study:

The All-University Council on Environmental Quality examines existing University programs in environmental matters, explores needs, and suggests possible new or revised programs. The Council compiles and distributes a comprehensive course bulletin on environmentally related courses and programs.

The Center for Studies of the Physical Environment coordinates environmental concerns of the Institute of Technology. It sponsors the Environmental Intern Program, among others, which allows undergraduate students to work with state and local agencies.

MPIRG, the *Minnesota Public Interest Research Group*, is a student funded, environmentally oriented, organization representing the concerns of Minnesota college students.

Two specialized environmental groups are the *Limnological Research Center* which carries out research on the various aspects of lakes, and the *Water Resources Research Center*, which stimulates, coordinates, and does training for research.

The Environmental Health Research and Training Center brings together a multi- and interdisciplinary approach to environmental health problems, examining and evaluating environmental factors in relation to the health and well-being of man.

CURA, responsive to needs of the larger community, helps coordinate and stimulate projects in: housing, urban transportation, waste management, local government reorganization, and diffusion of information about these topics.

PROSPECTIVE ENERGY ALTERNATIVES

The Current Energy Crisis

That the world's heritage of fossilized fuels stored in the earth will be depleted within a foreseeable period of time has been recognized and well documented for more than a quarter century. The United States is the principal consumer of energy in the world. With only 6% of the world's population, we use about 35% of all the world's energy each year.

Much of our fuel supply has been oil which is becoming in short supply within our own boundaries. In 1970, 25% of the U.S. oil needs were imported; at that time it was projected that in 1975 this would be 42%, in 1980, 55%, and in 1985, 67%. The discovery by the Middle East nations that their oil is a powerful economic and political weapon has resulted in escalation of the price. Thus, the expected thirty billion dollar cash outflow for oil projected for the United States in 1985 elevates to nearly a hundred billion dollars. Such a negative balance of payments would be completely disruptive to the United States economy and would be felt throughout our entire economic, industrial, political and social systems. The current crisis is not one of currently available oil but rather one of distribution and high cost.

The United States is better off than most of the world, other than the Middle East, insofar as available fossil fuels is concerned. However, our massive consumption of energy in this country means that to maintain our present social and economic life styles we must search for alternate sources of energy. The escalated price of foreign oil will make it profitable to open up abandoned oil fields in this country, explore shale oil, Athabaska tar sands and coal gasification, which in the past were regarded as economically noncompetitive.

There are also alternate sources of energy which we must attempt to exploit, but the lead time for their development is probably sufficiently long so that we must "buy" twenty-five years or so through the use of our current resources, including nuclear power and our massive reserves of coal.

Solar Energy

The sun is the principal source of all energy available on earth. All water power and all wind power are derived from solar radiation; all coal, oil, gas and other fossil fuels stored in the earth are but the collective heritage of billions of years of plant growth, small portions of which have become fossilized. The only other major energy sources which we have which are not solar derived, are nuclear energy, geothermal energy and tidal energy.

One of the important engineering and ecological challenges of our times is whether or not the mass harnessing of solar energy through technological developments is a practical possibility or an engineer's illusive pot-of-gold at the end of a rainbow. Attempts are not new, some of the first recorded solar experiments occurred in 1615, in France, about the same time the pilgrims were landing at Plymouth Rock.

Radiation which pierces the protective atmosphere around the earth contains some 32,000 times as much energy in a year as the entire human race consumes during that year. Of this energy, approximately 30% is reflected, about 40% absorbed by the atmosphere, the land and oceans and about 25% is used in evaporation of moisture, convection, precipitation and water recirculation. Only a minute part, 0.2%, is used in photosynthesis and results in our forests, grass, gardens, trees and crops.

Harnessing of solar energy has great potential, but there are several inherent technical problems. The energy is extremely diffused so that large, relatively expensive, collection areas are necessary. It is available only intermittently both because of the diurnal variations of the sun and because of cloud patterns. It is also capital intensive in first cost of the collection equipment needed.

Current Status of Solar Energy Conversion

The sudden escalation in the cost of fossil fuels has given new life to the possibilities of solar power utilization. We will consider separately the relatively high temperature collection of solar energy for utilization in the generation of power and low temperature collection of solar energy for its utilization in space heating.

One of the most advanced solar power research projects in the country is funded through the National Science Foundation's Research Applied to National Needs program. It is contracted to the Mechanical Engineering Department at the University of Minnesota. A sizeable portion of this work is subcontracted to Honeywell, Inc.

The basic system under study on the Minnesota project consists of a concentrator (trough-shaped parabolic mirror) which directs the incident solar radiation onto the surface of an absorber (heat pipe) located at the focal line of the mirror. This pipe is surrounded by a glass tube and the space inside the tube may be evacuated to reduce heat losses. The fluid in the heat pipe transports the collected energy to a heat exchanger located at one end of the collector. This heat exchanger may or may not be combined with a local storage unit. With this system a 1000 megawatt station would involve 500,000 collector units each forty feet in length spread over an area twelve miles by twelve miles. The collected solar energy would be used to generate steam which, in turn, would drive turbines for the generation of electric power. The system now under study represents current technology and is not to be construed as a final design. Rather it provides baselines from which system trade-offs and component research can be extended further.

Another system under study elsewhere involves the deployment in space of synchronous satellites which would remain stationary over the area to which power is to be supplied. Since this system would be beyond the earth's atmosphere and clouds, it would have a six to fifteen times advantage in the amount of solar energy available. However, deployment of such a system in space is not yet feasible.

Insofar as large scale generation of electrical energy from solar energy is concerned, the best predictions place its feasibility in about the year 1990 to 2000. It must be recognized that even for power systems such as coal or nuclear, where all of the technological problems have already been solved, time needed for constructing and placing the system in operation is between eight and twelve years. In those cases where many technological problems still remain, the required time must be multiplied by about three, even where the system feasibility is eventually proven.

Solar Heating

The time scale for utilization of solar energy for space heating is vastly shorter since most of the technological problems have been solved. Probably up to fifty solar heated houses have been constructed and are in use but there are practically no standardized designs nor mass produced components. Each system has been individually engineered and when capital costs are considered they have not been competitive with other heating systems.

Approximately 25% of the total energy needs of the country are spent in space heating and cooling and it is here that solar energy can conceivably have its greatest immediate impact. Within the next five years, there will undoubtedly be a number of different types of solar collectors marketed for integration into residential heating systems. Most of these, however, will supply only a portion of the heat needed. For a 1,500 square foot house, the equipment required for collection and integration of solar heating into the house may run as high as $8,000 beyond the cost of the distribution and standby heating system. The energy collected will be free, but the carrying costs of the $8,000 of capital equipment will not, nor will the maintenance of the system. Further, it will be much more difficult to retrofit such systems to existing houses.

A start is now being made and the eventual mass production of solar collectors may reduce the capital costs of the equipment. During the next few years a host of experiments will be conducted on solar space heating and a wide variety of solar collectors will be marketed.

Synthetic Fuels

Among other alternative sources of energy, of most immediate use may be the development of synthetic fuels such as methanol, hydrazine, methane, and ethanol. Methanol provides a particularly attractive alternate to gasoline and its partial use would release crude oil for other applications.

France was partially on a methanol fuel economy during the past century, and during World War I and II both Germany and France used methanol to supplement their gasoline supplies. In the United States, methanol is now produced in an amount equivalent to one percent of the amount of gasoline produced. It appears quite possible that we could substitute methanol, in the extent of about 10 to 15 percent, for gasoline without modification of our automobile and other internal combustion engines. The octane rating of methanol is higher than that for gasoline and it appears that probably the only thing necessary is an expansion of the production facilities for such methyl fuels. The cost is not certain, but it may well be less than that of the cost of imported petroleum.

We are now entering an era of technological change which has the possibility of social impacts greater than the Industrial Revolution. During the past we have developed science and technology within a philosophy of subduing and consuming our natural resources, including energy. In the future, the accent must be on replenishing and conserving our resources. This can be done, but only with major variations in our economic and social structure.

OUROBOROS: LOW ENERGY MODERN HOUSING

Architecture, embracing the entire built environment, is directly responsible for over a third of all energy use in the U.S. Architects and environmental designers have therefore begun to assume a responsibility for the reorganization and modification of land-use patterns, and to produce buildings which are, environmentally, less costly.

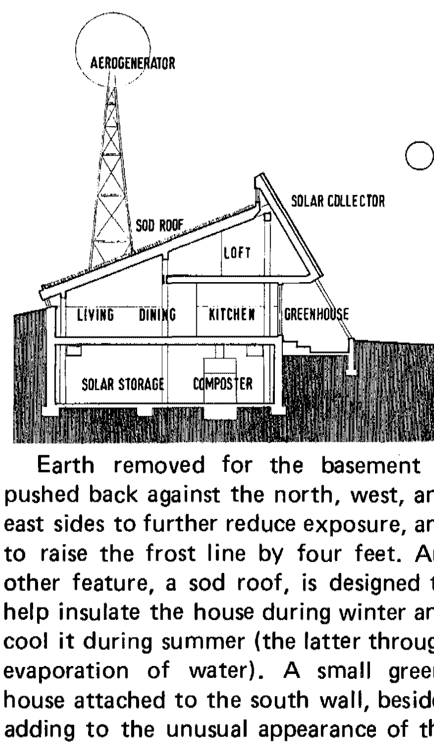
During the past year, 150 students in the Environmental Design class of the school of Architecture and Landscape Architecture of the University of Minnesota have been studying architecture's role in energy conservation through the research, design, and construction of a full-scale working experimental dwelling. The 2,000 square foot, two-level house incorporates energy conserving design features, such as increased wall and window insulation, solar water and space heating, a windmill to generate electricity, and sewage and water recycling.

The Environmental Design class project is named OUROBOROS after the mythological dragon that survives by consuming its own tail — a symbol for resource recycling and energy conservation in our finite world.

Project Ouroboros began last winter when the students were assigned the task of designing and building an experimental energy conserving house. The students first studied energy conservation, alternative low-impact energy systems and construction techniques. With this research as a design program, they then participated in a design competition.

Final plans for the house are a synthesis of many ideas submitted in the competition and advice from the faculty, teaching assistants, and students in the Engineering Design Studio of the Department of Mechanical Engineering.

The house is a trapezoid in plan with the largest wall facing south, maximizing collection of the sun's energy in the windows and solar flat plate collector. The side walls taper back to a small northern wall to reduce heat gain in summer and heat loss in winter.



Earth removed for the basement is pushed back against the north, west, and east sides to further reduce exposure, and to raise the frost line by four feet. Another feature, a sod roof, is designed to help insulate the house during winter and cool it during summer (the latter through evaporation of water). A small greenhouse attached to the south wall, besides adding to the unusual appearance of the house, will also provide food for the residents.

Energy conserving mechanical components of the house, which were designed in part by University engineering students, will include solar water and space heating systems.

The south-facing roof of the house incorporates a 700 square foot "Thomason" flat plate solar collector. Essentially, two sheets of glass cover a sheet of corrugated galvanized steel into which water is dripping. As the water washes down the metal pan, heat is absorbed raising the temperature 20 degrees F. Water is then drained to the basement storage tanks which are surrounded by crushed rock. Air pulled through the rock by a conventional forced air system is heated by radiation and then supplied to the rooms above.

A unique wind generator that is being built next to the house is theoretically expected to produce all of the power required. Designed by one of the students, Allen Sondak, the wind generator will use a two-blade high-speed propeller 15 feet in diameter. Excess energy produced will be first stored in long-lived batteries in the basement, with resistance heating coils in the hot water storage tank soaking up any additional excess energy produced. The house also has standard electrical service, but it is hoped that use of this service can be minimized or eliminated.

The dining and living areas are separated by moveable panels, and a loft provides space for sleeping. The only room enclosed by walls is the bathroom, which contains a high-pressure mist shower to conserve water and a Japanese style bath tub (reconverted from a large cedar beer barrel).

Though it stresses energy conservation, Project Ouroboros also seeks to conserve water and recycle wastes. Thus, the house includes a composting toilet that uses bacteria to break wastes down into fertilizer for use in gardens and the greenhouse. This system, known as the clivus multrum, has been used extensively in Sweden.

Construction of the house at the University Research Station at Rosemount began last spring and is expected to be completed by this winter. Money and materials have been donated by local governmental agencies and a variety of businesses. Funds to complete the first phase of the project are still being sought. The students of the School of Architecture and Landscape Architecture and the Dakota County Vocational Technical School have provided all of the labor.

Once the basic construction is completed, intensive research will determine the success of the energy conservation systems and ideas used in the project. The students will then have the opportunity to refine them or try new ones.

Thus far Ouroboros has been focusing on the application and integration of low-impact alternative energy systems into the building skin of new construction; but as the energy shortage in this country becomes more pressing, the necessity to investigate methods of sustaining the existing buildings we inhabit becomes increasingly important. The next phases of

Ouroboros will center on existing inner urban dwellings in St. Paul and Minneapolis, where we will investigate the extent to which typical existing houses can be energy-conserving and self-sufficient, and at what cost. Areas of study will include:

- new applications of solar collectors to south-facing roofs,
- application of aerobic composting toilets in conjunction with 'victory' gardens,
- new methods of reinsulating, 'winterizing' and 'cocooning' older structures,
- landscaping techniques employing ground cover, vines, sod roofs, and shrubs to reduce summer and winter exposure,
- reduction of space standards within dwellings without sacrificing comfort and privacy,
- application of neighborhood wind electricity generation grids combined with centralized cooperative neighborhood laundry, workshop, and maintenance facilities,
- application of heat pumps in conjunction with solar collectors.

Of special interest is the problem of the narrow unused spaces between houses which typically results in upwards of 40% of the house heating loss. Filling and enclosing this space with new house units, greenhouses, side porches, and terraces (constructed with recycled building materials) could result in significant energy savings. Enclosed central neighborhood gardens and play spaces for young children could be created by filling in the spaces between the houses of an entire block. These thoughts about wise energy use in the neighborhood are also an alternative to urban alienation.

Project Ouroboros recognizes that architecture and urban planning exert a major influence on energy use in the United States. The project serves not only the students in an action-oriented learning experience, but also the public-at-large, who will be able to *experience* concrete examples of architectural alternatives and supporting life style changes which we must be prepared to face in our lifetime.

TO THE CONSUMER . . . from the Extension Service

The University of Minnesota Agricultural Extension Service is shifting its educational programs to help people adjust to the problems caused by the fuel shortage. Much of the program emphasis in the past included wise use of inputs for urban and rural family living and agricultural production for economic reasons – getting the most value for time, energy, and other inputs invested. The recent energy crisis with its higher energy costs have caused the Extension staff to focus more sharply on the conservation of energy inputs for the public good as well as for economic reasons.

An ENERGY newsletter is being published twice a month. Its purpose is to present current information about the energy situation and to convey suggestions to help the Extension staff adjust to the changes the situation influences. The intent is to help meet educational needs that develop as a result of the energy supply situation. Printed information is available or being prepared by Extension specialists at this time. "Home Heating in an Emergency" and other publications for living with the energy crisis are available at 90 Coffey Hall in St. Paul and at county agent offices throughout the state.

The metropolitan area county agents of the Extension Service are located at 476 Federal Building, 110 S. 4th St. in Minneapolis and at 2020 White Bear Ave. in St. Paul.

Publications include information on: closing homes during freezing weather, energy requirements of electrical equipment, energy use of food preparation and storage appliances, energy considerations of lighting, home insulation, humidity control, heating system management, heating value of wood species, and home energy conservation.

Extension Director Roland Abraham appointed an ad hoc committee during September, 1973, to consider Extension concerns and responsibilities with respect to the impending energy crisis. The committee's report was distributed in November. It focuses on energy implications for agriculture, family living and communities. Program directors, specialists and county extension agents then met and prepared program recommendations and priorities for action. Selected for immediate action were: home heating, winter livestock production, and spring and summer field operations. Other immediate concerns are personal and agricultural transportation, timber operations, household equipment, textiles and clothing, petrochemicals, and business and industry adjustments. Long-run concerns are accurate energy situation information, adjusting life styles, energy policy, economics of energy conservation in agriculture and housing planning and construction.

ADDRESS CORRECTION REQUESTED

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