



## **The Cover Story:**

The statue of the Nebraska Sower, which graces the top of the State Capitol, is a symbol of the state's basic industry—agriculture. Using the word energy to form a silhouette of the Nebraska Sower depicts the continuing need for energy to fuel the state's agricultural economy.

CHARLES THONE  
GOVERNOR



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V.B. BALOK  
DIRECTOR

December 31, 1981

The Honorable Charles Thone  
Governor of Nebraska  
State House  
Lincoln, Nebraska 68509

Patrick J. O'Donnell  
Clerk of the Legislature  
Room 2018 State Capitol  
Lincoln, Nebraska 68509

Dear Governor Thone and Clerk O'Donnell:

This 1981 annual report is submitted in accordance with provisions of Section 81-1607, Nebraska Revised Statutes, (1980 Supplement).

If you have any questions, please contact this office.

Sincerely,

A handwritten signature in cursive script that reads "V. B. Balok".

V. B. Balok  
Director

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# Introduction

ENERGY. It is a continuing topic of concern with most Nebraskans. We hear about it daily in the news, it often invades our conversations and it certainly affects our pocketbooks.

The two primary concerns regarding energy are availability and cost. This, of course, is true of most other commodities we use. However, energy costs seem to cause more impact, or at least to generate more discussion, than other cost increases.

Set out as the top priority in the new Nebraska Energy Office Management Plan, petroleum/alcohol fuels continued to get serious attention during 1981 from the Nebraska Energy Office. This emphasis will continue in 1982.

However, there still are many energy problems, both political and economic, to overcome. Attempts to address some of them are outlined in this report.

Nebraska is in a particularly vulnerable energy position. Approximately 90 percent of the energy consumed in our state must be imported from other states or nations. This includes petroleum to fuel our cars, natural gas for our homes and the coal used to power electric generating plants.

Nebraskans are now paying some \$2.5 billion yearly in total energy costs and the state's annual petroleum products' bill alone, excluding fertilizer, is \$1.6 billion a year. That means rising prices tied to unpredictable foreign producers.

Nebraska is an agricultural state, which compounds the problem. In agriculture, as in all areas, energy costs are a growing percentage of total operating costs. Energy expenditures for agriculture amounted to \$331 million in 1980, or 13 percent of the total Nebraska energy outlay. An example is provided by the 1981 irrigated corn crop, for which energy costs amounted to approximately 15 percent of total production costs. This is up from 9.5 percent in 1975.

No energy problem will be more challenging in the next 20 years than breaking Nebraska's oil dependency.

In 1981, Nebraskans continued their voluntary efforts to conserve energy by reducing their gasoline consumption by 6.1 percent.

The comprehensive programs and projects outlined in our annual report are primarily designed to "show and tell" how to save energy and reduce energy costs. The charge to assure availability is considerably more difficult. In Nebraska, 95% of our liquid energy supplies is imported and some 29% of this supply is imported from foreign sources.

We will continue to research and experiment to find viable alternatives to petroleum and more effective uses. Study areas include biomass assessment, wind assessment, low head hydroelectric, and an alternate fuels rally.

Other energy sources presently are in reasonable supply with no shortfall expected.

The Nebraska Energy Office programs outlined in this annual report have helped Nebraskans, institutions and others reduce energy consumption.

These include voluntary energy conservation, weatherization, energy education, energy emergency planning, transportation and public service and information campaigns.

The Nebraska Energy Coordinating Committee, formed by Governor Thone for better overall state energy policy coordination, met regularly in 1981 to improve the agencies' activities in energy planning.

This report not only highlights the present programs aimed toward assuring a more secure energy future, but also sets out future priorities to increase energy efficiency in our homes, businesses and government. It deserves your careful reading and review.

# Management Plan

The Nebraska Energy Office (NEO) completed a detailed management plan in 1981. Significant energy resources were assigned management priorities based on potential supply shortfall or disruption and subsequent economic impact in Nebraska.

The top priority was assigned to petroleum/alcohol fuels, followed closely by natural gas, electricity and alternate resources. A complete evaluation of the NEO by the director and administrative staff was accomplished in conjunction with the drafting of the management plan. This resulted in not only the identification of priorities among resources, but also the establishment of sub-categories within each resource category.

The state-oriented energy management plan contains a policy statement, which follows:

"The Nebraska Energy Office is to assist in meeting the challenges placed before Nebraskans by the state's vulnerable energy supply; and, to ensure to the greatest extent possible viable, options for an energy secure future."

The plan is based on federal and state legislation, directives from the Governor, and public input. It contains an outline of existing and planned program activities to direct office staff in meeting the energy needs of Nebraskans.

"The petroleum supply for Nebraska is vulnerable," the plan reads. "Energy office programs will continue to assist and encourage Nebraskans to decrease consumption."

Encouragement for the development of indigenous alternate fuel resources to reduce petroleum dependence also is emphasized.

Areas of NEO concern under the petroleum/alcohol category are gasoline, diesel fuel, heating oils, Nebraska crude oil, ethanol, blended fuels (Gasohol), and methanol. A major objective of the plan is increasing the conservation of gasoline and diesel fuel.

Data collection, analysis and emergency planning are significant elements of the major priorities set by the management plan. The plan calls for NEO policy, priorities and program activities to be determined primarily by energy needs in the state. Also included, however, are federal and state legislation, timeliness of energy issues, personnel and funding.

Identified by the plan are consumption, supply, demand and production of each priority resource. Planned activities to meet needs are identified within each resource category.

The primary objectives in the natural gas category are to encourage efficient use, reduced consumption and dependable delivery in the state.

The plan's goals in electricity include safe and efficient use of electric power and NEO assistance for publicly-owned utilities in providing adequate power supplies for Nebraska consumers.

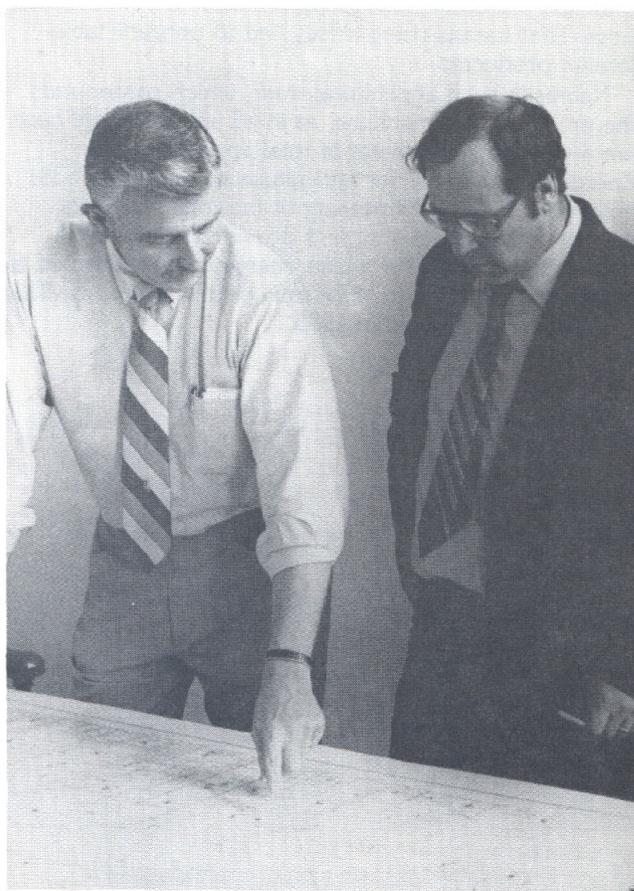
Alternate energy objectives are identified as to the development, production and use of various alternate

resources, primarily through NEO encouragement within the private sector. Methods include assessment, research, public information and education activities. Alternates are identified as passive and active solar, wind, geothermal, wood and waste products.

More NEO emphasis should be placed on staffing and programming in petroleum/alcohol and agriculture, according to the plan. This was addressed in 1981 by adding an agriculture and fuels specialist to the staff to coordinate research and development, data collection and assessment, along with program development in the area of agriculture and petroleum/alcohol fuels.

Another project involving the combination of agriculture and the petroleum/alcohol fuels situation was completion during 1981 of a study on biomass potential in Nebraska.

The management plan also contains historical perspective regarding NEO personnel and projected staffing levels.



NEO Director V.B. "Buck" Balok (left) and Deputy Director Leo Scherer plan programs to promote energy efficiency in Nebraska.

# Getting The Word Out

The illusion of unlimited low-cost energy has faded like a mirage in the desert. In the past decade, the energy crunch left its imprint on the United States and Nebraska.

Vehicle lines at gasoline service stations in the early 1970s let everyone know the days of plentiful, low cost energy were over. The lines gave way to dramatically increased prices for motor fuels. Utility bills increased because of rising energy costs, market pressures and deregulation. The cost of doing virtually any kind of business zoomed between 1970 and 1980 as a result of skyrocketing inflation fueled by increased energy bills.

Despite these hard and costly realities, habits have proven difficult to break. Where the most visible costs in energy and dollars are apparent, citizens have responded to form new and efficient energy behavior patterns. The total story on energy savings, however, has yet to be told to the point of full assimilation.

There are hidden or veiled ways in which energy losses mount up, which means there remain hidden and veiled financial costs. There are different methods of doing things in the energy field, which would mean savings of both energy and money. There are time-tested ways to save energy that are well known, but which have yet to be fully used.

In some cases, changing ingrained habits requires a generation or more. The information distribution effort of the Nebraska Energy Office (NEO) and others must continue to make certain the word gets out. Without such a continuing push, the future will invade the present too quickly for reasonable adjustments aimed at lessening the impact of energy problems.

This section of the NEO annual report for 1981 deals primarily with informational aspects, though the programs involved are designed to save energy. This coordinated approach provides immediate energy-saving benefits and fosters long-term awareness of energy efficient procedures.

## Conservation

Voluntary efforts by Nebraskans again have succeeded in cutting energy consumption, which is a continuing goal of the Nebraska Energy Office (NEO).

State residents cut gasoline consumption in 1981 by 6.1 percent based on data projections. Shaving the percentage use of gasoline in 1981 is considered impressive because it came on the heels of a 1980 decrease of 10.8 percent and a 1979 cut of 5 percent.

Data from the NEO shows the state's highest point in gasoline consumption was reached in 1978, when more than 951 million gallons were used.

In 1979, consumption dropped to 903 million gallons and in 1980 the level was cut dramatically to 808 million gallons. The projected figure for 1981 of approximately 760 million gallons continues Nebraska's excellence in conservation.

This record of decreasing gasoline consumption, though a major part of the state's conservation effort, is but one facet of the bid by the state administration and the NEO to curtail waste in energy use.

A broad range of energy conservation programs during the year promoted efficient use of all fuel resources by eliminating waste and curbing consumption. The NEO maintained its central role in this statewide effort to stretch available energy supplies.

Revised data covering 1980 showed Nebraskans used 540.1 trillion British thermal units (Btus) of energy. For 1981, the preliminary use figure was 523.1 trillion Btus. More detail on this conservation record is provided later in this annual report, on page 42, 43, & 45.

## Survey Results

The NEO has found that Nebraskans prefer conservation home improvements to monitoring temperature settings. The Bureau of Sociological Research at the University of Nebraska-Lincoln, in a telephone poll of 1,890 adults, determined that respondents in the Nebraska Annual Social Indicators Survey preferred paying for such improvements to allowing home temperatures to range above the comfort zone in summer or below it in winter.

Certain dwelling-oriented principles seem well accepted. The survey revealed a dramatic increase in adding attic insulation, wall insulation and storm windows in comparison with a similar poll in early 1980. Insulating, among the survey respondents, was 10.7 percent higher in the 1981 sampling.

These energy-saving techniques were stressed by the private sector and the NEO throughout 1981, as they were in previous years. The residential conservation theme was targeted for special emphasis during the 1981 "March Is Energy Conservation Month" campaign. The survey, however, was taken early in the year and doesn't reflect residential conservation techniques that may have been spurred by the month-long campaign.

The same survey determined for the NEO that (1) full-sized cars were owned by 63 percent of the respondents; (2) nearly 46 percent of those surveyed owned pickups or vans; (3) 30 percent had mid-sized automobiles; (4) compact cars accounted for 21 percent of the vehicles owned by respondents; and (5) sub-compacts were owned by less than 10 percent of the Nebraskans surveyed.

As cited in more detail in the transportation section, there was a 9.1 percent improvement in vehicle miles per gallon last year in Nebraska. A Nebraska Department of Roads survey, however, indicates there are further gains possible in petroleum conservation for Nebraskans as they continue switching to smaller and more fuel-efficient vehicles.

Renovation of homes for energy efficiency and

conversion to vehicles that use less gasoline or gasohol provide examples of increasingly realistic attitudes of Nebraskans regarding energy. Other examples were cited in a mid-year analysis from the NEO:

"Nebraskans are requesting information on (1) alternatives to traditional fuels; (2) improved technology to make more than a single use of an energy source; and, (3) re-examining neglected energy systems that now appear to be effective once more. Examples of these interests are the sharp rise in the use of passive solar principles and wood burning; the rapid acceptance of new heat recovery and waste utilization technologies, and renewed study of the energy to be obtained from wind and water."

The NEO conservation effort in 1981 brought to a close five major federally-funded activities. Agricultural, utility, solid waste and reclaimed oil projects, and emergency planning activities were all phased out at the NEO and shifted to other agencies or independent status. Coordination of energy audit work and a federally-directed information program also ended for the NEO with the advent of 1982. Services tailored for Nebraska needs will replace the formal grant activities in each of those cases.

Loss of those programs and continuing pressure for weatherization, lowering of fuels consumption and enhancing use of alternate energy sources signal the need for even greater NEO outreach efforts in 1982.

Late 1981 action at the federal level appeared to insure continuation of the Weatherization program for low income persons, but funding was decreased from the level in previous years. Increasing weatherization costs will further curtail the program's effectiveness. These facts, coupled with a drop in the same activity noted by most surveys of the private sector, show that the message about weatherization must still be emphasized.

In liquid fuels consumption, not only is the conversion to more fuel efficient vehicles needed, but more attention is required regarding maintenance. Vehicle efficiency tests performed by the NEO under

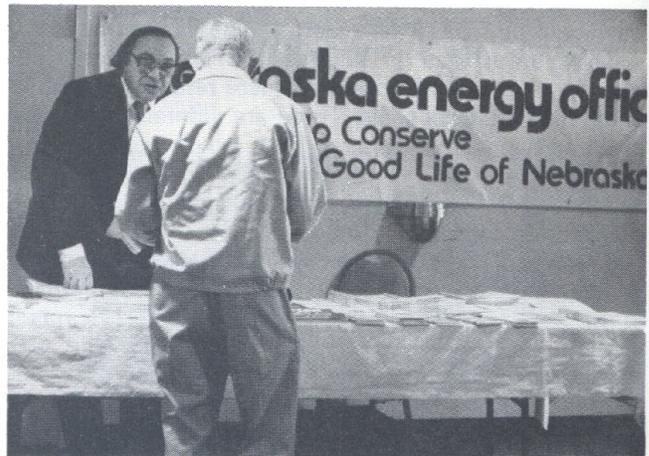
the Energy Extension Service show that most vehicles do not receive the regular maintenance that saves money and extends the life of automobiles.

An encouraging development in 1981 was the interest shown by municipalities in creating their own energy committees to identify local issues, problems and solutions. The NEO and legislative personnel have supported such work.

The 1981 theme calling on Nebraskans to "do it yourself and save money" in energy matters will continue in 1982. This theme is being sounded by the NEO, the Cooperative Extension Service, utilities and private industry.

The "March is Energy Conservation Month" theme for 1982 will be "Alternates Boost Conservation" to emphasize passive solar and earth-sheltered construction, active solar domestic water systems, wind, biomass, insulation, and efficiency in existing structures.

The gasoline conservation cited in this part of the report is detailed in table A.



NEO Conservation Division Chief Larry Riegel (left) discusses publications with a Nebraskan at the NEO display table set up for the County Officials Association meeting.

**Table A Gasoline Available for Sale in Nebraska\* (Metered Thousands of Gallons)**

	1977	1978	1979	1980	1981	Percent of Previous Year
January	69,334	69,166	69,602	63,763	60,917	95.5%
February	62,501	63,227	69,367	59,381	51,125	86.1
March	70,780	75,162	73,397	63,151	56,159	88.9
April	77,085	74,597	72,399	65,318	61,498	94.2
May	79,039	84,422	77,631	72,440	65,223	90.0
June	86,543	86,165	75,955	65,801	67,534	102.6
July	92,844	88,253	80,054	73,498	71,496	97.3
August	82,343	89,733	82,473	72,201	68,396	94.7
September	79,853	79,202	72,609	79,754	65,106	81.6
October	82,107	86,061	78,565	65,140	70,390	108.1
November	76,506	78,351	76,555	60,261	57,314	95.1
December	75,453	76,887	74,824	68,169		
<b>TOTAL</b>	<b>934,388</b>	<b>951,226</b>	<b>903,431</b>	<b>808,877</b>	<b>695,158</b>	<b>93.9%</b>

The last three months are preliminary.

\*Gross imports into the state minus exports out of the State.  
Source: Department of Revenue Tax Form 81

January 5, 1982  
NEBRASKA ENERGY OFFICE

# Transportation

The Nebraska gasoline consumption record in 1981 was significant, especially when combined with actual miles traveled.

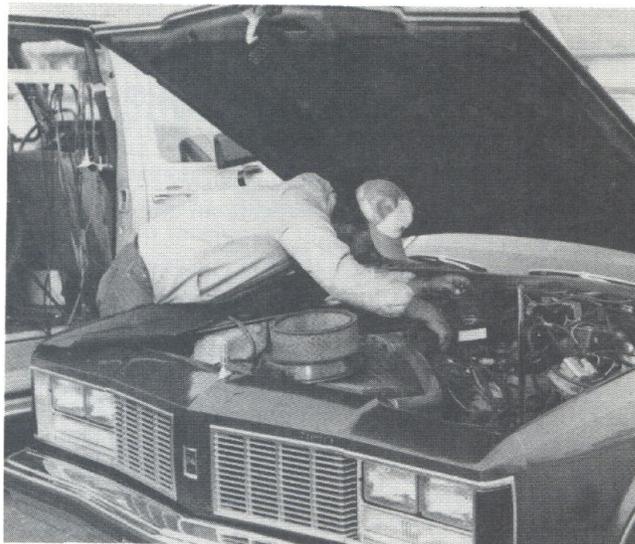
The Nebraska Department of Roads Planning Division indicates that during the first 11 months of 1981 there was a 2.8 percent increase in vehicle miles of travel statewide. During the same period, decreases in use of highway transportation fuels (gasoline, gasohol and special fuels for highway use) amounted to 5.8 percent. For gasoline alone, the 1981 drop was 6.1 percent based on projections.

Comparing miles traveled with gallonage used results in a 9.1 percent improvement in miles per gallon during the year. This improvement is the result of various factors: increased efficiency, more small cars, improved driving techniques, ride-sharing and, to some extent, the transportation programs of the Nebraska Energy Office (NEO).

The Driver Energy Conservation Awareness Training (DECAT) program continues to draw interest and contribute to the state's declining rate of petroleum products usage.

During the 1981 DECAT program, the NEO:

- Developed support literature for DECAT. This literature is not only available to the public, but also was selected for use as an example at the DECAT Training Office in Mercury, Nevada.
  - Trained 37 new DECAT instructors. These included representatives from state colleges, universities and high schools; city and county offices, including the Omaha and Lincoln police departments; the State Department of Education and the State Department of Roads, and quasi-governmental or private concerns.
  - Held DECAT workshops statewide that resulted in training for more than 100 persons.
  - Provided DECAT instruction and vacuum gauges for staff members at the Department of Aeronautics, each of whom average approximately 15,000 miles of driving per year.
  - Provided the Department of Education with two sets of gauges and received a commitment to offer DECAT instruction to classes in driver's education.
- Other 1981 transportation activities included:
- Development of a new brochure called "Making Tracks . . . And Saving Money." It replaces the MPG Kit formerly used in 1979 and 1980.
  - Completed the public transit education pilot project funded by the NEO and developed by the Lincoln Public School System and the Lincoln Transportation System. The project was implemented in Lincoln and demonstrated to officials of the Omaha and Topeka, Kansas, carpool and transit programs.
  - Augmented the activities of the Ga\$ Saver program under the NEO's Energy Extension Service.
  - Advised and worked with state government's Public Transportation Coordination Committee, the Federal Highway Administration, the Papio Natural Resource District, and numerous organizations sponsoring energy fairs.



*NEO Ga\$ Saver team member checks automobile for energy efficiency to determine tune-up recommendations aimed at better gasoline mileage.*

## Energy Education

Energy education will play a crucial role in long term efforts to move toward energy self-sufficiency. A strong commitment to energy education by the Nebraska Energy Office (NEO) is one means of providing students in the state with information they will need to make future energy decisions.

This policy commitment of the NEO is shared by educators in Nebraska, as evidenced by cooperation at various levels. While working to provide a comprehensive statewide program in energy education, the NEO requested and received support from the University of Nebraska, the Nebraska State Department of Education, the State and community college systems, and public and private elementary and secondary schools.

Accomplishments in energy education for 1981 are described in the following sections.

### Elementary Education

The curriculum project covering kindergarten through sixth grade, called **Energy Conservation Activity Packets (ECAP)**, received statewide evaluation in March, 1981. Preliminary analysis of this evaluation indicated lack of awareness that energy curricula for elementary teachers existed. Teachers using the materials, however, generally were satisfied. Several measures were undertaken to alleviate the lack of awareness:

- Workshops were held for practicing elementary teachers at Wayne State College and the University of Nebraska.
- Workshops were held for elementary student teachers at the University of Nebraska, Kearney State College, and Nebraska Wesleyan University.
- In conjunction with a Mid-America Solar Energy Complex grant, five Nebraska educators were trained as solar energy educators. These educators distributed

curriculum materials and resources to 200 elementary teachers throughout the state.

- Six additional workshops were presented to regional elementary teachers in the Broken Bow, Holdrege, Lincoln, Norfolk, Scottsbluff, and Weeping Water areas.

During 1980, federal funding was awarded to the Omaha Children's Museum to create an energy exhibit for elementary students. Design and construction were completed in September, 1981. This exhibit invites children into a working relationship with energy. The activities are designed to help each child focus on his or her own body energy for use in converting one form of energy to another. Surrounding the exhibit are graphics showing the cultural evolution of humanity, growth and development of energy consumption, alternative sources of energy for the future and suggestions for conservation.

## Secondary Education

The secondary science and social studies curriculum project covers grades seven through 12 and is called **Basic Teaching Units on Energy (BTU)**. It received statewide evaluation in March, 1981. A greater percentage of teachers were aware of the 30-unit curriculum project, compared with the project for lower grades. Teachers, however, were slightly less satisfied with the BTU project than with the Energy Conservation Activity Packets curriculum.

- An intensive revision program was initiated to upgrade the most popular units based on results of the evaluation. Of the original 30 units, ten to 12 will be reproduced as individual instructional units. The remaining units will continue to be available in the original format.

- Multiple workshops were conducted to introduce energy curriculum materials as well as to solicit revision suggestions.

- Media supplements have been developed for the topics of nuclear, coal and general energy concerns.

## Driver Education

The NEO consolidated its driver education efforts into two projects for 1981. The first provided driving simulation equipment at Educational Service Unit #10 (Kearney). Simulation driving reduces by half both the time students spend in "behind the wheel" driving and the school's fuel and maintenance costs. The second project, "Driver Energy Conservation Awareness Training" (DECAT), is a service provided to driver education instructors, fleet operators, and the general public. It demonstrates that money and fuel can be saved through improvements in driving technique, trip planning, vehicle maintenance, and purchase decision-making. For a more complete description of DECAT, see the transportation section.

## Industrial Arts Education

Industrial arts is taught at the secondary, post-secondary and adult education levels. Inter-agency and intra-agency cooperation were necessary for development of these energy education courses.

A non-credit home weatherization course continues to be offered in the six community college areas, at the University of Nebraska-Lincoln and in many secondary school industrial arts classes. This project is a cooperative venture of the NEO, the University of Nebraska-Lincoln Division of Continuing Studies, and the community colleges.

The "Russian Fireplace Demonstration Project" was initiated to provide builders, contractors, home owners, and industrial arts instructors with information concerning high efficiency (90 percent plus) masonry structures as alternatives to traditional fireplace designs. The NEO, in cooperation with Southeast Community College (Beatrice), offered a series of workshops providing details on construction techniques, aesthetic designs, benefits, and problems associated with the European woodburning furnace, also known as the "Russian Fireplace." Accompanying literature is being developed to inform the general public of this concept.



*Linn Sunderland, building technology instructor at Southeast Community College (Beatrice), fires up the energy efficient masonry fireplace built during the "Russian" fireplace demonstration project.*

## Home Economics

The Nebraska Home Economics Energy Management Guide was introduced at the State Vocational Education Conference at Kearney in August, 1981. The guide is designed to aid all teachers, junior high school through the adult education level. It attempts to incorporate energy awareness and management techniques into existing home economics curricula.

The 25 lesson, loose-leaf format includes background information, activities, ready-to-duplicate visuals, and additional resources in housing, foods, clothing and family living. In addition, the format is designed to provide educators the flexibility to keep the information updated.

## Postsecondary Education

The NEO and the Vocational Education Division of the Nebraska Department of Education developed three vocational/technical curriculum guides: *Energy Efficiency for Architectural Drafting Instructors*; *Energy Efficiency for Building Construction Technology*, and *Energy Efficiency for Electrical Technology*. These complement two previous curriculum guides on automotive technology and heating, ventilating, air-conditioning. The NEO thus has compiled a five-part curriculum series for vocational trade instructors.

The guides were written at curriculum development workshops and are presently being used at five community colleges to test their effectiveness. After an evaluation period, they will be revised and distributed statewide.

## Education Support Services

The "Energy and Environmental Simulator" is a computer decision-making game that allows participants to make judgments on the use of energy resources, environmental effects, energy and economic growth, and the quality of life. The two simulators, funded by the U.S. Department of Energy and the NEO, are located at Wayne State College and loaned out without charge. Simulator training workshops continue to be held for strategically located teachers and college professors across the state.

Inservice Teacher Training was provided during 1981 for all educational projects as part of the Nebraska Department of Education "Classroom Update" series, as well as for Nebraska State Education Association conferences and on an individual request basis.

The Mobile Alternative Energy Center was completed in August, 1981. The Center provides educators and students with technically sound, useful devices that demonstrate basic concepts of alternative energy sources, such as hydroelectric, active and passive solar, wind, and geothermal. The Center was piloted at Educational Service Unit #3, which serves suburban Omaha schools, and is now available to all educational service units throughout the state.

During 1981, the NEO continued to educate the general public about the need for energy conservation by participation in home shows, energy fairs, energy audit programs, teacher training institutes, utility displays, and at the 1981 Nebraska State Fair.

## Energy Extension Service

The Nebraska Energy Extension Service entered its second year of operation May 1, 1981, despite some reduction of activity to reflect cuts in federal funds.

Extension service programs operated by the Nebraska Energy Office (NEO) continued providing personalized information and technical assistance to small scale energy consumers despite the 1981-82 grant cycle reductions stemming from the federal cuts. Even though one program was eliminated and there was

some curtailment of activities in others, overall outreach goals were still realized.

The NEO extension service programs in 1981 were:

### Ga\$ Saver Van

The Ga\$ Saver Van is a mobile automobile diagnostic center equipped with a computer and printout machine. The van, operated by specially trained auto mechanics, travels throughout the state to offer free vehicle efficiency testing. During the year, more than 3,200 vehicles were tested at 115 locations.

In addition to private vehicles, testing was done for public fleets such as those operated by school districts and municipalities. The van also has visited technical community colleges in Nebraska to demonstrate the diagnostic equipment to auto mechanic students.

Automobile owners who have their vehicles tested under the program can expect to save from \$60 to \$220 worth of gasoline per vehicle if tuneups are done to correct problems identified in the tests.

### PUMP

The Pumping Unit Management Program—known as PUMP—is targeted for Nebraska farmers who irrigate. The purpose is to increase fuel efficiency of irrigation pumping plants throughout the state.

The University of Nebraska Cooperative Extension Service is under contract with the NEO to provide this program to Nebraska farmers. One facet of the program is demonstration. Two vans travel the state, giving demonstrations to farmers in irrigating counties. Approximately 1,400 persons attended 61 demonstrations in 1981 to learn about operating irrigation pumping plants efficiently.

The ultimate goal, however, is to have the private sector take over the program. Consequently, the PUMP team held four workshops in 1981 to train well drillers, engine sales personnel, pump personnel and private consultants to do pumping plant testing and adjustments. By the end of 1981, there were 22 firms capable of delivering the service, with each firm having several crews. More than 2,000 wells were tested and adjusted by these newly-trained groups from the private sector. Only four firms had been capable of delivering the same service in 1979.

Because the private sector charges for the service, farmers have asked if there is a simple way to determine if pumps require adjustments. Approximately 60 percent of the wells in the state need adjustment, so the NEO and the University of Nebraska-Lincoln Agricultural Engineering have developed a simplified estimated testing procedure. Seventeen testing kits were purchased and located throughout the state. County agents were trained in their use and arrangements were made to loan the kits to farmers. With a kit, a farmer can determine whether he needs professional assistance to adjust his pumping plant for maximum energy efficiency.

Due to the success of this Nebraska program, the U.S. Department of Energy Region VII office and the Western Area Power Administration provided the NEO with additional funds to assist in exporting this program to the states of Iowa, Missouri, Kansas, Colorado and Wyoming during 1982.



Workers assess progress during Pumping Unit Management Program (PUMP) demonstration in rural Nebraska.

## Conservation Recognition

Two separate programs provide recognition for outstanding energy conservation efforts in Nebraska. Businesses and industry are eligible for the E Flag program. Homeowners are eligible for the certificate program.

The E Flags are awarded businesses and industries that have done commendable jobs in energy conservation or alternate energy development. Nominations for the awards are made by knowledgeable citizens in the state. The NEO contacts each nominee to document information on specific conservation efforts and energy savings.

In 1981, these businesses and industries were E Flag recipients:

- |    |                               |                  |
|----|-------------------------------|------------------|
| 1  | Dutton Luinson Co.            | (Hastings)       |
| 2  | George A. Hormel & Company    | (Fremont)        |
| 3  | Goodyear Tire & Rubber Co.    | (Lincoln)        |
| 4  | Lincoln Plating Co.           | (Lincoln)        |
| 5  | Seal Rite Windows             | (Lincoln)        |
| 6  | Northwestern Bell Telephone   | (Omaha)          |
| 7  | Hinky Dinky                   | (Omaha)          |
| 8  | J.C. Penneys Westroads        | (Omaha)          |
| 9  | Union Pacific Railroad        | (Omaha)          |
| 10 | Allied Chemical               | (Omaha)          |
| 11 | Sperry Vickers                | (Omaha)          |
| 12 | Pacesetter Corporation        | (Omaha)          |
| 13 | Rockwell Manufacturing        | (Kearney)        |
| 14 | T. G. & Y. Store              | (O'Neill)        |
| 15 | St. Anthony's Hospital        | (O'Neill)        |
| 16 | City of South Sioux           | (So. Sioux City) |
| 17 | Walker Manufacturing          | (Seward)         |
| 18 | Beatrice Chamber of Commerce  | (Beatrice)       |
| 19 | Nebraska Aluminum Casting Co. | (Hastings)       |
| 20 | Fremont Mall                  | (Fremont)        |
| 21 | Beatrice Public Schools       | (Beatrice)       |
| 22 | Behlen Manufacturing          | (Columbus)       |
| 23 | Lynn & Al's Westside Store    | (Norfolk)        |
| 24 | Lou's Thriftway               | (Norfolk)        |

Through the Residential Recognition program, homeowners are recognized for energy efficiency in their homes. The program provides a self-certifying energy efficiency checklist to Nebraska homeowners. If a home meets weatherization and insulation criteria, the owner receives a certificate and seal that can be affixed to a door or window.

## Alternative Energy Projects

During 1981, three alternate energy projects were initiated as part of the Energy Extension Service.

For the past two years, the NEO has helped fund a research project at the University of Nebraska-Omaha (UNO). This research resulted in a new publication entitled *The Path to Passive Solar Energy*. The Nebraska-based passive solar energy document became the basis for a series of solar workshops. Designed for builders, architects and engineers, the first three workshops were held in November and December of 1981. The last three will be held in January and February of 1982.

Another alternate energy project is the statewide wind assessment being conducted jointly by the NEO, the Western Area Power Administration and the Nebraska Rural Electric Association. The result will be the first step in developing a comprehensive wind regime picture for Nebraska. Twenty anemometers were located at 20 sites throughout Nebraska. Local rural public power districts are cooperating by providing assistance in maintaining the various sites. All the anemometers were sited and began collecting data by the end of 1981.

The third component of this program is the Alternate Fuels Race Classic, for which energy extension is providing assistance in the proof of concept for an alcohol fueled vehicle.

## Solar Subdivision Program

The Solar Subdivision program, contracted to the Nebraska Solar Office, was completed in 1981.

The project assisted developers and builders in the design, layout and legal aspects of a solar subdivision. Four subdivisions were designed as a result of this project. However, because of high interest rates, only two homes actually were constructed during and for the project.

## Nebraska Energy News

The Nebraska Energy News, which is published every other month, provides Nebraska energy consumers with up-to-date information on various aspects of energy conservation and alternate energy. Approximately 11,000 individuals and organizations receive the letter at no cost.

Articles covering the gamut of energy fields are submitted from the NEO, other state agencies, and departments at the University of Nebraska. The program is contracted to the University of Nebraska-Lincoln College of Engineering.

## Easy On Energy

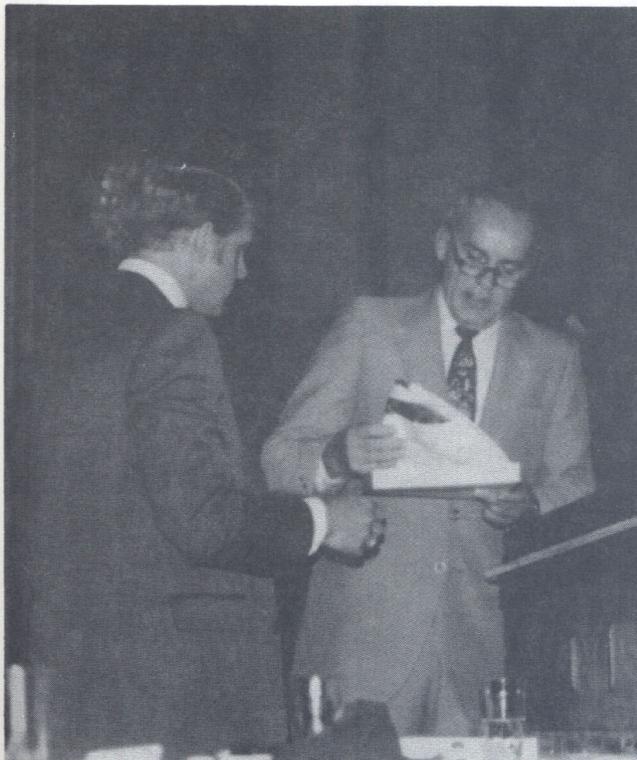
A live television program, known as "Easy On Energy," was broadcast monthly over the Nebraska Educational Television Network. The April, 1981 program was the last to be broadcast as part of this series. The program was dropped as the result of federal budget cuts in the 1981 grant.

## Boiler Efficiency Program

Five boiler efficiency workshops were held across the state in December, 1981. This project is a cooperative venture of the Nebraska Energy Office, Blue Flame Gas Association and the Legislature's 309 Task Force. Five additional workshops were planned for January and February of 1982. The NEO is encouraging continuation of this program on a self-supporting basis by the private sector.

## Evaluation Program

Two energy extension programs were targeted during 1980 for special independent evaluation. The Bureau of Sociological Research at the University of Nebraska-Lincoln, under contract with the NEO, completed the evaluation in April, 1981. The Ga\$ Saver and PUMP programs drew approval, with at least 90 percent of the participants recommending that both programs be continued. During 1981, all energy extension programming underwent evaluation and the range of activities also prompted favorable responses.



*Governor Thone (right) presents an E-Flag conservation award to South Sioux City Mayor Vernie Larson during a ceremony in South Sioux City.*

## Public Information

Providing information on energy matters is among the primary responsibilities of the Nebraska Energy Office (NEO). This legislatively-mandated function embraces the spectrum of programs handled by the NEO. Ongoing public information projects include news releases, brochures, handbooks and audio visual aids that coincide with continuing energy programs. In addition, staff promotes energy efficiency and conservation periodically through opportunities on broadcast talk shows, at conventions and home show exhibits, and as guest speakers.

These efforts to heighten energy awareness represent a multi-faceted approach that must continually be updated to meet challenges in the swiftly-changing field of energy.

A handbook entitled "Energy Info" was produced and distributed to provide a directory of the publications and audio-visual materials (films, slides, video cassettes, etc.) that are available from the NEO.

Because of federal funding cuts and a decreased effort at the national level in providing energy information materials, the NEO decided in 1981 to generate more in-state energy materials than previously to comply with the public information directive in Nebraska law. This included extensive reprinting of available materials and development of new materials to respond to increasing consumer requests.

Other major projects included quarterly and annual reports, television productions and the annual "March Is Energy Conservation Month" campaign.

Quarterly reports and this annual document represent elements in the continuing effort to clarify the energy picture in Nebraska. Energy information is presented through narrative, photographs and graphics so officials and the general public have access to concise, yet comprehensive and updated, presentations regarding NEO activities.

## TV Programs

The television facet of public information included some programs designed to reach adults and others aimed at younger persons.

A program known as "Easy On Energy" was handled by the Energy Extension Service of the NEO and was aimed primarily at the adult sector in Nebraska. It ended in April due to loss of federal funding. Four programs of 28 minutes each were prepared to reach students aged nine to 19. They were developed through a cooperative agreement among 4-H programs and the energy offices in Nebraska, Iowa and Missouri. These programs for younger viewers were aired during the second quarter and an evaluation project is under way in the three states in a bid to polish the material for nationwide distribution.

The 1981 "March Is Energy Month" campaign began February 26 with a news conference at the Capitol. Governor Thone proclaimed March energy conservation month and pumped 190-proof Nebraska alcohol into two State Patrol cruisers to stress the importance of transportation conservation and the development of new technologies.

The month-long campaign coincided with national activities associated with American Energy Week and National Energy Education Day. The Nebraska campaign included retail promotion, public service announcements, education programs, a special edition of the "Statehouse Observer" and presentation of E Flags.

The retail promotion utilized materials developed and distributed by the NEO to 250 lumberyards, hardware stores and heating, ventilating and air conditioning distributors for use in educating consumers. Approximately 750 posters, 275 in-store banners and more than 65,000 fact sheets on home weatherization were distributed.

Public service announcements were developed to stress the importance of residential and transportation conservation. In two television and radio spots, Governor Thone emphasized the importance of home

weatherization and congratulated Nebraskans on cutting gasoline consumption by more than 10 percent between 1979 and 1980. Four additional radio spots featured other conservation concepts.

The "Statehouse Observer" edition on energy stressed conservation among state agencies. Special education workshops and programs on boiler efficiency, energy audits and passive solar techniques, along with Driver Energy Conservation Awareness Training sessions, complemented other facets of the campaign.

In 1982, the ongoing programs of the NEO will continue, with another March campaign planned to showcase the programs and activities under way throughout the year. The 1982 "March Is Energy Conservation Month" sub-theme will stress alternate energy sources by following an ABC format, which stands for "Alternates Boost Conservation."



*Governor Thone pumps Nebraska-produced alcohol into a State Patrol car to kick off the March Is Energy Conservation*

*Month campaign and to emphasize the use of alternate fuels technologies.*

# Keeping The Heat In

Information serves a vital function in the energy field, but making the information pay dividends is even more crucial. There are various areas in which proven techniques to save energy and money can and are being employed.

Cooperative programs mounted by federal, state and local government — along with programs put forth by each level of government separately — are fashioned to save energy and provide direction that can bolster commitment to similar efforts in the private sector.

Federal, state and local government programs to save energy and money represent more than stopgap efforts, but still must be viewed primarily as leading the way. Prudent changes throughout the public and private sectors of Nebraska's economy still are required. Government officials have selected for funding those programs that prove cost effective by returning verifiable savings in energy and money for each tax dollar invested.

Among the programs mounted are those that retain energy by avoiding needless heat loss or air conditioning in large buildings and those that provide similar benefits for low income homeowners.

Because rising utility costs have created pressures in the operating budgets of government, commercial enterprises and the average family, making energy do optimum work has become an imperative.

This section of the annual report for 1981 details these programs to provide the public and officials with a status report on progress. Included are tables to pinpoint various aspects of expenditures and savings, along with some analysis of the significant amount of work in this arena that remains to be done.

## Weatherization Program

The home weatherization program in Nebraska approached the 12,000 dwelling mark as the 1981 program year drew to a close. Since the 1977-78 inception of the federally-funded program for low income residents, some 9,400 homes were weatherized in Nebraska before the 1981 cycle began. The target for the 1981 program year was 2,600 more dwelling units, with more than 1,800 done by the close of the calendar year. The program year ends March 31, 1982, and the target was well within reach.

The Nebraska Energy Office (NEO) administers the federal funds to weatherize the homes of state residents whose financial resources do not exceed 125 percent of the federal poverty level. Weatherization assistance includes caulking and weatherstripping around doors and windows, insulating attics and side walls, covering windows, and other measures that reduce heat loss.

The NEO has contracts with ten Community Action Agencies and the Nebraska Inter-Tribal Development Corporation for delivery of weatherization services at the local level. These contracting agencies receive an initial allocation based on past performance. Additional funds, when available, may be granted to agencies that demonstrate productivity and need.

Delivery of the services varies from agency to agency, with many using contractors. Comprehensive Training and Development Act (CETA) workers no longer are available to the agencies as they were in the past.

Material costs for weatherization assistance may not exceed \$700 per home, and the total cost for both labor and materials may not exceed an average of \$1,200 per home.

## Quality Control

Quality control in the weatherization program is provided by the contracting agencies and the NEO. Each agency inspects the homes weatherized to make certain that material and labor standards are met. The NEO then inspects some of the weatherized homes on a random basis. In addition, the NEO makes a minimum of two monitoring visits per year to each agency under contract. The monitoring visits include an inspection of files, records, requests for service and actual field work.

The NEO applied for \$3,467,100 for the 1981 program year, which would have been a significant increase if it had been granted. However, due to cuts in federal funding, the amount allowed the state's 1981 weatherization effort was \$2,522,777. This amount compared favorably with the 1980 level, but fewer homes could be weatherized in 1981 due to increased costs for materials and labor. The cost per dwelling increased by 30 percent over the 1980 level, which limited potential completions for the 1981 program year to approximately 2,600 homes.

Estimated savings are significant for elderly, handicapped and low income Nebraska residents whose homes are weatherized. A study by the NEO of energy use before and after weatherization showed an average saving of 24.4 million Btus (British thermal units) per home each year. This saving is the equivalent of 24.6 MCF (thousand cubic feet) of natural gas per home. The estimated savings amount to \$103 per dwelling annually for homes using natural gas, or \$189 a year for each home using heating oil. As the cost of fuel increases, the savings realized increase.

Weatherization assistance in Nebraska has saved the equivalent of more than 62,283 barrels of oil since it began, not including the homes weatherized during the 1981 program year. The payback period for this weatherization work is estimated at seven to nine years.

Despite these gains, much work remains. A study by the community action agencies for the NEO estimates

that 10,000 more owner or tenant-occupied dwellings could be weatherized in the state.

Action at the federal level late in 1981 appeared to insure that weatherization funding would continue for another program year, but at a significantly reduced level.

Table B shows the work accomplished by the various agencies in Nebraska for the program years 1977, 1978, 1979 and 1980.

Table C is a contract summary covering weatherization activity, including projections through the end of the 1981 program year.

**Nebraska Energy Office  
Nebraska Weatherization Contracts**

**Table B**

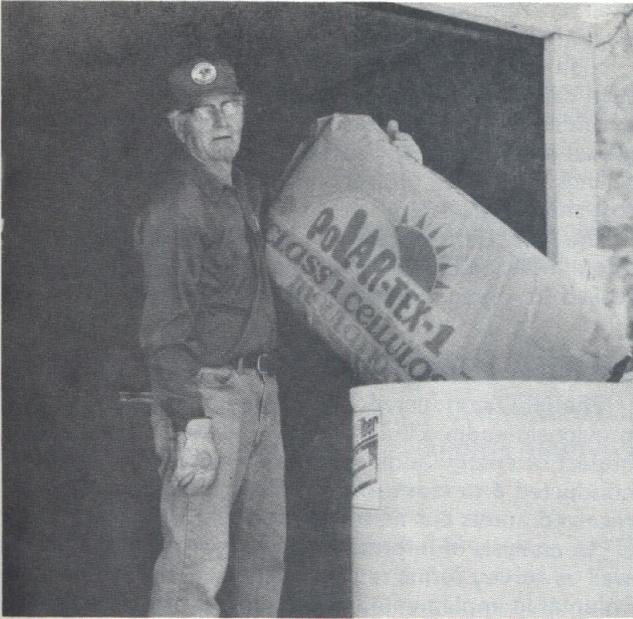
Subgrantee	Allocation	Homes Weatherized	Subgrantee	Allocation	Homes Weatherized
<b>Blue Valley CAA</b>			<b>Mid NE-East CAA</b>		
1977	33,987	159	1977	37,215	181
1978	70,779	180	1978	85,332	187
1979	229,176	274	1979	213,292	208
1980	255,634	280	1980	155,795	260
<b>Central NE CAA</b>			<b>Mid NE-West CAA</b>		
1977	53,864	121	1977	22,038	57
1978	130,654	190	1978	50,531	87
1979	288,171	229	1979	127,067	113
1980	362,342	351	1980	162,944	146
<b>Goldenrod Hills CA</b>			<b>Panhandle CA</b>		
1977	43,705	104	1977	17,369	89
1978	100,212	205	1978	39,824	83
1979	317,669	295	1979	161,104	274
1980	363,463	674	1980	192,308	267
<b>Greater Omaha CA</b>			<b>Northwest CA</b>		
1977	64,959	317	1977	15,771	68
1978	148,945	265	1978	36,162	131
1979	476,504	679	1979	58,996	217
1980	128,206	298	1980	171,908	191
<b>Inter-Tribal Dev.</b>			<b>Southeast CA</b>		
1977	31,500	90	1977	18,799	83
1978	69,810	95	1978	43,104	125
1979	110,364	207	1979	86,225	191
1980	57,692	68	1980	256,880	250
<b>Lincoln Action</b>					
1977	25,793	95			
1978	59,141	96			
1979	224,638	407			
1980	407,306	593			

**Nebraska Weatherization Summary**

**Table C**

Program Year	Contract Period	Contract Amount	Homes Weatherized
1977	Jan '78-April '79	\$ 365,000	1,365
1978	July '78-Feb '80	834,494	1,644
1979	June '79-July '81	2,293,206	3,094
1980	Mar '80-July '81	2,514,478	3,378
*1981	Mar '81-Mar '82	2,522,777	2,600
Totals		8,529,955	12,081

\*Number of homes estimated



*Weatherization program contract worker prepares insulation for work on a home in western Nebraska.*

## School Weatherization Grants Program

Approximately \$1,000,000 was awarded for energy efficiency projects in the initial grant cycle of the two-year School Weatherization Grants Program administered by the Nebraska Energy Office (NEO).

Passage of Legislative Bill 257 early in 1981 established the cost-sharing grants program for school districts in Nebraska. The state provides 80 percent of the funding from oil and gas severance tax revenues. Local school districts provide 20 percent for the energy efficiency projects they propose. The 20 percent local share of the overall project cost represents one-fourth of the state grant amount.

During September, the NEO distributed program materials to school superintendents. Meetings were held in Lincoln, Grand Island and North Platte with school administrators so NEO staff could discuss with them the program's procedures and guidelines.

Applications for the initial grant cycle were submitted to the NEO by the October 28-30, 1981, grant cycle deadline. More than \$3,400,000 was requested in 88 applications for various projects, such as insulation, window replacement and lighting modifications.

Oil and gas severance tax revenues provided \$983,861 for distribution in the first grant cycle, so applications underwent a thorough review for eligibility based on priorities established to determine potential energy savings and project cost effectiveness.

The initial grant cycle concluded in December with 17 school districts throughout the state receiving awards for projects at 26 buildings. The local matching money brought the total for the projects to more than \$1,200,000.

Energy cost savings from the projects were estimated at \$275,536 annually, or approximately \$5,500,000 over the projected 20-year average life of the projects. Energy savings were estimated at the equivalent of 434,582 gallons of fuel oil annually. The payback period, on average, was calculated at 4.5 years.

At least four more grant cycles were envisioned for the two-year program. The NEO encouraged applicants failing to receive funding in the initial grant cycle to apply during subsequent grant cycles.

## Institutional Conservation Program

The Institutional Conservation Program was created under the National Energy Conservation Policy Act of 1978 to provide energy audit services and cost-sharing grants for energy conservation. Four categories of public and private non-profit buildings are involved: (1) schools, (2) hospitals, (3) local government and (4) public care facilities.

During 1981, the Nebraska Energy Office (NEO), with assistance from Regional Councils of Government, conducted energy audits on 1,172 buildings.



*Weatherization program contract worker in western Nebraska blows insulation into the wall of a home.*

Table D provides a breakdown of audits by building category. Since the beginning of the audit program in 1979, more than 2,020 buildings have been audited. Analysis of energy audit reports indicated that if Nebraska institutions implemented all audit recommendations, an estimated overall annual energy cost savings of approximately \$14,700,000 would be realized. The corresponding estimated annual energy (Btu) savings would be equivalent to 431,315 barrels of imported oil. Table E provides a breakdown of potential energy savings, by type, units and cost of fuel. Analysis also indicated that Nebraska institutions could reduce annual energy consumption an average of 12 to 16 percent.

## Audit Program History

Prior to offering the energy audit service, the NEO distributed survey forms to potentially eligible institutions in the state to gather energy related information on buildings. Participation in this survey was necessary for an institution to receive an energy audit of its buildings and to participate in the grants portion of the program. Information obtained from more than 2,200 survey forms was used to establish a priority list for audit scheduling. The energy audits began in July, 1979.

Nebraska is one of only a few states to provide energy audits without charge. The average cost of an audit is \$250. Rather than require institutions to pay half the cost, which would discourage use of the service, the Nebraska Legislature provided funds necessary to match federal money for the audit phase of the program.

## Audit Personnel and Procedures

Ten energy auditors were trained extensively in methods of recognizing energy deficiencies in all types of institutional buildings. To provide statewide coverage, auditors were stationed in North Platte, Grand Island, Lincoln and Omaha. In an effort to stimulate greater program participation on the part of local governments, the NEO trained 20 outside auditors through contracts with the Regional Councils of Government.

An energy audit consists of an on-site building evaluation, primarily to identify all low cost/no cost opportunities for saving energy in operation and maintenance.

While conducting the walk-through inspection, the energy auditor examines construction of the building, window condition, insulation, infiltration, lighting and mechanical systems.

An audit report is prepared and sent to the administrator of the facility. The report identifies areas of energy consumption and ways in which energy use and costs can be reduced. Energy saving recommendations are separated into two categories: (1) operation and maintenance procedures, and (2) high initial investment, or capital improvements.

Operation and maintenance changes are low or no-cost methods of saving energy, such as

weatherstripping and caulking, thermostat control, cleaning filters and efficient boiler operation.

High initial investment recommendations include such capital improvements as switching from incandescent to fluorescent lighting, adding double-glazed storm windows, and insulating walls and ceilings. For these projects, institutions may apply for cost-sharing grants.

The NEO performed free audits on eligible buildings through December 31, 1981, when federal support ceased for energy audit activities.

## Audit Program Results

The NEO conducted 149 follow-up visits to previously-audited buildings to evaluate and assess the impact of energy audit services. In addition, the office conducted a random survey of 200 institutions that had received audits but no follow-up visits.

An analysis of information in follow-up reports, as well as survey forms returned, showed institutions voluntarily implemented approximately 76 percent of the low/no cost recommendations and approximately 30 percent of the capital improvements identified in the audits. Based on this level of compliance, audits conducted under the program will result in an estimated annual energy cost savings of \$7,300,000. The corresponding estimated annual energy (Btu) savings will be the equivalent of 214,675 barrels of imported oil.

Because there are many audit recommendations for which an energy auditor is unable to calculate savings, and there will be future increases in the price of fuel, these energy cost savings estimates must be viewed as conservative. Table F provides a breakdown of estimated energy savings by type, units and cost of fuel saved.

Of the institutions responding to the survey, more than 88 percent believed the energy program is worthwhile. Institutions that charted energy usage since implementation of the audit recommendations have achieved an annual energy savings of five to 15 percent.

## Energy Grant Awards

In 1981, the NEO administered a third Institutional Conservation Program grant cycle. During this grant cycle, 99 cost-sharing grants (50/50) were awarded to 40 Nebraska institutions to help finance engineering energy studies and implementation of energy savings projects.

Under the grants portion of the program, audited institutions were eligible to apply for federal funds to hire an engineer or architect-engineer team to conduct an in-depth study of the building(s). In-depth studies identify cost effective projects that pay back the initial cost of the investment through energy cost savings in more than a year, but less than 15 years.

Schools and hospitals, however, are the only institutions eligible to receive federal funds to implement the cost effective energy conservation projects identified by the in-depth engineering studies. These projects might be replacement of old boilers with

new energy efficient boilers, reduction of glass area with brick or insulated paneling, or installation of a solar domestic hot water system.

To encourage maximum participation in the grant program by eligible institutions during 1981, the NEO conducted a promotional campaign that included revision and distribution of program information to 2,966 institutions, presentations for organizations affected by the program, and regional workshops for institutional administrators at North Platte, Grand Island, Lincoln and Norfolk.

As a result of promotion, 174 eligible applications were submitted for grants during the year. Based on recommendations made by the NEO, the U.S. Department of Energy awarded architectural-engineering energy study grants of \$119,199 to 45 schools, two hospitals, two local government facilities and one public care facility. Energy conservation construction grants of \$1,594,008 were awarded to 44 schools and five hospitals. Table G provides a breakdown of grant funds awarded by building category.

**Table D Institutional Conservation Program  
Energy Audit Activity Summary for 1981**

Type of Building	Number of Buildings Audited	Percentage of Total
Schools	458	39%
Hospitals	57	5%
Local Government	551	47%
Public Care	106	9%
<b>TOTAL</b>	<b>1,172</b>	<b>100%</b>

**Table E Institutional Conservation Program  
Energy Audit Potential Savings Summary 1979-1981**

Potential Type of Fuel Saved	Estimated Potential Units of Fuel Saved	Estimated Potential Energy Dollars Saved
Natural Gas	1,913,452 MCF/year	\$8,610,532/year
Fuel Oil	2,934,665 Gal/year	\$3,228,131/year
Electricity	56,726,633 KWH/year	\$2,836,332/year

**Table F Institutional Conservation Program  
Energy Audit Savings Summary 1979-81**

Type of Fuel Saved	Estimated Units of Fuel Saved	Estimated Energy Dollars Saved
Natural Gas	951,126 MCF/year	\$4,280,067/year
Fuel Oil	1,460,662 Gal/year	1,606,782/year
Electricity	28,234,398 kWh/year	1,411,720/year

**Table G Energy Grants Awarded To  
Nebraska Institutions During 1981**

Institution	Type of Grant	Number of Grants Awarded	Total Dollar Amount Awarded
School	Construction Project	44	\$1,227,143
School	Engineering Study	45	113,699
Hospital	Construction Project	5	366,865
Hospital	Engineering Study	2	3,500
Local Government	Engineering Study	2	900
Public Care	Engineering Study	1	1,100
<b>TOTALS:</b>		<b>99</b>	<b>\$1,713,207</b>

Energy conservation construction projects funded in grant cycle three will produce an estimated annual energy cost savings of \$781,268. These capital improvements will pay for themselves in an average of 4.4 years.

Based on implementation of all energy conservation projects funded under this grants program by December 31, 1981, Nebraska institutions will accomplish an estimated \$1,505,973 in energy cost savings per year. The annual energy savings equivalent will be more than 52,960 barrels of imported oil. The average payback period for the projects will be 4.8 years.

## Monitoring of Grants

The U.S. Department of Energy required that the NEO closely monitor progress of all energy study and construction grant projects to make sure of financial and performance accountability by grant recipients. With completion of the third grant cycle in August, 1981, the NEO had 286 grants to monitor.

Energy auditors conducted on-site inspections of grant projects at more than 25 institutions. These inspections helped insure that grant projects were being properly implemented and that grantees were complying with program requirements.

In addition to on-site inspections, the NEO also monitors progress reports submitted by grantees. An analysis of annual energy consumption report information has revealed the following notable examples of the significant impact and effectiveness of this grants program.

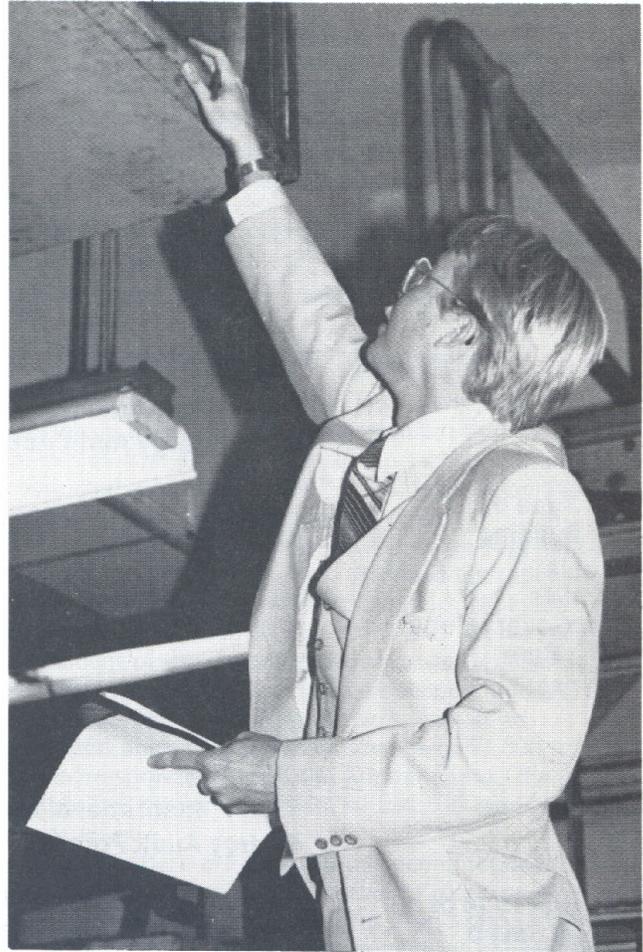
PENDER PUBLIC SCHOOLS received a grant of \$2,307, during the first grant cycle, to insulate the high school attic. Because of this energy conservation project, the school has reduced consumption of natural gas by 39 percent for an annual cost savings of \$20,060.

DECATUR PUBLIC SCHOOL was awarded \$85,733, during the first grant cycle, to undertake projects ranging from insulation of ceilings and walls to installation of vestibule doors. The result of these projects was a first-year reduction in heating oil usage of 55 percent for an annual cost savings of \$18,370.

In light of the Reagan Administration request that funding be continued for the grants program, the NEO expects to administer a fourth grant cycle during 1982. The office will continue monitoring grant recipients funded in prior cycles.

## State Building Audit Program

The State Building Audit Program began in 1981. The program, established under Legislative Bill 158, is designed to pinpoint potential energy and cost savings in structures owned by the State of Nebraska. The energy auditors provide information for later corrective action.



*Gary Nystedt of the NEO Omaha field office checks the energy efficiency of a Beatrice building during an energy audit.*

The Nebraska Energy Office (NEO), which administers the program, sent information to all state agencies during the summer months. Program procedures were outlined and the agencies were asked to return preliminary data on structures.

The state agencies, including the University of Nebraska and the state colleges, returned preliminary forms to provide an overview of characteristics of the buildings, annual energy consumption, and existing operating and maintenance procedures.

By September, nine agencies responded by providing information regarding 550 buildings. This represented approximately 25 percent of the estimated number of structures owned by the state. Preliminary energy audit forms continued reaching the NEO as the year drew to a close, but actual energy audits began in September.

Information provided on the preliminary forms is used by staff audit personnel from the NEO as an aid in conducting on-site energy audits. The forms and field inspections help identify opportunities for greater efficiency through better use of energy resources and reduction of energy consumption.

Changes recommended by the energy auditors must be cost effective. The recommendations come in two forms: low cost/no cost items and energy conservation

measures. The low/no cost items include temperature setback, caulking and weatherstripping, elimination of excess lighting and other inexpensive changes. The energy conservation measures require more initial capital outlay. They include such items as window replacement, changing from incandescent to fluorescent lighting and similar renovations.

The 27-month program officially began at the end of August and will run through the end of 1983. The seven NEO auditors average approximately 25 to 30 audits per month.

An ongoing assessment of audit results is planned by the NEO administrative staff, but full scale follow-ups to determine the extent to which audit information is used must await decisions on further funding.

Table H indicates the number of structures audited from the beginning of the program through December, along with the amount of energy savings recommended for the state-owned buildings.

## Emergency Building Temperature Restrictions Survey

The U.S. Department of Energy requested that the Nebraska Energy Office (NEO) provide data on voluntary compliance with federal temperature restrictions in effect during 1980. In late 1980 and early 1981, NEO staff members visited affected buildings in the Omaha and Lincoln areas to gather data, but that data did not relate to any potential enforcement activity at the federal level.

The emergency building temperature restrictions have been discontinued, but technical assistance and related programs aimed at retaining lowered

Table H

### Recommended Savings in State-owned Buildings

Number of Buildings Audited: 60

Type of Savings	MBTU'S RECOMMENDED FOR SAVINGS	Percentage Savings	Dollar Savings
Operation and Maintenance	4,359.8	7.2%	\$31,827
Energy Conservation Measure (ECM)	12,264.3	20.1%	\$89,529

MBTU'S are millions of British thermal units



Jeff Morgan of the NEO North Platte field office determines the lighting level at a gymnasium in North Platte.

temperature practices continue.

During 1981, these activities included:

- Publicity, promotion and distribution of the temperature restriction notification booklet was handled through the NEO information network.
- Telephone, personal and meeting time attention was provided regarding temperature restriction questions.
- Media exposure for temperature settings came from "Easy on Energy" telecasts and through the bimonthly Nebraska Energy News.
- Assistance was provided to chambers of commerce, association groups, corporations and others

in disseminating temperature restriction information.

• Temperature restriction information was included in the NEO building audit activity for schools, hospitals, city and state facilities, as well as for commercial and industrial property owners.

• On site temperature restriction technical assistance was provided at various locations.

The NEO purchased an infrared scanner with funds provided by the U.S. Department of Energy. The temperature advisory activity and the use of infrared imaging now provide the ongoing technical assistance.

The EBTR results appear in table I.

Table I

**Nebraska EBTR Survey Results**  
**October 1, 1980 through January 16, 1981**

<b>Building Type</b>	<b>Number of Buildings in Sample</b>	<b>Number of Buildings in Compliance</b>	<b>Percent Compliance</b>
<b>Colleges and Universities:</b>			
Public (music auditorium; museum; student union)	17	10	59
Laboratory	16	5	31
Classroom	37	23	62
Office	7	2	29
Gymnasium	9	6	67
Other	5	4	80
<b>Schools</b>			
Elementary Schools	3	1	33
Junior High Schools	11	8	73
Senior High Schools	8	2	25
<b>EDUCATION BUILDINGS TOTAL</b>	<b>113</b>	<b>61</b>	<b>54</b>
<b>Government Buildings</b>			
Institutional (open 24 hours daily)	2	0	0
Offices (open Mon-Fri)	9	6	67
<b>GOVERNMENT BUILDINGS TOTAL</b>	<b>11</b>	<b>6</b>	<b>55</b>
<b>Commercial:</b>			
Restaurants	3	1	33
Groceries	2	2	100
Retail Stores	21	10	48
Office/Bank	6	0	0
Shop/Industrial	3	2	67
Other	2	0	0
<b>COMMERCIAL TOTAL</b>	<b>37</b>	<b>15</b>	<b>41</b>
<b>GRAND TOTAL FOR ALL BUILDINGS VISITED</b>	<b>161</b>	<b>82</b>	<b>51</b>

## Different Dimensions

# Making The Future Work

Information and programs to deal with energy problems are important, but they are designed to manage the present and provide a hedge against the future. The future may resemble the present as little as the present resembles the past. Insight is required to determine in which areas similarities require continuation of past policy and to perceive differences that dictate revision.

Insight can come from research and development of alternatives to supplement or replace current energy supplies. Insight can come from planning through legislation, emergency plans, the people who implement them. All this requires some financial underpinning.

Fossil fuels remain the base of Nebraska's energy supply at present and will in the immediate future. For a state that imports most of its energy needs, there is little choice currently but continued heavy reliance on conventional energy supplies over the short term.

However, work in Nebraska and elsewhere can point the way toward alternative sources of energy. These alternates require research, development and information distribution keyed to the specific needs of the particular region in which they will be used.

In addition, legislation and emergency plans to deal with a range of energy matters are drafted, adopted and implemented in an effort to tackle the tangled problem of securing an energy-sufficient future.

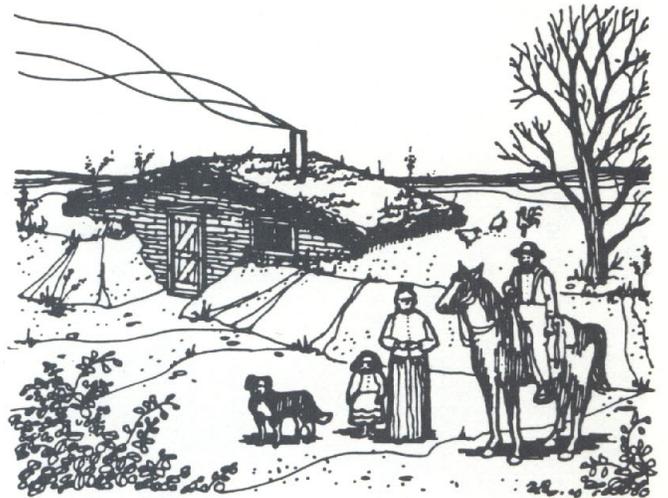
In this section of the Nebraska Energy Office (NEO) annual report for 1981, a wide-ranging analysis of the different dimensions being explored is offered. This section provides a glimpse into the future of renewable resources, a look at legislation and planning that covers the entire energy field, and a listing of the personnel and financial resources involved.

## Alternate Energy Sources

Programs to develop alternate energy sources are under way on various levels in Nebraska. Research and development go hand-in-hand with distribution of information as key elements in this multi-faceted effort.

Alternate energy sources include solar, wind, biomass, hydroelectric generation, geothermal, and solid and liquid wastes. Chances for energy security in Nebraska can be enhanced by using alternates and conserving fossil fuels.

The Nebraska Energy Office (NEO) spearheads some of the alternate programs and acts as one of the major information clearinghouses in the state on alternate energy matters.



0-11 NEBRASKA: 1800'S  
EARTH SHELTERED SODDY



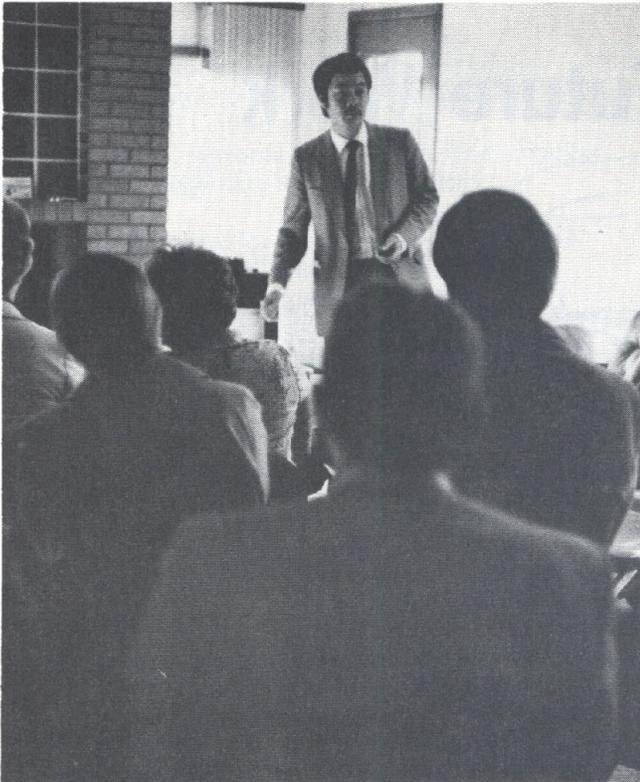
3-18 PAUL NYHOLM DOUBLE SHELL  
HOME OMAHA, NEBRASKA

*Authored by Solar Energy Associates of Omaha and published through the NEO, Nebraska's Passive Solar Primer includes text and illustrations such as these to provide passive solar design-construction information.*

## Solar

Among the NEO solar activities in 1981 were data collection and the printing and distribution of a solar primer in conjunction with a series of passive solar workshops.

In cooperation with the U.S. Department of Energy, Region VII, the Solar Energy Research Institute and Seward County Rural Public Power District, the NEO began a one-year solar insolation data project. The study used four pyrometers to collect data on solar potential.



*Bing Chen of Solar Energy Associates and the University of Nebraska-Omaha conducts a Lincoln workshop for realtors on passive solar housing techniques.*

The system involves pyrometers on one stand at four angles. Station one, the data base at which solar data is normally collected, is horizontal to the surface. Station two, data for solar domestic hot water, is at a 60° angle. Station three, for passive solar heat gain, is at a 90° angle. Station four will eliminate indirect sunlight and assist in determining value of indirect sunlight in solar heat gain; it is set at a 90° angle with an artificial horizon.

The Nebraska Passive Solar Primer was completed in late 1981. Dealing specifically with Nebraska, it will enable architects, builders, developers and the general public to better understand passive solar design and construction techniques. Three passive solar workshops were held in Scottsbluff, Hastings and Norfolk during November and December. Three additional workshops were scheduled for Lincoln and Omaha in January and February of 1982. The Nebraska Passive Solar Primer is available through the workshops, the NEO, and is being sent to every library in the state.

## Wind

During 1981, a statewide wind assessment began. It is a cooperative effort of the NEO, Western Area Power Administration, Nebraska Rural Electric Association and the following Rural Public Power Districts: Cornhusker, Cuming County, Custer, Dawson, KBR Rural, McCook, Northwest Rural, Roosevelt, Seward County Rural, Southwest, Twin Valleys, and Norris; the Midwest, National Valley and Panhandle Rural Electric Membership Corporations; and the Wyrulec Company.

Twenty anemometers have been sited and were installed by the end of December, 1981. Data will be recorded on magnetic tapes, collected and analyzed monthly.

The project is divided into two phases: monitoring wind speed and determining potential for wind generated electricity. In phase one, each site will be evaluated at intervals of six, twelve, and eighteen months. From this evaluation, the best sites will be chosen for phase two, in which new evaluations will again take place at six, twelve and eighteen month intervals. A decision then will be made on whether data collection will cease, remain the same or be expanded to full meteorological installation. Analysis will assist those interested in determining potential of wind generated electricity at each site.

## Biomass

Biomass potential was assessed in a report prepared for the NEO in 1981. The study was conducted regarding potential for biomass in the production of liquid fuels to deal with a petroleum disruption or shortfall. The Energy and Agricultural Resource Assessment was prepared in a joint project of the NEO and the Nebraska Gasohol Committee.

The study was not designed to determine whether crops should be converted to ethanol, or what the economic impact would be if such steps were taken. The resource assessment showed, however, that Nebraska had sufficient and proper crops for conversion if it became necessary. The potential alcohol yield from biomass in Nebraska would have been more than 3.2 billion gallons in 1980.

"If crops are utilized in conjunction with other biomass resources, an efficient alcohol production system could develop," the study determined. "Not only would a valuable fuel result from agricultural crop usage, but an important high-protein product, which would be used for animal or human consumption, would result, too."



*NEO Director V.B. "Buck" Balok (left) and a Japanese delegation listen as spokesman for Pure Energy, Inc. in Lincoln makes a point during energy tour for the visiting delegation.*

## Hydroelectric Generation

After a study started in early 1979 on small-scale hydroelectric potential in Nebraska, the NEO completed work last year on a listing of existing Nebraska sites and has reported on information from each location.

The Nebraska Municipal Power Pool, in cooperation with the U.S. Department of Energy, funded the 1979 Big Blue River Co-Dependent Hydroelectric Development Study. The study covered a series of seven existing dams on a 65-mile stretch of the Big Blue River in southeast Nebraska. After this study, the power pool proposed investigation of feasibility for all of Nebraska's low-head hydro sites. The NEO report stemmed from this investigation.

The NEO analysis began with listings of facilities prepared by the U.S. Army Corps of Engineers under the National Hydroelectric Study. Sites identified by Nebraska state agencies and utility personnel were subsequently added. Lists of dam locations with preliminary geographic data were then circulated to state and federal contacts for review and comment on restoration potential. The report lists information on dam conditions and revitalization plans at feasible sites.

Preliminary work in a study of existing dams with a potential of at least 50 kilowatts was completed by the U.S. Army Corps of Engineers in September, 1980. In Nebraska, 115 sites originally were identified by the Corps as possible or existing hydro locations, with three new areas included.

The 1981 Nebraska Legislature passed Legislative Bill 132, which allows municipalities jointly to assume indebtedness for energy developments. Hydroelectricity is eligible for such joint funding. The U.S. Department of Energy has made available to Nebraska a \$20,000 grant to provide technical assistance for hydro development. Work will go forward under the grant through September, 1982. A small amount of additional funding has been set aside under the Nebraska Energy Conservation Plan for NEO assistance on the project.

## Solid and Liquid Waste

In its State Energy Conservation Plan for 1977, the NEO had included measures to encourage burning solid municipal waste as fuel and to recycle used oil. Surveys of refuse-derived fuel plants and industrial utilization of process waste for plant heating fuel were completed in 1981.

A feasibility assessment was made of a demonstration refuse-derived fuel plant for Nebraska to produce a combination of salable electricity, steam and hot water. Personnel from the University of Nebraska-Lincoln physical plant provided statistical and technical evaluation assistance regarding fuel and equipment for community-sized operations.

Lincoln, South Sioux City, and Metropolitan Omaha had already begun studies for possible development of such facilities. Only Lincoln won matching funds from the NEO by completing a full feasibility study.

The NEO has since turned to industrial utilization of process waste for plant heating fuel.

Personnel from the University of Nebraska-Lincoln conducted surveys for the NEO of voluntary waste oil collection and reuse activities in 1979 and 1980. The work included a national review of state efforts to recycle waste oil. Fifteen states had active projects and legislation. The result of Nebraska data gathering revealed that approximately 10 percent of the oil in the state is collected for reuse, largely in space heating, industrial process, or in the manufacture of asphalt.

In 1981, waste oil and solid waste management activities were turned over to the Nebraska Department of Environmental Control due to state legislation.

## Geothermal

Geothermal energy has been used in the form of steam, hot water, and hot, dry rock. Hot water temperatures recorded in Nebraska lead to a preliminary conclusion that the western half of the state could utilize underground water as a heat source.

With a \$165,000 grant from the U.S. Department of Energy, the University of Nebraska-Lincoln has been developing temperature logs from thousands of wells to prepare estimates of the potential in the state. The University of Nebraska-Omaha and the Nebraska Conservation and Survey Division at the University of Nebraska-Lincoln have cooperated in this effort over the last three years. The first Nebraska geothermal resource map will be published in February, 1982.

Information reveals that an area west of a line running slightly southwest from Boyd County in the north to Red Willow County in the south contains a low-temperature thermal-water resource adequate for space heating. Temperature ranges from 112° to 190° Fahrenheit have been recorded and the highest temperatures have been found in the Panhandle.

## Independence Day Fuel Classic

Detailed planning for the state's first Independence Day Alternate Fuels Classic began in 1981.

The Classic, scheduled for July 4, 1982, will focus attention on existing alternate fuel automotive technologies, which can help the country move again toward energy security.

Covering a 150 mile course from Lincoln to Aurora and back, the Classic already has three official entries and some 32 states, individuals or firms have expressed serious interest in competing.

Participating vehicles are expected to run on everything from ethanol to wood. They will be placed on display in Lincoln so that people will have an opportunity to observe and learn about non-petroleum based fuel technologies.

The Classic, under supervision of the NEO, is outlined in detail in an official rules and regulations handbook which is available from the NEO.

# Nebraska Solar Office

The Nebraska Solar Office (NSO) continued in 1981 serving as a focal point for contact and communication in the informational areas connected with all facets of renewable energy.

Established in 1978, the NSO is a joint office of the Nebraska Energy Office (NEO) and the University of Nebraska Research and Development Center.

During the past year, the federally-funded NSO worked closely with state and local governments to eliminate barriers, promote incentives, support development of legislation and encourage use of solar energy. The office maintains a resource center for public information, which consists of a small library, computer programs and solar home plans for review.

The NSO inventories solar developments in Nebraska, assists in the development and implementation of solar energy publications, conducts and coordinates projects, provides technical assistance to the NEO and acts as a liaison with the Mid-American Solar Energy Complex, the University of Nebraska and appropriate local, state, regional and national organizations.

The NSO market development program seeks to accelerate acceptance and utilization of solar energy to reduce Nebraska's dependence on non-renewable



*A pair of Nebraska Public Power District personnel check the solar pathfinder in western Nebraska to determine energy levels provided by the sun.*

energy imports. To do this, the NSO (1) collects and disseminates information, (2) participates in education and training activities, (3) works on gaining commercialization and consumer confidence for solar technologies and (4) promotes intergovernmental liaison.

The following programs/projects were designed to address the primary objectives of the Nebraska solar market development mission. The NSO budget supplemented the larger programs/projects rather than being the primary source of funding.



**Nebraska  
Solar  
Office**

W.191 Nebraska Hall, Lincoln, Ne. 68588

402 / 472-3414

## Intrastate Coordination and Planning

The NSO conducted a peer review panel for the 1981 "Small Grants for Appropriate Technology." The office provided input to the NEO-Nebraska Energy Policy Development, the guidelines for Nebraska property tax exemption for solar and other renewable energy systems, and for a program on conservation and solar funds for schools in the state.

The NSO cooperated with the Mayor's Committee on International Friendship and U.S. State Department in the tour of visiting scientists, provided assistance to the cities of Syracuse and Lincoln for solar access protection, and testified before the U.S. House Committee on Small Business in the Solar Energy Business.

## Consumer Protection/Assistance

The Solar Office provided more than 200 solar system sizing and economic analysis computer runs to consumers and professionals in the state and reviews and recommendations for over 90 house plans. The NSO completed input for the Regional "Solcan" Project, analysis and assessment of solar consumer attitudes and decision factors, and the Nebraska Solar Yellow Pages. Solar Home Tours were held in Lincoln and Omaha in 18 homes with more than 3,000 visitors attending.

## Education and Training Services

In conjunction with other agencies, the Nebraska Solar Office sponsored various workshops on such subjects as operational results, residential passive solar design, superinsulation, and wind energy systems. The office received national acclaim for its 400 page Passive Solar Workbook and a 560 solar slide set for residential workshops. This recognition came from the Southern Solar Energy Center and the National Passive Solar Industries Council.

## Information Services

Features and articles on the office appeared in four state-wide publications. A booth was manned at the Lincoln and Omaha Energy Expos, the Lincoln Home Show and the National State Home Builders Annual meeting. Presentations were made at several local and state organization meetings.

Assistance was provided to the Behlen Manufacturing Company to assist in incorporating solar features in their manufactured buildings. The two Passive Solar Home Plans developed for the Grand Island Disaster Relief Program have been sent out to meet more than 100 requests and more than 300 "Power From the Wind" guidebooks have been distributed.

Public information efforts during 1981 involved 1,400 written requests, 900 telephone requests, 450 office visits and the distribution of 40,000 brochures.

## Legislation

Responsibilities of the Nebraska Energy Office (NEO) increased significantly during 1981 because of action by the Nebraska Legislature in the 1980 and 1981 sessions.

An omnibus energy measure, Legislative Bill 954 of 1980, provided for various state government initiatives, including some directly affecting the NEO. The legislation permitted conservation loans by the Nebraska Mortgage Finance Fund and allowed sales tax refunds to purchasers of alternate energy devices. It set up statewide energy efficiency standards, increased executive powers for the governor to cope with vital resource shortages, established greater data collection responsibilities for the NEO, and outlined energy-related procurement standards.

Among the actions taken by the NEO during 1981 in response to the bill was administration of the sales tax refund program.

By December, 1981, the NEO had received 61 applications for the energy sales tax refund. Of these, 51 won approval, six were not filed by the owner, three were ineligible and one application was incomplete.

The total amount of the sales tax refunds requested by successful applicants amounted to \$10,402, with nearly half (\$4,500) requested by the builders of two alcohol plants. Excluding these two plants, the average refund was \$131.16.

In addition, Legislative Bill 954 prompted the following activities during 1981:

- Rules and regulations were drawn up for the residential conservation loan program of the Nebraska Mortgage Finance Fund.
- Local government jurisdictions were encouraged to adopt an energy efficiency standard equivalent to the state standard. (Six Nebraska Councils of Government contracted with the NEO to help in this program).
- The effective date of the energy efficiency standard was publicized and certification forms were processed.
- A manual covering residential and non-residential building construction standard requirements was prepared.

- A vast data collection and analysis system, which will allow energy forecasting, is being implemented.
- Energy efficient procurement practices were promoted at the state and local levels.

The 1981 Legislature passed three bills that directly affected the NEO. They were Legislative Bills 257, 158 and 151.

Under terms of LB257, the NEO receives \$400,000 from the Nebraska Energy Resource Fund during fiscal year 1981-82 and a greater amount from the same oil and gas severance tax revenue for the two-year School Weatherization Grants Program. The school weatherization program has commenced and is discussed in greater detail elsewhere in this report.

The \$400,000 in funding for FY 1981-82 is split, with \$125,000 provided on a pass through basis from the NEO to the University of Nebraska - Institute of Agriculture and Natural Resources for the Alcohol Injection Equipment Testing program and the Alcohol Still Performance Testing program. The balance of the funding—\$275,000—is being used by the NEO for conservation programs and to provide technical assistance in developing alternate sources of energy.

Under terms of LB158, the NEO is required to perform energy audits on all state buildings by the end of 1983. This State Building Audit Program has started and is discussed in greater detail on page 18.

## Exemption

Under terms of LB151, a five-year exemption from property taxation is available for eligible energy conservation improvements on real estate.

The legislation requires that eligible improvements be designed primarily for energy conservation and be installed between November 11, 1980, and December 31, 1985. The NEO is charged with determining if such an improvement is an alternate energy facility and eligible to receive the exemption.

During September and October, 1981, the NEO and the Department of Revenue decided one type of form could be used for applicants, county assessors and county boards of equalization. The application form was developed, printed and distributed.

## Energy Emergency Plan

The Nebraska Energy Office (NEO) during 1981 faced increasing responsibilities in Energy Emergency Planning due partially to new directions at the federal government level.

Decontrol of petroleum products by President Reagan occurred on January 28, 1981, creating a major impact on the State of Nebraska and the NEO. Elimination of the state set-aside for gasoline and propane came on the same date as the President's decontrol order in January. The middle distillate set-aside was eliminated at the end of March. The set-aside program had provided standby reserves in case of supply shortfalls or disruptions.

During the period from January 28 to September 30, 1981, the President had standby authority to act in an energy emergency. Since September 30, standby authority for both an allocation program and gas rationing ceased to exist.

Congress has been considering legislation that would give the President power to intervene if a major shortfall occurred. Different House and Senate versions passed and a conference committee was working toward a compromise. However, the President has opposed this legislation, saying free marketplace factors would manage any shortfall effectively.

This results in the prime responsibility for handling energy emergencies being shifted to the individual states and their citizens. As a result of the shifted emphasis in energy emergency planning and related NEO responsibilities, the NEO staff during the last half of 1981 began work on an energy engineering/economic forecasting model.

## Enables Analysis

The model will enable the NEO to analyze various supply disruption scenarios. It also will enable the NEO to apply various demand restraint measures against the model to determine which activities have the least negative economic and social impact on the state's economy and citizens.

During 1981, the NEO completed the 1981 summer and 1981-82 winter energy emergency plans. As the winter plan was being developed, Governor Thone activated the Nebraska Private Sector Resource Crisis Management Committee. This group is made up of representatives from the various energy sectors, such as petroleum, electric utilities and natural gas utilities.

In September, representatives of the NEO met with the committee and the Nebraska Resource Crisis Management Board, which is made up of selected state agency heads. The committee and board reviewed the 1981 summer plan and advised the NEO of steps to improve the 1981-82 winter plan. Virtually all the committee/board recommendations were incorporated into the latest winter plan.

## Incorporate Trends

The committee and board will meet periodically with representatives of the NEO to advise office staff on energy matters, as well as to assist in future energy emergency planning activities. During 1982, both the summer and winter plans will be updated to incorporate the most recent trends in energy use.

The Energy Emergency Preparedness Plan and the Nebraska Energy Emergency Plan for Gasoline were merged into one plan during 1981. The gasoline plan was mandated in 1979 by federal law, which was known as the Energy Emergency Conservation Act of 1979 (EECA). As a result, all energy emergency planning currently is contained in a single plan. Unlike the state set-aside and gas rationing, EECA remains in effect until July 1, 1983.

In 1981, these persons made up the Nebraska Resource Crisis Management Board (government group) and the Nebraska Resource Crisis Management Committee (private group):

## Nebraska Resource Crisis Management Board

V.B. "Buck" Balok  
Director  
Nebraska Energy Office  
9th Floor, State Capitol  
Lincoln, NE 68509  
(402) 471-2867

Brent Stevenson  
Director  
Department of Administrative Services  
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Bert Garvin  
Director  
Department of Agriculture  
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Lincoln, NE 68509  
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Irwin Chesen  
Director  
Department of Economic Development  
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(402) 471-3111

Daniel T. Drain  
Department of Environmental Control  
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Dr. Henry D. Smith  
Director  
Department of Health  
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John R. Hanlon  
Commissioner of Labor  
550 South 16th Street  
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General Edward C. Binder  
The Adjutant General  
Military Department of Nebraska  
1300 Military Road  
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Terrance L. Kubicek  
Secretary  
Nebraska Public Service Commission  
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David O. Coolidge  
Director-State Engineer  
Department of Roads  
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J. Michael Jess  
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Department of Water Resources  
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Dr. Martin Massengale  
Chancellor  
University of Nebraska-Lincoln  
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Dr. Donald E. Pursell  
Director  
Bureau of Business Research  
U of N Main Campus, 200 CBA  
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#### Nebraska Private Sector Resource Crisis Management Committee

Bus Whitehead  
Whitehead Oil Company  
2535 Randolph  
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Bill Sapp  
Sapp Brothers  
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Pro Oil Inc.  
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Vince Brown  
Nebraska Petroleum Council  
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Northern Propane  
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Grand Island, NE 68801

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7171 Mercy Road, Suite 303  
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Phillips Petroleum Company  
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Petroleum Sales Manager  
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Regional Manager  
Cengas  
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Lincoln, NE 68508

Larry L. DeRoin  
Vice-President, Administration  
Alternate: Casey Olson  
Director  
State Government Relations  
Northern Natural Gas Co.  
2223 Dodge Street  
Omaha, NE 68102

## Budget Operations

### A Comparison of Expenditures for Calendar Years 1980 and 1981

The Nebraska Energy Office (NEO) has two funding sources, the state and federal government. The major federal source is the Department of Energy.

The following expenditure breakout and comparison, by sources and fund types for each calendar year, is broken into three categories:

1) SALARY EXPENDITURES include total costs for wages and fringe benefits (social security, state retirement program, health and life insurance).

2) OPERATING EXPENDITURES include total cost for operating expenses such as postage, printing, data processing, building rent, utilities, consultants, office supplies, travel expenses and capital outlay equipment.

3) CONTRACT EXPENDITURES include total cost for contracts with outside sources such as community action agencies, Nebraska Inter-Tribal Development Corporation, the State Solar Office, the University of Nebraska, and Nebraska public schools.

Tables detailing the NEO budget, which follow, reflect an overall increase by one-quarter in funding from all sources between 1980 and 1981. However, a decrease of more than one-third was experienced in the state general fund portion of the NEO budget.

Table J

## NEO Expenditures

Description	1980	1981	% Increase/ (Decrease)
<b>State Monies:</b>			
Salary Expenditures	\$ 248,601	\$ 168,409	(32%)
Operating Expenditures	69,316	42,332	(39%)
Contract Expenditures	-0-	1,024,699	N/A
Sub Total	\$ 317,917	\$1,235,440	289% **
<b>Federal Monies:</b>			
Salary Expenditures	\$ 397,212	\$ 573,803	45%
Operating Expenditures	303,808	361,345	19%
Contract Expenditures	3,806,942	3,869,824	2%
Sub Total	\$4,507,962	\$4,804,972	7%
Totals	\$4,825,879	\$6,040,412	25%

Table K

## Disbursements Picture

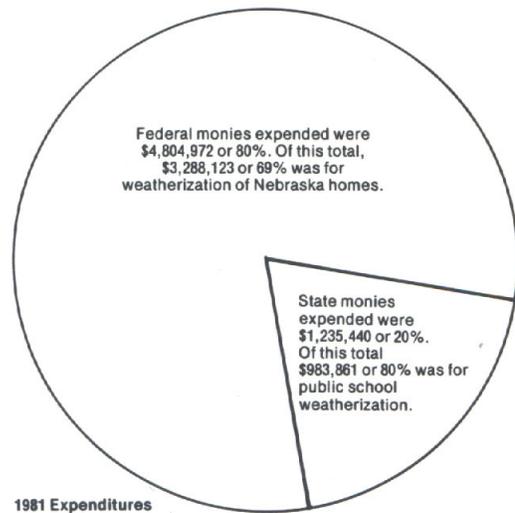
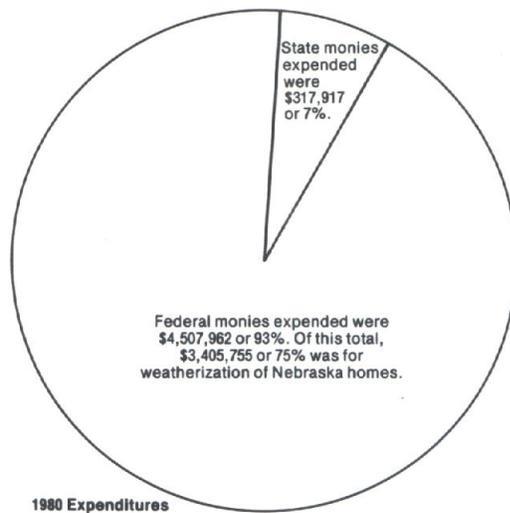


Table L

## NEO Funds

Description	1980	1981	% Increase/ (Decrease)
<b>State Fund Types:</b>			
State General Fund	\$ 317,917	\$ 193,335	(39%)
State Cash Fund	-0-	1,036,382	N/A
Other	-0-	5,723	N/A
Sub Total	\$ 317,917	\$1,235,440	289% **
<b>Federal Fund Type:</b>			
Federal Fund	\$4,507,962	\$4,804,972	7%
Sub Total	\$4,507,962	\$4,804,972	7%
Totals	\$4,825,879	\$6,040,412	25%

\*\*\$1,042,105 of the 1981 State monies expended was due to Sections 81-1632 through 81-1634, and 81-1627 through 81-1631 of the Nebraska Revised Statutes, 1981 Supplement. Of the 1981 State expenditures, 82% was passed through monies to Nebraska Public Schools and the University of Nebraska.

# Nebraska Energy Office Employees

## Director

V.B. Balok

## Deputy Director

Leo Scherer

## Public Information Officer

John Barrette

## Intragovernmental Coordinator

Ann Brockhoff

## Administrative Division

Division Manager: Michael Wolverton

Auditor: Robert Poehler

Accounting/Personnel Supervisor: Barbara Rowen

Administrative Secretary: Peggy Gochmour

Accounting Personnel Clerk: Joyce Rempe

Office Clerk II: Debbie Thomas

Receptionist: Claire Royal

Word Processing Specialist: Mary Ely

Typist II: Molly Spinks

## Conservation Division

Division Manager: Larry Riegel

Transportation/Industrial Coordinator: Robert Leavitt

Residential Energy Coordinator: Mardel Meinke

Omaha-Based Office:

Commercial Service Coordinator: Gary Nystedt

## Institutions Division

Division Manager: Daniel Berlowitz

Assistant Manager: Janice Knight

Program Supervisor: Shane Myers

Lincoln-Based Energy Auditors:

Sim Gurewitz

James Wiseman

Randy Schantell

Omaha-Based Energy Auditors:

Adelay Idler

Bradford Cummings

Grand Island-Based Energy Auditor:

Lane Leisinger

North Platte-Based Energy Auditor:

Jeffrey Morgan

## Extension Division

Division Manager: Gary Lay

Energy Education and Statistics Coordinator: Larry Scharmann

Energy Conservation Program Administrator: Leonard Pewthers

Office Clerk: Gordon Ayers

Auto Efficiency Specialists:

Michael Roberts

Kirk Stevens

Energy Data Section:

Data Applications Analyst: Ronald Konecny

Statistical Analyst II: Nikolai Rudakov

Statistical Analyst I: Betty Badberg

## Interagency Division

Division Manager: David Glaze

Technical Advisor: Kirk Conger

Administrative Assistant I: Robert Morley

Interagency Program Administrator: Peter Davis

Lincoln-Based Weatherization Specialist: Robert Wilson

Grand Island-Based Weatherization Specialist: David Harris

### Energy Office Student Interns

Larry Petr  
Gary Shaffer  
Jackie Petersen  
Renee Taner  
Greg Dunn  
Hugh McDermott  
Glenn Schinzel  
George Mechlin  
Ganesh Krishnan  
Nahketha Wright  
Barbara Boerner

### Nebraska State Solar Office Employees

Director: Robert Youngberg  
Business and Projects Manager: Robert Kudlacek  
Extension Programs Coordinator: James Bowman  
Special Projects Coordinator: Nancy Nilson  
Assistant Draftsman: Erich Helge  
Secretary III: Doris DeVries



*Transportation Services Bureau employee fills a state car with Gasohol as an ongoing part of the administration effort to lead the way in energy efficiency.*

# Seeing The Energy Picture

Tackling assignments regarding information, programs and new dimensions in energy requires a solid base of data keyed to Nebraska's energy experience. The research and statistical section of the Nebraska Energy Office (NEO) handles the task of providing this data base.

The latest extension of this function is creation of a Nebraska-specific energy demand model. The model, which became operative in December, 1981, uses economic and weather conditions to determine the amount of energy demanded by the residential, commercial, industrial, agricultural and transportation sectors in the state.

The agricultural part of the model accounts for four major end uses (field operations, grain drying, irrigation and livestock operations) and five fuel types (natural gas, electricity, propane, diesel oil and gasoline). It also uses state and national agricultural data in calculating and forecasting energy usage.

The commercial and industrial parts provide calculations and forecasting for business and manufacturing energy use. The commercial part consists of demand equations for natural gas, electricity and other oil. The industrial part covers natural gas, electricity, distillate/residual, coal and LPG or propane.

The transportation part evaluates passenger vehicles, motorcycles and heavy trucks by fuel type. The residential part covers natural gas, electricity, home heating oil and propane. It concerns demand data for 22 heating, cooling and general appliances by single and multiple family dwellings.

The model is aimed at forecasting energy demand to the end of this century, extending the continuing data capabilities of research and statistical personnel.

It is this ongoing data-gathering and analysis responsibility that enables the NEO, in this section of the 1981 annual report, to provide a visual potpourri of energy information primarily through tables, charts and graphs.

## General Energy Supply

Information on energy supplies is of critical importance in energy planning, especially in a state that is a large-scale importer of energy such as Nebraska.

Without a comprehensive, ongoing picture of the energy supply situation, it would be difficult to foresee supply and price fluctuations.

Both those factors are significant in the public and private sectors to understand the dynamics and anticipate changes in the shifting field of energy. As a result, an important responsibility of the Nebraska Energy Office (NEO) is keeping track of accurate supply data.

An energy summary covering the national scene for January-August, 1981 is presented in table M.

Total production and consumption, as well as net imports, experienced decreases in comparison with 1980 data. Total imports dropped almost 23 percent.

The decrease of almost 2 percent in total energy production and the 8.2 percent drop in coal production were linked to a strike by coal miners.

Despite increased efforts in oil exploration and development, national oil production fell slightly compared with 1980 data.

## Consumption Down

National energy consumption was 1.4 percent lower than in 1980 due to conservation and mild weather conditions. Coal consumption was up more than 4 percent despite the decreased coal production level.

The national energy supply was generally sufficient overall for the various types of fuels, but there was a moderate increase in gasoline prices.

**Table M National Energy Summary (Quadrillion (10<sup>15</sup>) Btu) Cumulative January Through August**

	1981	1980	Percent Change*
<b>Total Production</b>	<b>42.178</b>	<b>43.191</b>	<b>-1.9</b>
Petroleum <sup>1</sup>	13.631	13.712	-0.2
Natural Gas	13.299	13.214	+1.1
Coal	11.317	12.379	-8.2
Other <sup>2</sup>	3.931	3.886	+1.6
<b>Total Consumption</b>	<b>49.797</b>	<b>50.712</b>	<b>-1.4</b>
Petroleum <sup>3</sup>	21.574	22.711	-4.6
Natural Gas	13.338	13.572	-1.3
Coal	10.822	10.424	+4.2
Other <sup>4</sup>	4.063	4.005	+1.9
<b>Net Imports</b>	<b>6.519</b>	<b>8.494</b>	<b>-22.9</b>
Petroleum <sup>5</sup>	7.575	9.222	-17.5
Natural Gas	0.544	0.657	-16.9
Coal	(1.732)	(1.505)	(+15.6)
Other <sup>6</sup>	0.132	0.119	+11.8

Total may not equal sum of components due to independent rounding. Parentheses indicate exports are greater than imports.

\* Based on daily rates in order to remove the influence of leap year.

<sup>1</sup>Includes crude oil, lease condensate, and natural gas plant liquids.

<sup>2</sup>Includes hydroelectric, nuclear, and geothermal power and electricity produced from wood and waste.

<sup>3</sup>Includes refined petroleum products and natural gas plant liquids.

<sup>4</sup>Includes hydroelectric, nuclear, and geothermal power, electricity produced from wood and waste, and net imports of electricity and coal coke.

<sup>5</sup>Includes crude oil, lease condensate, refined petroleum products, unfinished oils, natural gasoline, plant condensate, and imports of crude oil for the Strategic Petroleum Reserve.

<sup>6</sup>Includes net imports of electricity and coal coke.

Source: Monthly Energy Review, November 1981, U.S. Department of Energy.

# National Oil Supply

Stocks of crude oil and petroleum products, along with motor gasoline stocks, remained above or in the average range.

Stocks of distillate fuel oil remained above or in the average range until near the end of the year, when they dipped to slightly below average.

The U.S. Department of Energy supplied the graphs in tables N, O and P to portray these facts regarding overall petroleum status at the national level.

Stocks of crude oil and petroleum products were down 5 percent from a year ago, but up 1 percent from 1979.

Stocks of motor gasoline during 1980 and the first half of 1981 were higher than the midpoint of the average range, reflecting instability of imports from OPEC (Organization of Petroleum Exporting Countries) members. During the July-November, 1981 period, motor gasoline stocks were close to the average range.

Motor gasoline stocks in November, 1981 were 7 percent lower than in the same month of 1980, but

were almost 9 percent higher than in November, 1979.

The distillate oil stocks followed the regular seasonal pattern. The November, 1981 level was 13 percent lower than in the same month of 1980 and 18 percent lower than November, 1979. However, because of sufficient crude oil stocks there is no shortage seen in distillates.

There is cautious optimism that in 1982 there will be no serious oil shortage or abrupt price increase, barring war or revolution in the Middle East. These are the reasons:

- The last OPEC decision basically retained the oil price for benchmark crude Arab Light at \$34 per barrel until the end of 1982.

- The current balance between price and oil supply may help avoid price increases. The previous base price level for Arab Light of \$32 per barrel was constant for 11 months despite efforts by some Arab countries to boost it.

- The high petroleum stocks of oil in consuming nations in 1980 and the first half of 1981 not only prevented a new price increase, but also caused some softening of the average international price.

Table N

**Stocks of Crude Oil and Petroleum Products<sup>3</sup>**  
(Millions of Barrels)

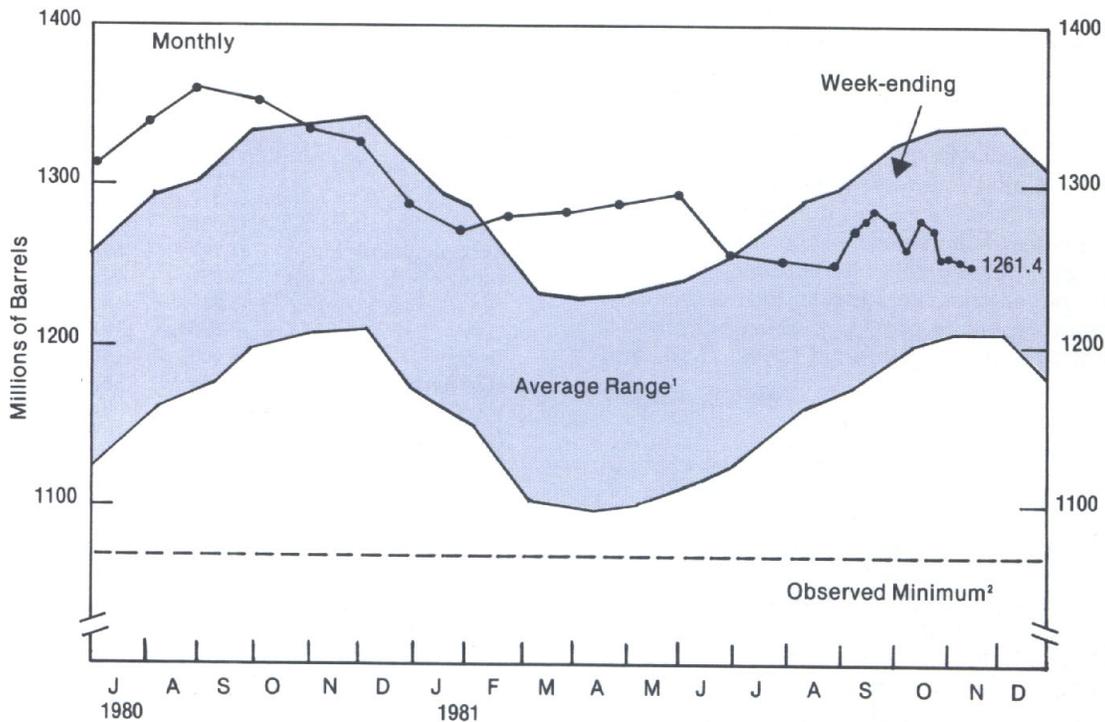
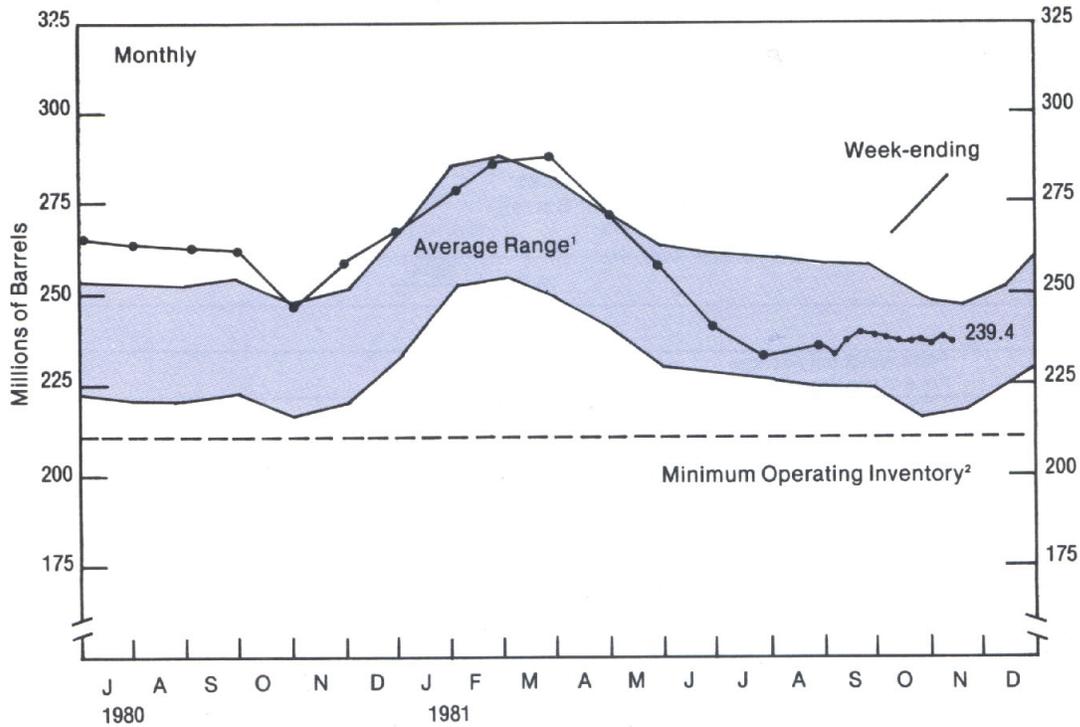


Table O

**Stocks of Motor Gasoline, U.S. Total  
(Millions of Barrels)**



**Stocks of Distillate Fuel Oil, U.S. Total  
(Millions of Barrels)**

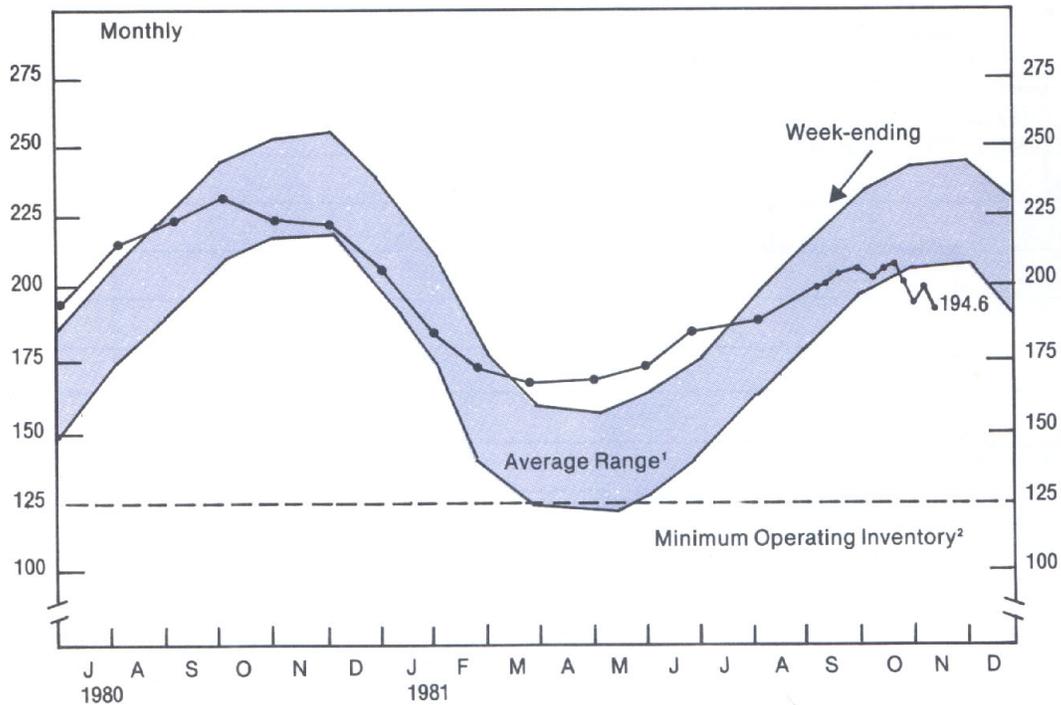


Table P

<sup>1</sup> Average level and width of average range are based on three years of monthly data from January, 1978 through December, 1980. The seasonal pattern is based on seven years of monthly data from January, 1973, through December, 1979.

<sup>2</sup> The National Petroleum Council defines Minimum Operating Inventory as the minimum level required for routine operation. By their definition, runouts and shortages would occur if inventory levels fall below that level.

Source: — Ranges and seasonal patterns: 1973-1978, EIA, "Petroleum Statement, Annual (Final Summary)."

— 1979 totals: EIA, "Petroleum Statement, Annual (Final Summary)."

— 1979 Regional Data: EIA, "Petroleum Statement Monthly."

— Monthly Data: January, 1980-May, 1981, EIA, "Petroleum Statement, Monthly;" June, 1981-August, 1981, EIA, "Monthly Petroleum Statistics Report."

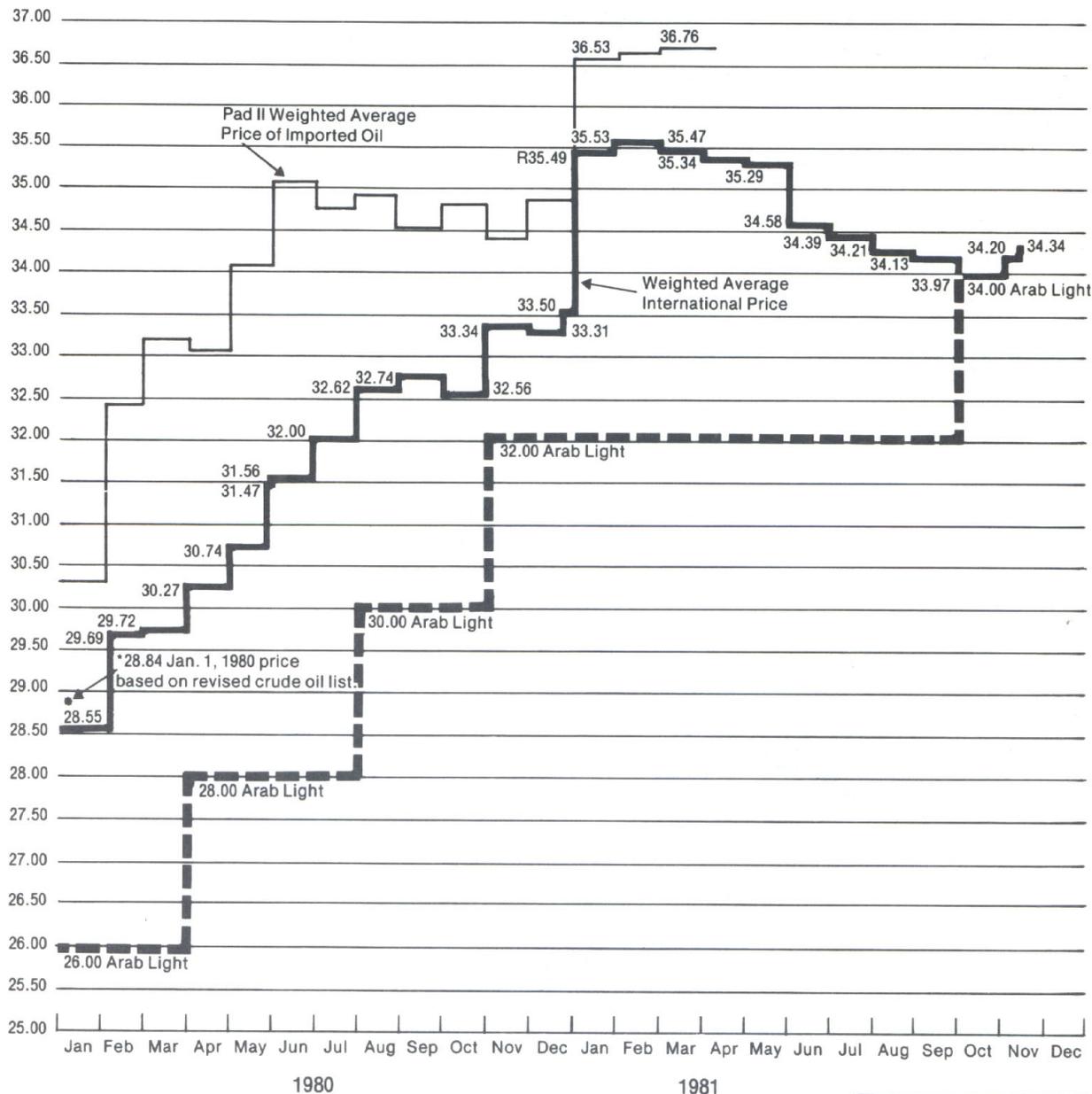
— September 4, 1981—Current week: Estimates based on EIA weekly data.

<sup>3</sup> Excludes stocks held in strategic petroleum reserve and includes oil in transit to refineries.

The weighted average international price, the price for benchmark crude Arab Light, and the weighted average price of imported oil coming into Petroleum Administration District II (PAD 2) are shown in table Q. Nebraska is part of PAD 2, which covers 15

Midwestern states. The PAD 2 oil price was substantially higher throughout 1980 and most of 1981 than the prices for international and benchmark crude. PAD 2 levels, however, followed the same pattern as the weighted average international price.

**Table Q**  
**Crude Oil Prices<sup>1</sup>**  
**(Dollars per Barrel)**



<sup>1</sup> Internationally traded oil only. Average price (FOB) weighted by estimated export volume.

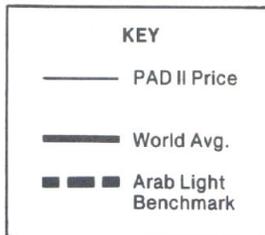
Note: Beginning with the May 1, 1981 issue of the Weekly Petroleum Status Report, the world crude oil price is based on a revised crude list.

Additions: Saudi Arabia's Arabian Heavy, Dubai's Fateh, Egypt's Suez Blend, and Mexico's Maya.

Omissions: Canadian Heavy.

Replacements: Iraq's Kirkuk Blend for Iraq's Basrah Light.

The above graph shows an estimated world crude oil price based on this revised list beginning January 1, 1981. An asterisk shows the January 1, 1980 price based on the revised list. All other 1980 prices represent the old crude list before revisions.



# Nebraska Energy Supply

During 1981, the Nebraska energy supply continued to follow trends at the national level. This part of the NEO annual report for 1981 deals primarily with the state's energy supply, but in certain cases supply or deliveries virtually represent Nebraska consumption.

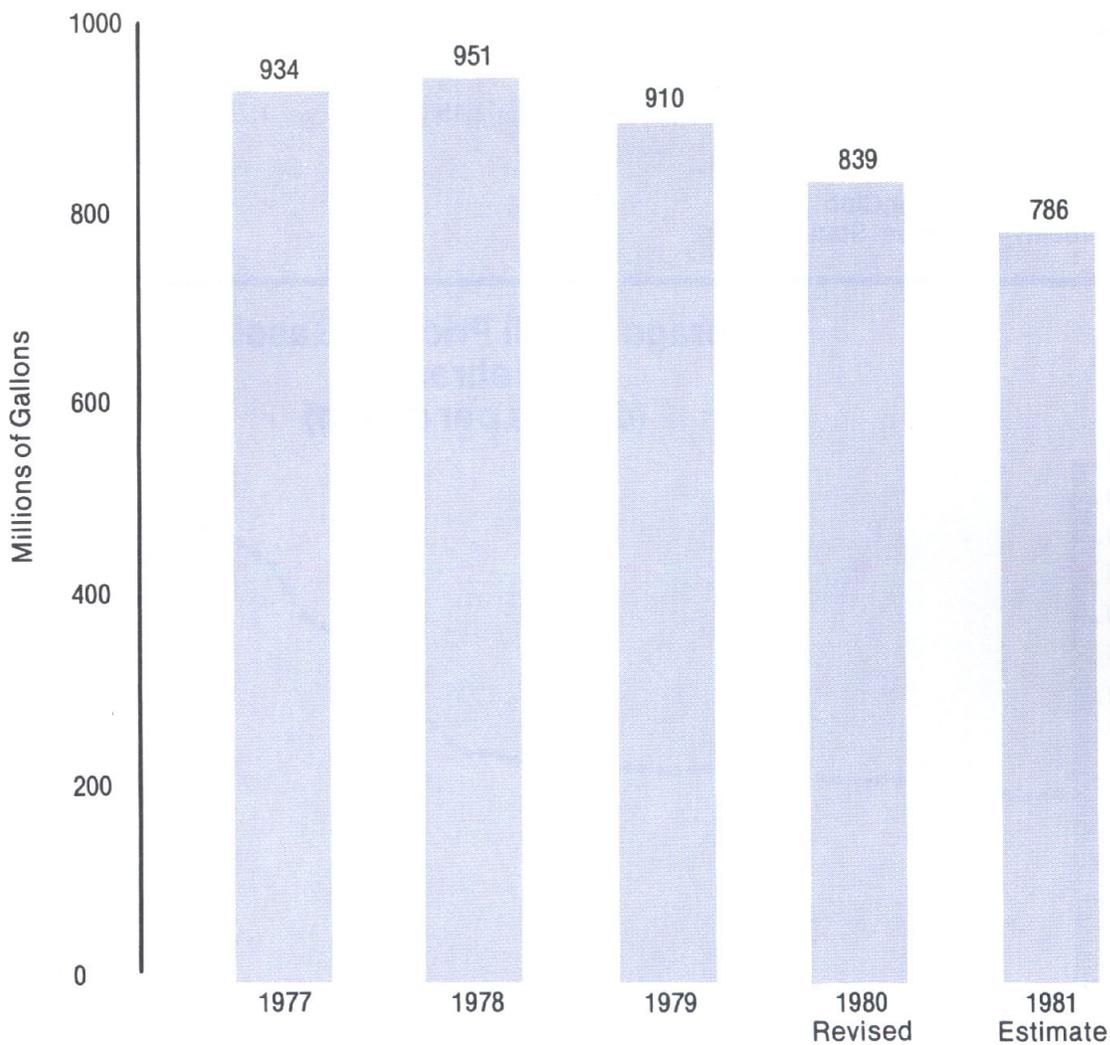
## Gasoline

Motor gasoline data, as compiled by the Nebraska Department of Revenue, is approximately the same as consumption. The supply-consumption experience in Nebraska decreased for the third straight year in 1981, as is shown in table R.

Reasons for this accomplishment are identified by the NEO research and statistical personnel as price-induced conservation efforts, the increased number of new smaller and more fuel-efficient vehicles, and the

Table R

Supply of Motor Gasoline and Gasohol in Nebraska



Supply virtually equal sales

Source: Nebraska Department of Revenue  
Nebraska Energy Office, December, 1981.

growing number of diesel engines in cars and trucks.

As cited in the conservation section of this report, the supply-consumption situation involving motor gasoline in Nebraska continues dropping from the peak of 951 million gallons reached in 1978, which is demonstrated graphically in the motor gasoline supply table.

The retail price for motor gasoline in Nebraska during 1981 fluctuated between \$1.21 and \$1.35 per gallon, ending the year in the mid-range between those amounts.

Nebraska's gasoline price experience, as compiled by the Cornhusker Motor Club, is shown in tables S and T.

**Table S** **Average Retail Price of Gasoline in Nebraska**  
(Dollars per Gallon)

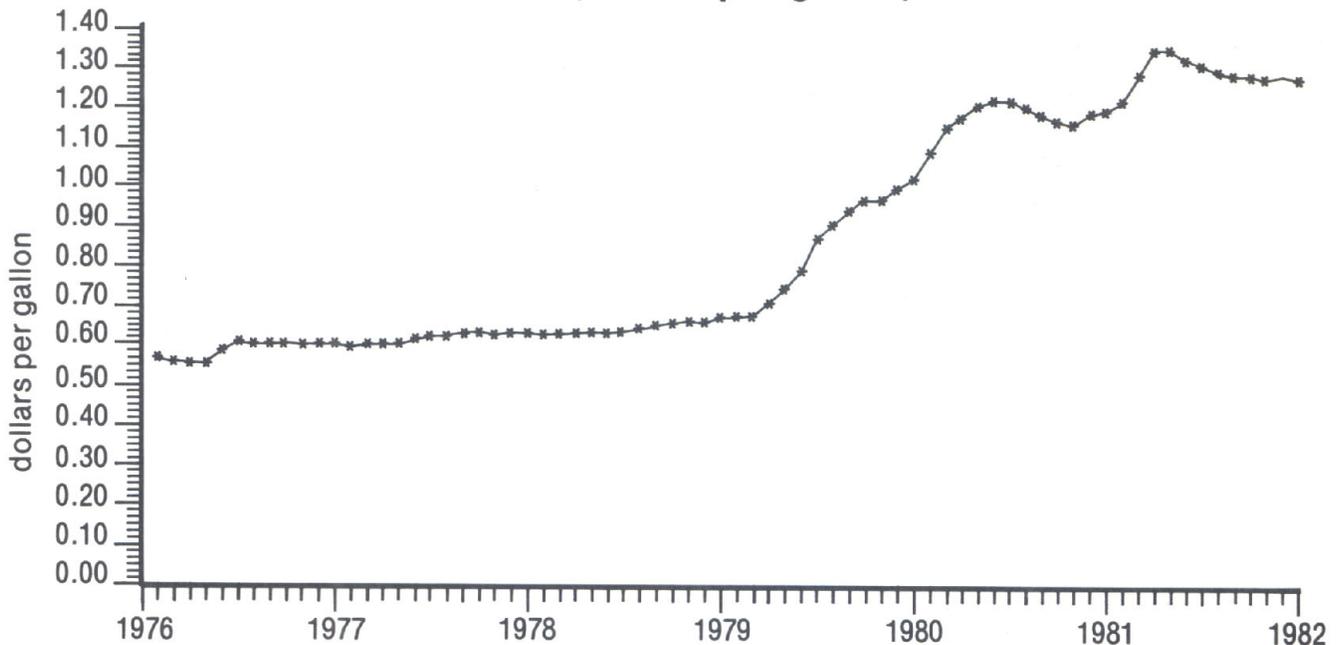
	1978	1979	1980	1981	Percent of Previous Year
January	\$ .63	\$ .67	\$1.09*	\$1.21	111.0
February	.63	.68	1.15	1.28	110.9
March	.63	.71	1.18	1.35	114.2
April	.63	.74	1.21	1.35	111.4
May	.63	.79	1.22	1.32	108.3
June	.63	.87	1.22	1.31	107.3
July	.64	.90	1.20	1.29	107.7
August	.65	.94	1.18	1.29	109.1
September	.66	.97	1.17	1.28	110.0
October	.66	.97	1.16	1.28	109.7
November	.66	1.00	1.19	1.28	108.2
December	.67	1.02	1.19	1.28	106.9
				Average	109.6%

Source: Cornhusker Motor Club

\*Source: Weekly Petroleum Status Report

**Table T**

**Average Retail Price of Gasoline**  
**in Nebraska**  
(dollars per gallon)



Source: Cornhusker Motor Club

—\*— AAA Gasoline survey of prices

## Distillates

Middle distillate deliveries dovetailed closely with consumption. Nebraskans have managed to decrease use of middle distillates significantly in 1979, 1980 and 1981, compared with the peak year experience in usage recorded in 1978.

That peak reached more than 538 million gallons, while the figures in the subsequent years were lowered toward 400 million gallons annually, with 1981 data based on projections because December totals were missing.

Middle distillates include diesel, home heating oil, kerosene and other similar fuels.

Research and statistical personnel at the NEO said the conservation accomplishments resulted from a

combination of greater awareness of energy efficient techniques and favorable weather conditions.

There was an exceptionally warm spell during the 1980-81 winter season. A mild summer in 1981 brought 5.4 percent fewer cooling days, cutting the amount of diesel fuel needed for peak electric generation units during the warm months. More summer rains than usual cut the amount of diesel fuel required for irrigation.

The state's experience since 1977 in middle distillate fuel deliveries/consumption is portrayed in table U.

Despite the significant decreases in middle distillate consumption recorded in 1979, 1980 and 1981, research and statistical personnel at the NEO caution the favorable weather conditions most responsible cannot be expected every year.

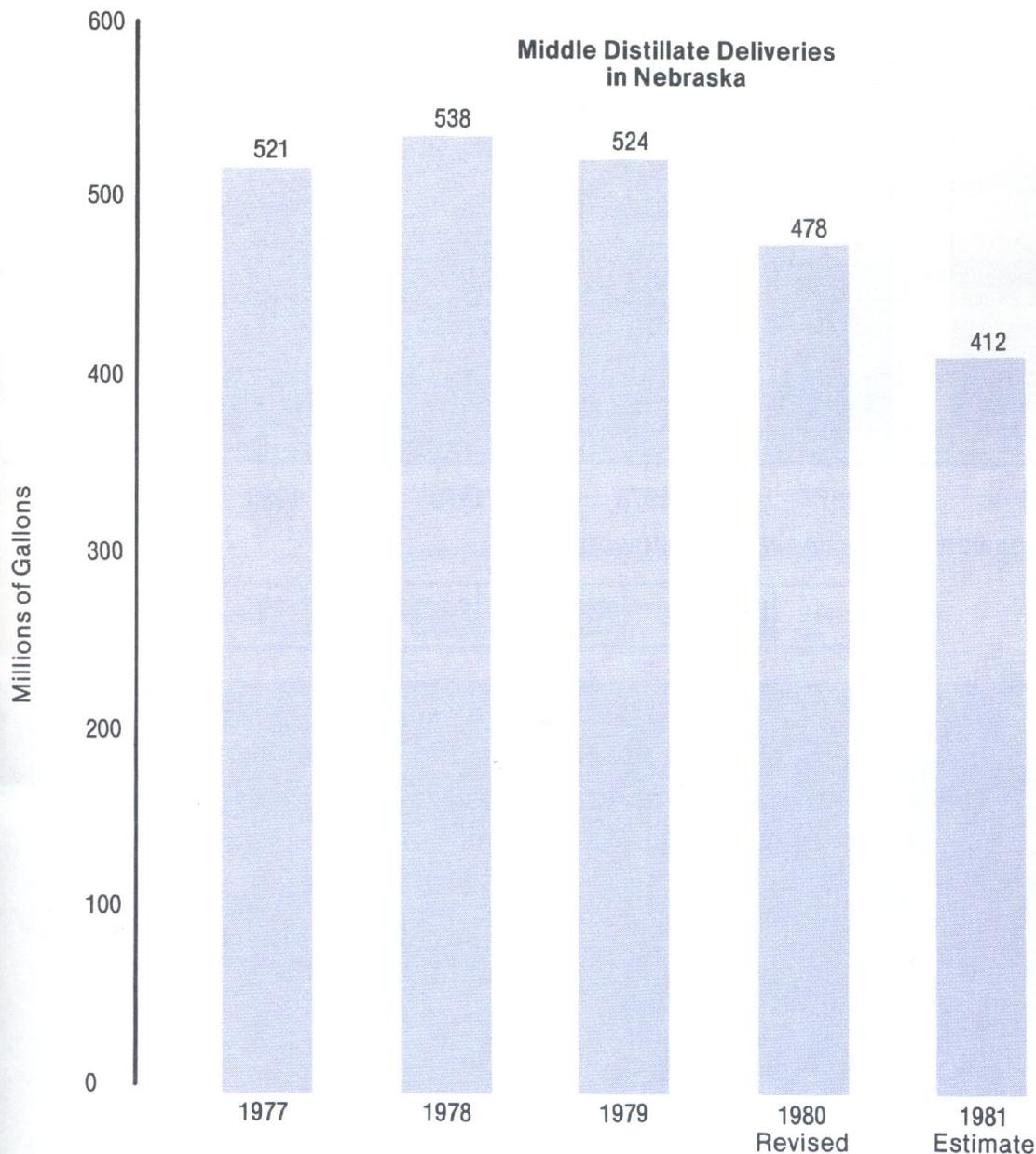


Table U

Deliveries virtually equal sales

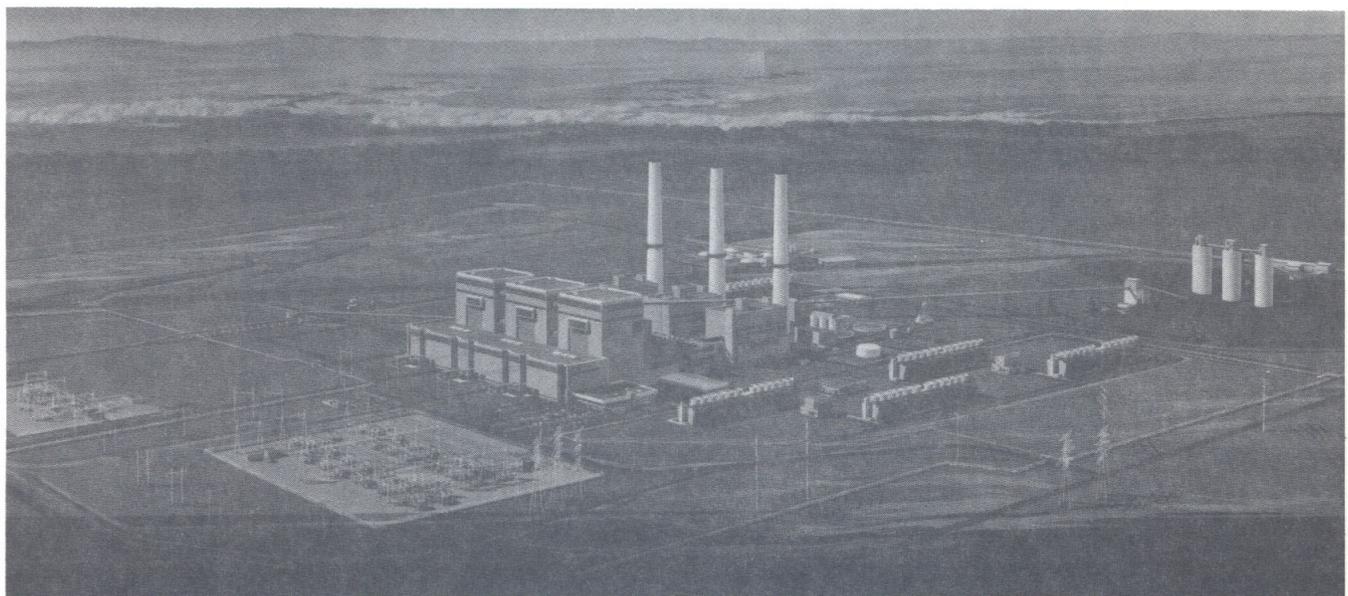
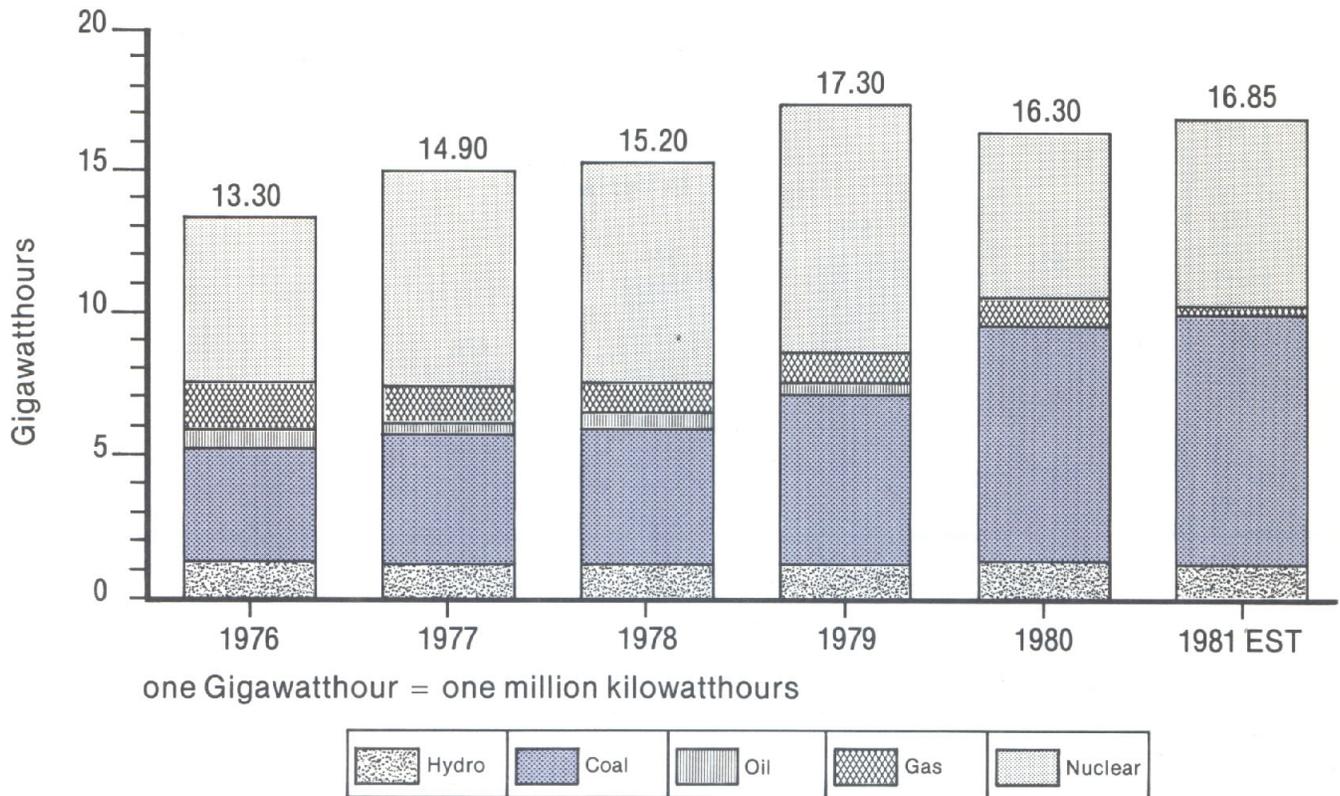
Source: Energy Information Administration  
Form 25. Nebraska Energy Office, December, 1981.

# Electricity

Electricity production in Nebraska has a strong coal and nuclear base, while the use of oil to generate electric power is decreasing annually. The five sources for electric power generation are compared in table V, in which the increasing reliance on coal and nuclear are shown.

An ample supply of open-mined coal from nearby states makes coal-fired steam turbine generation of electricity a stable energy source now and in the future. The increase in coal consumption for the state's electricity generation, including data on the new Gentleman II, Grand Island and Hastings units, is shown in table W.

## Nebraska Electricity Production by Energy Source



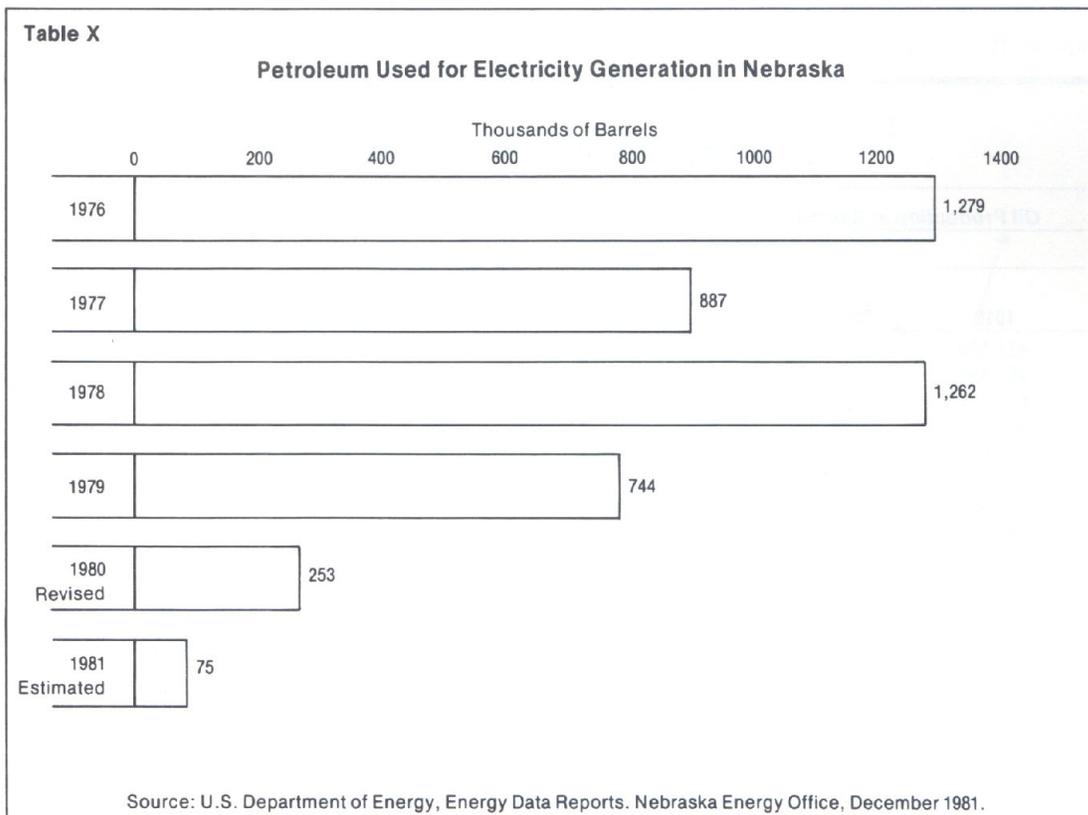
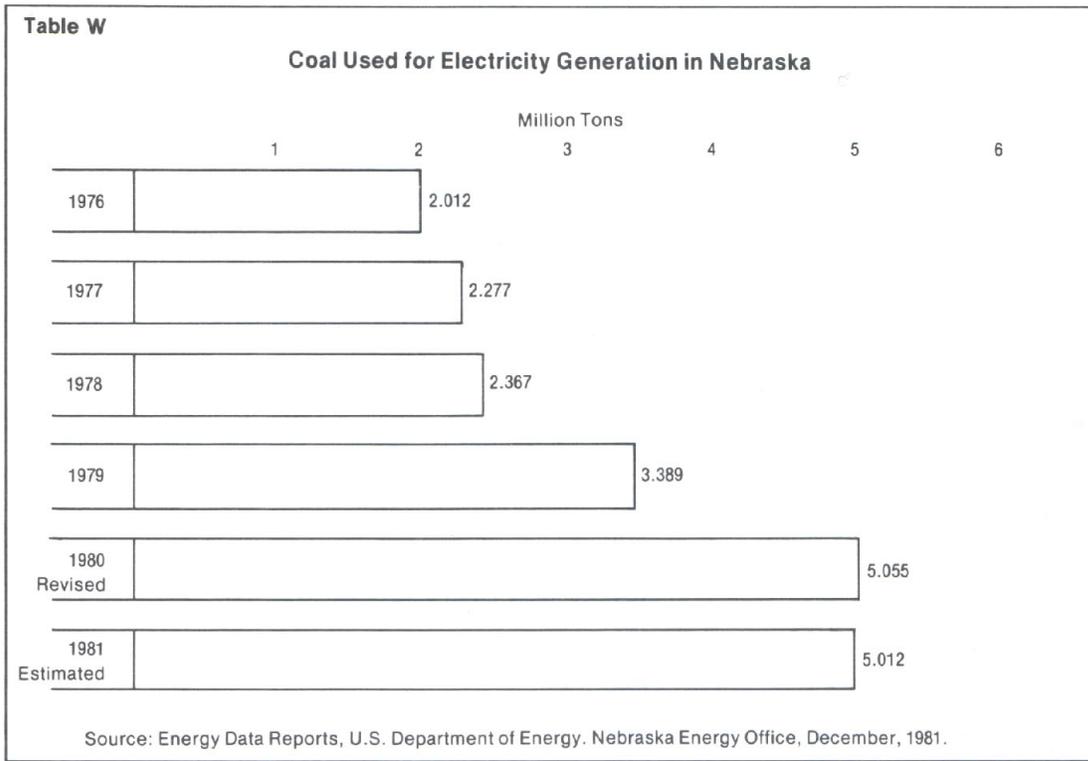
Artist's rendering of the Laramie River Power Station in Wyoming, which provides electricity from the coal-fired unit

to the Lincoln Electric System, areas in the Nebraska Panhandle and other regions among western states.

The shift from expensive fuels such as petroleum and natural gas to more plentiful and less expensive fuels for electricity generation continues. Nebraska electric utilities used more than five million tons of coal in

1981, compared with two million tons in 1976.

At the same time, the use of petroleum products for electricity generation decreased almost tenfold in 1981, compared with 1979, as is shown in table X.



Sales of electricity to Nebraska's ultimate consumers are shown in table Y. The five columns show sales by three major utilities: Nebraska Public Power District, Omaha Public Power District and Lincoln Electric System.

Total electric sales to Nebraska consumers showed a moderate decline of 3.6 percent. The highest decline of 8.4 percent took place in the residential sector. This decline in residential use is associated with favorable weather conditions and conservation efforts.

Commercial and public use of electricity declined in 1981 by approximately 2 percent. Industrial consumption of electricity exceeded the previous year's level by 0.5 percent.

Nebraska oil production experienced an increase in 1981, compared with the two previous years. In table Z, data on oil production is shown according to barrels and drilling permits. The partial listing reflects incomplete data for the year.

Table Y

**Electricity Sales to Ultimate Consumers  
By Three Major Nebraska Electric Utilities  
(From Edison Electric Institute Monthly Reporting Form)**

Month		Total Sale GWh	Residential GWh	Commercial GWh	Industry GWh	Public Use GWh
1980	November	623	205	201	190	28
	December	703	255	221	189	29
1981	January	761	297	238	196	30
	February	717	274	234	188	29
	March	651	234	200	188	27
	April	620	199	197	197	27
	May	614	190	202	197	26
	June	714	239	229	220	27
	July	892	360	273	227	31
	August	817	319	257	209	30
	September	724	245	234	215	31
	October	639	198	210	200	31
TOTAL		8,475	3,015	2,696	2,416	346

1 million kilowatthours = 1 gigawatthour = 1 GWh

Table Z

**Nebraska Oil Production and Exploration**

Month	Oil Production in Barrels				Drilling Permits							
					Exploratory				Development			
	1979	1980	1981	**	1979	1980	1981	**	1979	1980	1981	**
January	483,206	502,703	554,180	110	35	45	27	60	22	21	27	129
February	451,691	480,512	503,868	105	10	21	22	105	18	27	29	107
March	515,334	516,836	565,799	109	20	20	16	80	22	25	22	88
April	501,530	486,000	559,925	115	25	19	23	121	27	30	56	187
May	525,112	540,000	553,556	103	20	27	15	56	14	28	40	143
June	507,398	509,397	548,195	108	18	17	50	294	20	32	30	94
July	518,302	504,840	547,937	109	36	14	27	193	17	33	44	133
August	543,823	547,833	578,214	106	20	13	39	300	20	16	20	125
September	508,758	534,617	559,887	105	24	34	23	68	16	22	24	109
October	536,185	539,889			38	41	34	83	18	32	24	75
November	458,615	502,264			37	34			26	30		
December	501,008	529,079			30	24			33	27		
TOTALS	6,050,962	6,193,970	4,971,561	108	313	309	276	110	253	323	316	119
*Annual Summary												
Totals	6,068,019	6,239,652			320	309			255	311		

Notes: \*Annual summary data is compiled after corrections and is considered more reliable.

Electricity generation and fuels used by the Omaha Public Power District, the Nebraska Public Power District, the Lincoln Electric System, Grand Island and Fremont are listed in table AA.

Nebraska natural gas price and consumption are compared in table BB. As the graph shows, consumption has decreased somewhat as the price has increased in recent years.

Table AA

**Electricity Generation and Primary Fuels Used  
By Five Major Nebraska Electric Utilities  
(OPPD, NPPD, LES, GRAND ISLAND, FREMONT)**

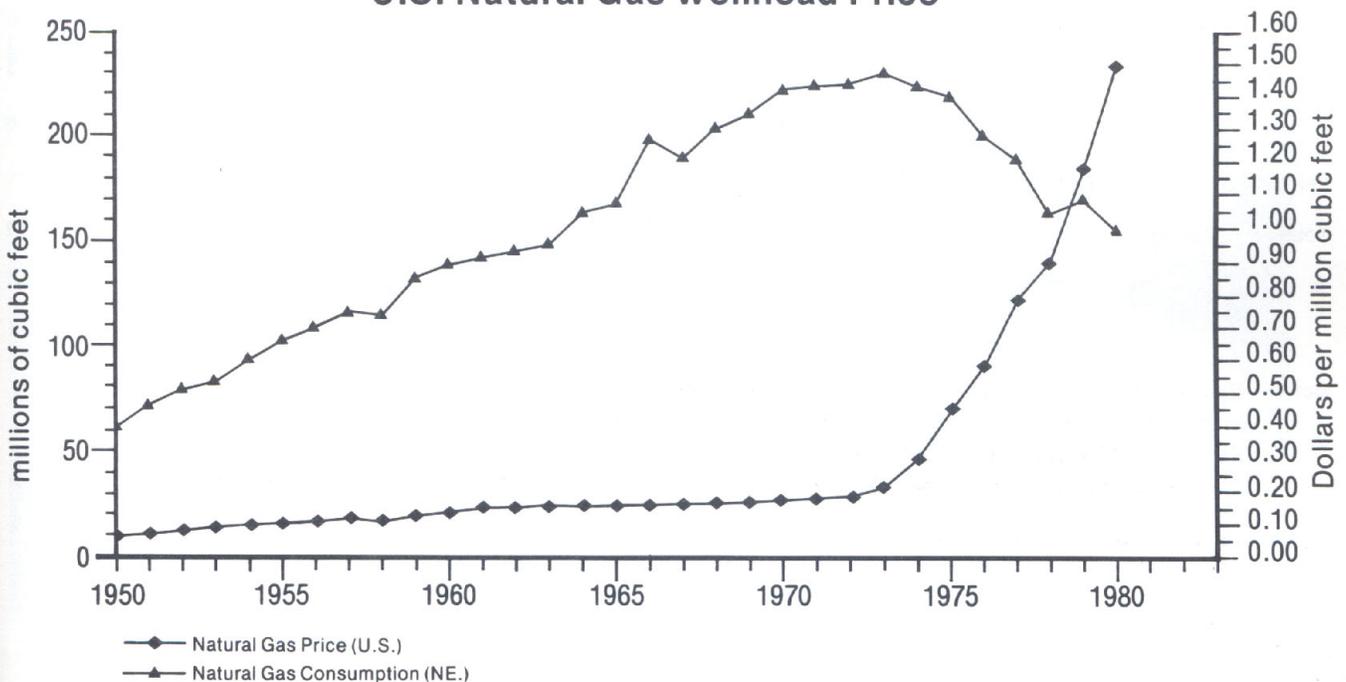
Year	Month	Net Generation *GWh	Bitum. Coal Thousands Sh. Tons	Heavy Oil Barrels	Light Oil Barrels	Natural Gas MCMF	Generated By Nuclear Stations *GWh
1980	November	1,048	233	8	3,475	191	589
	December	1,434	376	1,059	3,151	207	731
1981	January	1,491	442	202	3,439	186	695
	February	1,340	352	4,221	6,836	136	713
	March	1,359	398		1,574	156	664
	April	1,210	462	1	7,093	164	407
	May	943	439	381	4,866	243	156
	June	1,193	387		5,996	338	482
	July	1,627	477		8,380	501	781
	August	1,412	365		5,771	265	767
	September	1,097	438		1,771	165	331
	October	769	440	2	422	22	-3
	TOTAL	14,923	4,809	5,874	52,774	2,574	6,313

Source: FPC 12 E2 Reporting Forms

\*1 million kilowatthours = 1 gigawatthour = 1 GWh

Table BB

**Nebraska Natural Gas Consumption and  
U.S. Natural Gas Wellhead Price**



# Nebraska Energy Consumption

Revised 1980 energy consumption data by fuel type and consuming sector is presented in table CC. Comparing the data with preliminary estimates published in the NEO annual report for 1980 showed that coal and motor gasoline consumption were underestimated while middle distillate and nuclear energy were overestimated. However, the total amount of energy consumed in the state differs only slightly from the estimates.

In the 1980 annual report from the NEO, the fuels distribution between sectors was made in proportion with previous years, arbitrarily to some degree. However, in this report the energy distribution between fuels in every sector was calculated by independent

model. Only minimal proportional corrections were made to insure that the total amount of middle distillates and liquified petroleum gas did not exceed the amount reported by the state's Department of Revenue.

Preliminary estimates of 1981 Nebraska energy consumption are shown in table DD. They are presented by fuel type and consuming sector. The estimates are based on data available for the first eight-to-ten months of 1981.

Estimates reveal that in 1981, Nebraskans used 17 trillion fewer British thermal units (Btus) of energy in comparison with 1980. The major savings took place in the consumption of natural gas, middle distillates, liquified petroleum gas and gasoline. Consumption of nuclear energy and coal increased.

The main portion of the energy savings is associated with favorable weather and motor gasoline fuel efficiencies.

**Table CC 1980 Nebraska Energy Consumption by Fuel Type and Consuming Sector (Revised) in Trillions (10<sup>12</sup>) Btu**

Fuel Type	Conversion Factor	Electric Utilities	Residential	Commercial	Industry	Agriculture	Transportation	Total	%
Coal	22.56 10 <sup>6</sup> Btu/t	114.0	—	—	9.4	—	—	123.4	22.8
Natural Gas	.994 10 <sup>9</sup> Btu/mcf	11.6	59.6	36.4	35.3	10.3	—	153.2	28.4
Motor Gasoline	0.12495 10 <sup>6</sup> Btu/gal	—	—	—	—	3.8	101.0	104.8	19.4
Aviation Fuel	0.1334 10 <sup>6</sup> Btu/gal	—	—	—	—	—	5.5	5.5	1.0
Liquified Petroleum Gas	0.0955 10 <sup>6</sup> Btu/gal	—	4.2	2.5	1.1	7.5	—	15.3	2.8
Middle Distillates	0.1387 10 <sup>6</sup> Btu/gal	1.4	3.3	6.1	6.6	24.9	20.1	62.4	11.6
Nuclear		61.6	—	—	—	—	—	61.6	11.4
Hydro		13.9	—	—	—	—	—	13.9	2.6
Electricity Sales	3413 Btu/kWh	(46.8)	18.9	13.9	9.5	4.5	—	NA	
Total		155.7*	86.0	58.9	61.9	51.0	126.6	540.1	100
%		28.8	15.9	10.9	11.5	9.4	23.4	100	

Notes: Sum of components may not equal total due to independent rounding.

In order to get physical units, divide the Btu by the corresponding conversion factor.

Data is preliminary; further revision is possible.

\*Generation and transmission losses equal total energy used by electric utilities excluding electricity sales.

Nebraska Energy Office, December, 1981

Table DD

**Preliminary Estimates of  
1981 Nebraska Energy Consumption by Fuel Type and Consuming Sector  
in Trillions (10<sup>12</sup>) Btu**

Fuel Type	Conversion Factor	Electric Utilities	Residential	Commercial	Industry	Agriculture	Transportation	Total	%
Coal	22.56 10 <sup>6</sup> Btu/t	113.1	—	—	10.3	—	—	123.4	23.6
Natural Gas	.994 10 <sup>6</sup> Btu/mcf	9.7	55.4	32.6	33.2	11.0	—	141.9	27.1
Motor Gasoline	0.12495 10 <sup>6</sup> Btu/gal	—	—	—	—	3.9	94.3	98.2	18.8
Aviation Fuel	0.1334 10 <sup>6</sup> Btu/gal	—	—	—	—	—	4.8	4.8	0.9
Liquified Petroleum Gas	0.0955 10 <sup>6</sup> Btu/gal	—	2.8	1.7	0.8	6.1	—	11.4	2.2
Middle Distillates	0.1387 10 <sup>6</sup> Btu/gal	0.4	2.8	5.4	6.0	22.4	19.2	56.2	10.7
Nuclear		73.3	—	—	—	—	—	73.3	14.0
Hydro		13.9	—	—	—	—	—	13.9	2.7
Electricity Sales	3413 Btu/kWh	(45.5)	17.9	13.6	9.5	4.5	—	NA	
Total		164.9*	78.9	53.3	59.8	47.9	118.3	523.1	100
%		31.5	15.1	10.2	11.4	9.2	22.6	100	

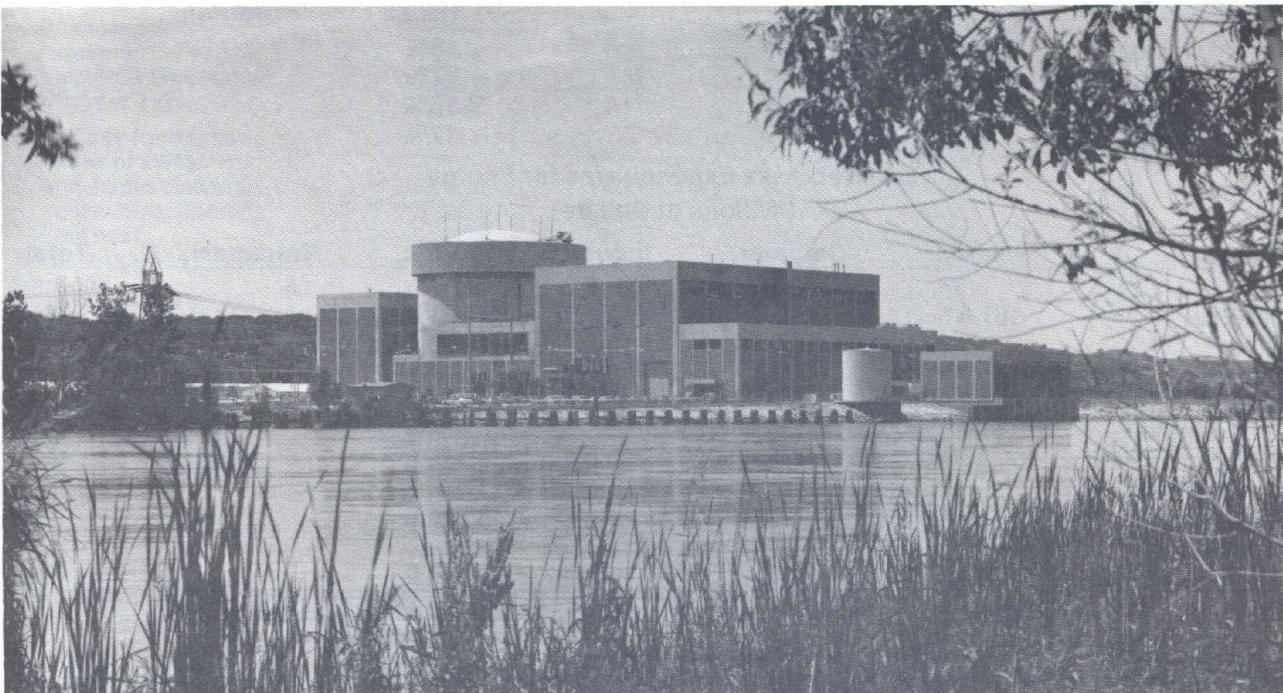
Notes: Sum of components may not equal total due to independent rounding.

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Nebraska Energy Office, December, 1981

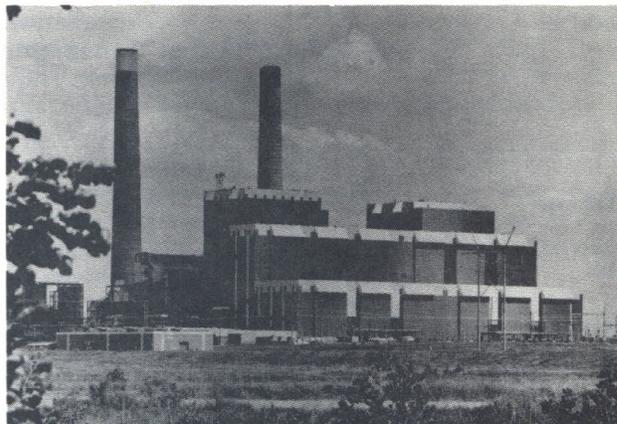


*The Fort Calhoun Nuclear Station provides power for electrical consumers in the Omaha Public Power District.*

# Nebraska Energy Experience

The Nebraska Energy Office (NEO) in this 1981 annual report has used the latest available data at publication to provide as full a picture of the state's energy situation as possible.

However, much of the data is preliminary. In an effort to provide the full picture on energy, this part covers the Nebraska energy experience in as concise a manner as the topic allows.



*The Gerald Gentleman Power Station near Sutherland in western Nebraska generates power used in the Nebraska Public Power District.*

Table EE

## Nebraska Energy Production in 1980

### Electricity

18,960 gigawatt hours generated and net available for sale  
 13,708 gigawatt hours sold to ultimate consumers  
 5,252 gigawatt hours total sold out of state or 26.1% of total generation.  
 Includes 3788 gWh for Iowa Power and Light Company portion of the Cooper Nuclear Station  
 (1 gigawatt hour = 1 million kWh)

**Average Retail Value  
at 3.3¢ per kWh**

\$637 million  
461 million

\$176 million

**Average Domestic Wellhead  
Value @ \$24.00 per bbl**

\$151 million

**Oil Production** — 6,239,652 barrels (Crude only)

Nebraska oil is shipped out of state to be refined and put into pipelines for distribution throughout the midwest.

**Gross State Product** Total value of all final goods and services in 1979

\$16.58 Billion

Four Largest Components  
of Gross State Product

1979 Billions of dollars

Percentage of  
Gross State Product

Trade	2.91	18%
Manufacturing	2.76	17%
Finance	2.53	15%
Agriculture	1.96	12%

### 1980 Nebraska Expenditures for Energy (Millions of Dollars)

Fuel Type	Resident.	Commer.	Industry	Agric.	Transport.	Total
Coal	\$	\$ 0.1	\$ 5.2	\$	\$	\$ 5.3
Natural Gas	161.9	99.3	129.6	31.0		421.8
Gasoline		3.9	9.7	29.2	941.9	984.7
Aviation Fuel					35.6	35.6
L.P.G.	33.2	6.2	16.9	29.2		85.5
Home heating oil	56.0	17.0		89.0		162.0
Diesel fuel		29.0	40.0	85.0	160.8	314.8
Other petroleum (kerosene, residual)	10.0	9.0		10.0		29.0
Electricity	207.0	94.0	102.0	58.0		461.0
<b>TOTAL</b>	<b>\$468.1</b>	<b>\$258.5</b>	<b>\$303.4</b>	<b>\$331.4</b>	<b>\$1,138.3</b>	<b>\$2,499.7</b>

Sources: Edison Electric Institute, EIA-25 reports, Energy Price Forecast, Nebraska Statistical Handbook.

\*Gross State Product figures for 1979 provided from Nebraska Statistical Handbook for comparison with 1980 production and expenditure experience; 1980 Gross State Product unavailable at publication.

Distribution between sector and fuel types are estimated by data section.

Prepared by: NEBRASKA ENERGY OFFICE October, 1981

Table EE on the preceding page presents data on energy production and costs in 1980, contrasted with the 1979 gross state product. This contrast is provided to show the large percentage required to fuel the state's economy.

Table FF on this page provides extensive data on energy use in Nebraska from 1976 through 1981, with the 1981 figures preliminary. This table indicates that Nebraskans have been increasingly aware of conservation over the past five years.

Table FF

Source	Utilization of Energy in Nebraska					
	1976	1977	1978	1979	1980 (Revised)	1981 (Prelim)
<b>Natural Gas (billions of cubic feet)</b>						
Residential	53.4	52.9	48.2	53.5	60.0	55.7
Commercial	38.2	37.5	32.0	31.8	36.6	32.8
Industrial	58.8	60.4	51.2	50.1	35.5	33.4
Other	0.1	9.5	8.7	11.7	10.4	11.1
Electricity	17.4	15.6	12.8	14.0	11.7	9.8
<b>TOTAL GAS</b>	<b>168.0</b>	<b>175.9</b>	<b>152.9</b>	<b>161.1</b>	<b>154.2</b>	<b>142.8</b>
<b>Middle Distillate Fuels (millions of gallons)</b>						
Aviation Fuel	37.6	42.8	46.0	42.4	41.1	36.0
No. 1 fuel oils	14.1	51.6	36.8	42.6*	30.7	18.1
No. 2 heating oils	271.7	188.5	191.0	201.9*	177.2	158.6
Diesel fuel	155.2	294.2	309.9	316.2*	270.4	239.6
<b>TOTAL DISTILLATES</b>	<b>478.6</b>	<b>577.1</b>	<b>583.7</b>	<b>603.1</b>	<b>519.4</b>	<b>452.3</b>
<b>LP-Gas (millions of gallons)</b>						
Residential/Commercial	156.1	138.8	141.5	121.9*	84.3**	60.1
Internal Combustion	26.3	19.3	17.9	15.4*	35.2**	25.0
Industrial	18.3	25.9	19.9	17.2*	7.5**	8.4
Other	73.4	65.1	50.3	43.4*	33.0**	20.4
<b>TOTAL LPG</b>	<b>274.1</b>	<b>249.1</b>	<b>229.6</b>	<b>197.9</b>	<b>160.0</b>	<b>113.9</b>
<b>Gasoline (millions of gallons)</b>						
Agricultural	91.7	35.1	24.0	24.4	30.4	31.2
Transportation	828.6	899.3	927.2	868.1	808.3	754.7
Other				10.8		
<b>TOTAL GASOLINE</b>	<b>920.3</b>	<b>934.4</b>	<b>951.2</b>	<b>903.4</b>	<b>839.0</b>	<b>785.9</b>
<b>Coal (millions of tons)</b>						
Commercial	N/A	0.03	0.01	0.01*		
Industrial	N/A	0.28	0.55	0.55*	0.42	0.46
Electricity Generation	N/A	1.82	2.90	3.46	5.05	5.01
<b>TOTAL COAL</b>	<b>2.27</b>	<b>2.12</b>	<b>3.46</b>	<b>4.02</b>	<b>5.47</b>	<b>5.47</b>
<b>Electricity Production (millions of kWh)</b>						
from hydro stations	1276	1221	1187	1246	1335	1197
from nuclear sources	5824	7452	7725	8658	5783	6628
from coal	3919	4493	4664	6027	8123	8595
from natural gas	1599	1293	994	1088	947	430
from oil	673	425	631	398	126	51
<b>Total Electricity Production</b>	<b>13,291</b>	<b>14,884</b>	<b>15,201</b>	<b>17,417</b>	<b>16,314</b>	<b>16,901</b>
<b>Electricity Sales to Ultimate Consumers (millions of kWh)</b>						
		12,404	13,339	13,357	13,708	13,331
<b>Total Annual Btu Equiv. x 10**12</b>	<b>507.7</b>	<b>547.9</b>	<b>560.3</b>	<b>571.8</b>	<b>540.1</b>	<b>523.1</b>

NOTES: Sum of the components may not equal totals due to independent rounding  
Methodology of 1980 estimation of LP gas components was changed.

\*Estimates

\*\*Estimated by NEO survey.

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