

# NEBRASKA ENERGY OFFICE

*The vision of the Nebraska Energy Office is for Nebraska to have reliable and affordable sources of energy that support a cleaner environment and ensure security for our lifestyle and economy.*

*The mission of the Nebraska Energy Office is to promote the efficient, economic and environmentally responsible use of energy. Our principles are: we value teamwork, are customer oriented, believe in creativity and innovation, are committed to excellence and pursue the highest standard of professionalism and integrity in serving the state's citizens.*

*In support of the agency mission, the following goals have been adopted:*

- Advance the conservation of traditional energy resources.
- Encourage the development of alternate and renewable energy resources.
- Advise the executive and legislative branches of state government in the development of energy policy.

## The Programs

The Nebraska Energy Office operates a number of different programs. These programs can be categorized as follows: low-income weatherization, oil overcharge-funded activities, state energy program activities, organization activities and natural gas technical assistance. An overview of the 1999-2000 financial activity appears at the end of this section. The period covered by this report is from July 1, 1999 to June 30, 2000, except where noted.

### Low Income Weatherization Assistance Program



The Energy Office administers this federally-funded program for weatherizing homes to save money and energy.

Typically, the types of improvements made include wall and attic insulation and checking the energy efficiency and safety of furnaces, stoves and water heaters.

The agency is responsible for inspecting the homes that are weatherized and for monitoring and auditing the subgrantees, primarily community action agencies, that actually make the home weatherization improvements. In this reporting period, an estimated one-quarter of the homes weatherized were inspected by agency staff.

In fiscal year 1999-2000, 1,180 homes were weatherized by Energy Office subgrantees. This effort received a total of \$2,852,902 from four sources: \$1,434,263 from the U.S. Department of

Energy's Low Income Weatherization Assistance Program, \$1,370,976 from the Low Income Energy Assistance Program; \$39,792 from *Stripper Well* oil overcharge funds; and \$7,871 from *Exxon* oil overcharge funds.

Since the program's inception in 1979, \$76.70 million has been spent to make energy efficiency improvements in 50,700 homes. An estimated 58,000 homes of Nebraskans remain eligible for the weatherization program.

Energy savings resulting from weatherization typically last 20 years or longer. The cumulative savings since the program began are illustrated in Figure 1. Conservatively, estimated savings of \$49.7 million have been achieved. About \$4.2 million in savings accrue annually.

### Oil Overcharge Funds



Since 1982, Nebraska has received oil overcharge funds — also called petroleum violation escrow funds — as a

result of various court actions against oil companies that overcharged their customers during the period of federal price controls from 1973 to 1981. Since direct compensation to injured consumers was not possible, the courts ordered the money be distributed to the states and used, within parameters established by the courts and federal regulators, to fund energy assistance and efficiency programs.

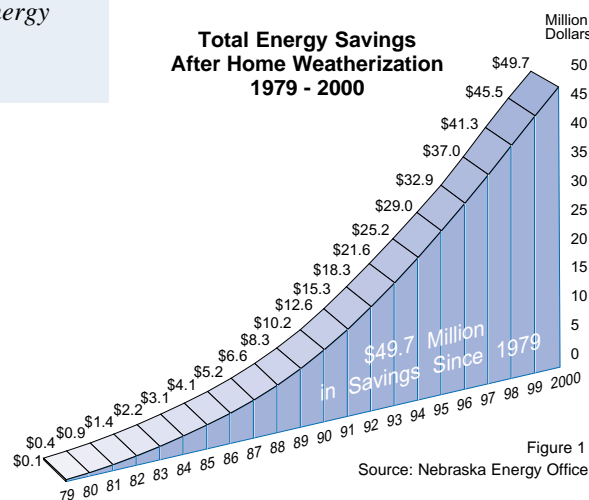


Figure 1  
Source: Nebraska Energy Office

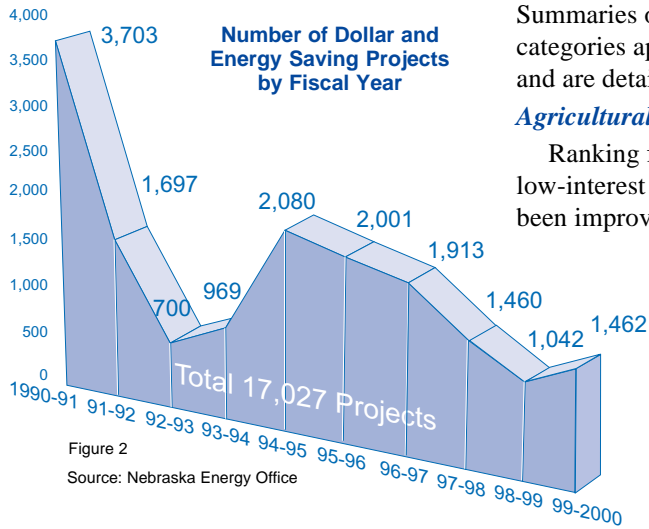


Figure 2  
Source: Nebraska Energy Office

Summaries of the major categories appear in Figure 3 and are detailed below:

**Agricultural Improvements**

Ranking fourth in the use of low-interest financing have been improvements in agricultural equipment and systems. More than 6.1 percent of all loan funds have financed typical agricultural projects such as low-pressure irrigation

systems, replacing irrigation pumps and motors, making well modifications and replacing grain dryers. Since 1990, the Energy Office and lenders have financed 445 agricultural projects totaling \$7.5 million.

**Mortgage Loans**

The Energy Office began financing new home construction in 1996. To date, the agency and lenders have financed 119 homes which meet or surpass the 1995 Model Energy Code by up to 30 percent. In financing these projects, the agency offers inducements in the form of interest rate reductions, from ¼ to 1 percent, to encourage future homeowners and their builders to construct very energy efficient homes. The Energy Office and lenders have financed construction totaling \$15.9 million, and lenders and homeowners have financed an additional \$3.4 million on the same projects. Currently, 13 percent of all energy efficiency financing has gone to these projects.

**Residential Improvements**

Nearly 92 percent of all the energy efficiency projects financed are in the homes of Nebraskans. More than 66.9 percent of all the funds loaned finance residential improvements such as replacing or installing furnaces, air conditioners and heat pumps, replacing windows and doors and insulating walls and ceilings.

**Small Business Improvements**

More than 9.3 percent of all the energy efficiency financing, \$11.4 million, has been used to make improvements in 731 buildings and systems in small businesses in the state. Typical small business improvements include replacement of furnaces and air conditioners as well as insulation, lighting and replacement doors and windows.

**Impacts and Savings**

A 1997 evaluation of Dollar and Energy Saving Loans found the projects created the equivalent of 1,416 jobs between 1990 and 1996. Savings earned by Nebraskans who used the loans came in two forms: savings from reduced energy use and savings from lowered financing costs.

The Legislature requires the Energy Office to annually report on disposition of these funds. A summary of activities funded with these dollars follows:

**Dollar and Energy Saving Loans**

This program, which was capitalized with oil overcharge funds and is re-charged with loan repayments, provides low-interest loans to Nebraskans to finance home, building, transportation and system improvements. Presently, 302 participating lenders at 678 locations provide five percent interest rate financing for up to 15 years on loans for energy saving improvements.

In 1999-2000, no new oil overcharge funds were added to the revolving Dollar and Energy Saving Loan fund.

By June 30, 2000, 17,027 projects totaling more than \$122.14 million have been financed with low-interest loans. Of that total, the Energy Office has provided more than \$57.649 million which leveraged more than \$60.148 million from Nebraska lenders. These projects also leveraged an additional \$15.58 million spent on non-energy related improvements.

Loans have financed projects in all of the state's 93 counties. During the reporting period, 1,462 new projects were financed.

For reporting purposes, the agency categorizes loans into 11 types.

Oil Overcharge Funds Invested In Types of Dollar and Energy Saving Loans as of June 30, 2000

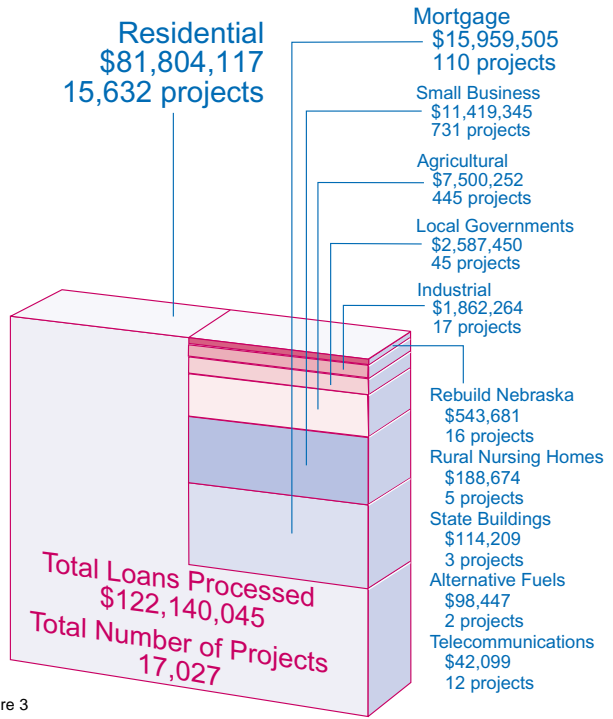


Figure 3  
Source: Nebraska Energy Office

**Nebraska Energy Settlement Fund  
A Summary of Exxon, Stripper Well and Diamond Shamrock  
Oil Overcharge Funds as of October 31, 2000**

	<i>Exxon</i>	<i>Stripper Well</i>	<i>Diamond Shamrock</i>	<b>Total</b>
Total Received	\$15,504,944	\$15,411,142	\$359,172	\$31,275,258
Interest Earned	9,149,229	6,211,532	232,320	15,593,081
<b>Total Funds Budgeted</b>	<b>\$24,654,173</b>	<b>\$21,622,674</b>	<b>\$591,492</b>	<b>\$46,868,339</b>
Contracts	\$3,957,118	\$5,890,221	\$0	\$9,847,339
Program Development	103,692	0	6,434	110,126
Monitoring/Evaluation	361,527	0	0	361,527
Education	117,292	0	0	117,292
Load Management	50,039	0	0	50,039
Attorney General Legal Fees	0	299,327	0	299,327
Bank Wire Fees	0	98	0	98
Low Income Weatherization	4,022,371	3,932,181	0	7,954,552
Emergency Preparedness	45,907	0	0	45,907
Dollar & Energy Saving Loan Program	13,705,505	8,345,629	0	22,051,134
Loan Program Delivery	915,117	460,914	0	1,376,031
Special Projects	256,785	358,175	0	614,960
Designated Interest	927,901	1,180,255	0	2,108,156
Oil Overcharge Administration	0	384,199	575,872	960,071
Direct Restitution Project	0	0	9,186	9,186
Governor's Plan - 2000	190,919	771,675	0	962,594
<b>Allocated to Low Income Programs</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Allocated to Native American Programs</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>Uncommitted Balance</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

Source: Nebraska Energy Office

Figure 4

Energy Saving Loan program.  
 ■ \$269,810 (*Stripper Well*) to be added to the Low-Income Weatherization Assistance Program.  
 ■ \$15,187 (*Stripper Well*) to be allocated to Indian Tribal governments for energy programs.

### State Energy Program



In 1999-2000, Nebraska received \$319,500 for this federally-funded effort and supplied \$63,900 in state funds from oil and natural gas severance taxes, as required matching funds.

These funds are used to provide energy efficiency services to consumers and other small energy users, and include the publication of this *Annual Report* and the *Nebraska Energy Quarterly* as well as maintenance of the state's energy database and web site.

These funds also provide administrative support for a wide array of activities that include energy shortage management and emergency preparedness, education and information,

Dollar and Energy Saving Loans and management of competitive federally-funded Special Projects grants secured by the agency.

A number of activities are grouped under the State Energy Program, in part, because the federal energy department primarily funds them. The activities that occurred under each program during the reporting period is documented in this section.

### Federal Energy Management Program/Army National Guard

This federal grant of \$64,500 was received in 1999. This project allowed the Nebraska Army National Guard to hire an energy manager to implement energy savings in federal and state military buildings identified in an earlier project.

Between 1990 and 1997, the dollars saved by Nebraskans from reduced use totaled \$16.9 million and savings from reduced financing charges totaled \$15.86 million.

### Low-Income Weatherization Assistance Program

During the reporting period, \$39,792 in *Stripper Well* oil overcharge funds were spent to assist Nebraskans with residential weatherization projects in accordance with the court order mandating that an equitable share of the funds be set aside for the state's low-income population.

### Native American Tribal Governments

The *Stripper Well* court order requires the state to provide an equitable share of oil overcharge funds to Native Americans. Based on their

Nebraska population, \$77,000 have been set aside for eligible projects, of which \$8,528 remains unspent.

### Other Funds

During the reporting period, the agency spent no *Stripper Well* funds to process and monitor Dollar and Energy Saving Loans.

Another \$18,401 in *Diamond Shamrock* funds were spent on agency operating expenses.

### 2000 Oil Overcharge Plan

In November 2000, the agency submitted to the Legislature a pre-disbursement plan to use \$962,594 in *Exxon and Stripper Well* oil overcharge funds for three projects:

- \$677,597 (\$190,919 *Exxon* and \$486,678 *Stripper Well*) to be added to the state's low-interest Dollar and

In this reporting period, \$2,994 was spent. This project is targeted for completion in June 2001.

### **Financing Incentives for Increased Energy Efficiency in Nebraska**

This federal grant of \$400,000 was received in 1998. This project leveraged private funds from lenders to finance home construction built 30 percent above the *1995 Model Energy Code* in rural counties in the state. Rural is defined as all counties except Lancaster, Sarpy and Douglas.

During the reporting period, \$121,600 were loaned and \$486,400 were leveraged for projects in Butler, Clay, Kearney and Perkins Counties.

### **Geothermal Heat Pump Training Program**

This federal grant of \$50,000 was received in 1999, and teams the state's three largest electric utilities — Nebraska Public Power District, Omaha Public Power District and Lincoln Electric System — along with the Energy Office to provide information to school officials, architects and engineers and provide training for well drillers and installers of geothermal heat pump systems.

During 1999-2000, \$2,360 was spent to establish a coordinating committee to plan and schedule upcoming activities.

### **Home Energy Ratings Systems for Nebraska**

This 1998 grant of \$50,000 enabled the Energy Office to create a Home Energy Rating System in Nebraska. A home energy rating system is a measurement of a house's energy efficiency. A homeowner can also use the rating to pinpoint the most cost-effective energy saving improvements.

In this reporting period, the agency completed the process of certifying 33 home energy raters in Nebraska, issued 20 sublicenses for computer software used by the raters and others, tested the computer software's usefulness on multi-family buildings, completed 155 home energy ratings and provided technical assistance as requested.

Nearly \$36,200 was spent during this period and the project was completed.

### **Non-Traditional Approach to Model Energy Code Compliance**

This 1997 grant of \$255,500 created a non-traditional financing approach to encourage Nebraskans to construct energy efficient buildings above the minimum requirements of the Model Energy Code.

Under this activity, the agency continued to review building plans for projects funded with state and federal funds. In 1999-2000, an additional 188 units were reviewed by agency personnel. A total of 1,083 units have been reviewed since the project began.

The agency continued to implement LB 755, adopted by the 1999 Legislature, requiring buildings constructed with state funds to comply with the latest International Energy Conservation Code. Rules and regulations were drafted and a public hearing was held.

Modifications were also made to increase the efficiency of improvements made to homes and buildings financed with the agency's Dollar and Energy Saving Loans.

During the reporting period, \$101,581 was spent.

### **Omaha Clean Cities OxyDiesel Project**

This \$42,800 federally-funded grant was received in 1999 and was intended to fund a fuel test of 15 percent ethanol/80 percent diesel/5 percent additive in several Metro Area Transit Authority buses in Omaha.

During the reporting period, this project became unfeasible and was cancelled.

### **Rebuild Nebraska II**

Rebuild Nebraska is a federally-funded offshoot of Rebuild America that helps owners of multiple-family and commercial buildings increase energy efficiency and reduce operating costs. Free assessments of energy use and access to low-interest financing for making improvements are offered to building owners who voluntarily participate.

In 1999-2000, the agency and its partners, NMPP Energy and Nebraska Public Power District (NPPD), offered the program to 15 building partners in each of four communities. NMPP Energy staff marketed the program and conducted energy audits in Alliance. NPPD staff marketed the program and conducted the energy audits in Ogallala, Wayne and Filmore County. Collectively, more than 891,000 square feet of building area in the communities was audited.

During the reporting period, \$45,434 were spent, and the project was completed.

### **Rebuild Otoe County**

This \$100,000 grant was received in 1998 and provided for a localized effort to help owners of historically significant commercial and multi-family buildings to make these buildings more energy efficient without compromising architectural integrity.

During the reporting period, 33 building owners in Otoe County became Rebuild partners. Twenty-nine of those buildings, totaling more than a quarter of a million square feet, have received audits. Ten of the buildings were listed on the National Register of Historic Places and 27 were more than 50 years old.

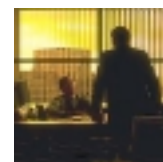
Work continued on the development of a booklet which brings together energy efficiency and historic preservation through "the whole building approach" to make building improvements.

In 1999, Rebuild Otoe County was selected as an "Environmental Projects and Awareness" winner in the Nebraska Community Improvement Program's competition for towns larger than 3,500.

During the reporting period, \$57,780 was spent.

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## **Organizations**



The Energy Office serves as the headquarters for four state, regional, national and international organizations:

## Governors' Ethanol Coalition

Nebraska was the driving force in this group's creation in 1991. Today, there are 25 members from Hawaii and Washington in the West to North Carolina and Puerto Rico in the East. There are also four international members.

An Energy Office staff member is one of the Nebraska governor's representatives for the group. The Energy Office serves as the Coalition's administrative headquarters, handling fiscal, media and operational matters.

During the reporting period, the Coalition:

- Supported the third National Ethanol Vehicle Challenge in which 14 university and college teams of engineering students modify mass production vehicles to maximize operational aspects of engines fueled with an 85 percent ethanol/15 percent gasoline blend.

### Governors' Ethanol Coalition Member States

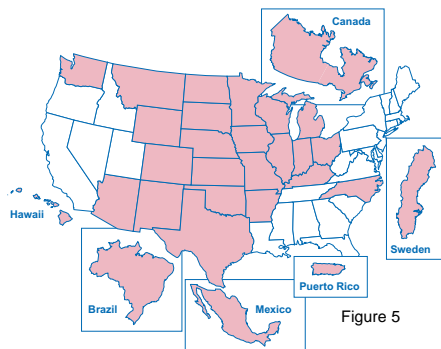


Figure 5

- Continued publication of the Coalition's *Ethanol Alert* and maintenance of the web site.
- Reorganized and incorporated the National Ethanol Vehicle Coalition as a separate entity.
- Continued to seek resolution of the use of methyl tertiary butyl ether, or MTBE, as an additive in the nation's transportation fuels. MTBE has caused substantial water pollution in areas of the nation. While some states have banned the additive's use after a certain date, the federal government has not definitively acted on the issue, either administratively or congressionally.

- Selected Governor Johanns, the vice chair of the Coalition in 2000, to become chair of the group in 2001.

## Governors' Public Power Alliance

This bi-partisan, short-term coalition of six governors was formed so consumers served by publicly-owned

### Governors' Public Power Alliance Member States

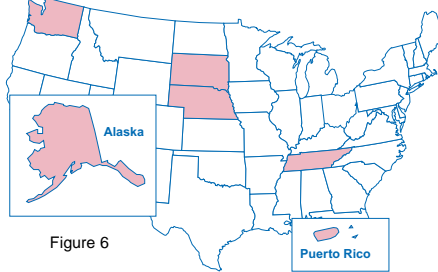


Figure 6

electric systems would not be disadvantaged as the industry was restructured. Nearly one-quarter of the nation is served by consumer-owned systems, including all electric utilities in Nebraska.

Formed in 1998, the governors of Nebraska and Tennessee serve as co-chairs of the Alliance.

During the reporting period, the Alliance continued to monitor federal legislative restructuring activity, making its position known in a number of venues. The agency also received a federal grant to foster the continued use of renewable energy resources in a restructured electric industry.

## Western Regional Biomass Energy Program

Since 1997, the Energy Office has administered this federal 13-state regional program. Biomass is renewable organic matter such as forest residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operations residues, aquatic plants and municipal wastes.

### Western Regional Biomass Energy Program Member States

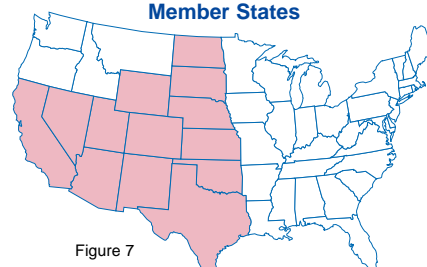


Figure 7

Over the years, numerous projects in Nebraska have been supported with funds from this program, especially the state's ethanol industry. No projects in Nebraska were selected for funding during the reporting period.

Since the Energy Office began administering this program, \$1.425 million in grants have been spent on projects in the 13 states.

## Biopower Steering Committee

Created by the Legislature in 1999, the Energy Office provides assistance to this 12-member group. Its task is to foster the use of bio-based resources as energy production resources.

## Natural Gas Loans and Technical Assistance



Nebraska is only one of two states to regulate investor-owned natural gas suppliers at the local level. Village boards

and city officials review rate requests under the state's *Municipal Natural Gas Regulation Act of 1987*.

The Energy Office, under the auspices of the Governor's Policy Research Office, administers the revolving loan fund that finances rate regulation. Initially the fund was capitalized with \$370,000 in severance taxes. Groups of communities borrow from the fund to finance rate studies and the fund is replenished by the regulated utilities who, in turn, bill the customers for the cost of regulation.

At the end of the 1999-2000 reporting period, the agency approved five area hearing phase loans:

Peoples Natural Gas	
Rate Area Three .....	\$25,692
KN Energy Rate Area Two ....	\$84,864
KN Energy Rate Area Three ..	\$79,482
KN Energy Rate Area Four ..	\$106,119
KN Energy Rate Area Seven	<u>\$119,535</u>
TOTAL .....	\$415,692

In addition, the agency has received requests for an additional \$480,753, which is in excess of the loan fund balance.

The Energy Office is also directed to provide technical assistance to municipal officials during all phases of the regulatory process.

## Financial Activity



In 1999-2000, the income and expenditures for the agency totaled \$11,838,971, and includes federal, state, oil overcharge and miscellaneous state funds. The source of the funds is illustrated in Figure 8. Approximately 52 percent of the funding came from oil overcharge accounts. More than 40 percent was derived from federal sources.

About 52 percent of all expenditures were used for oil overcharge aid and are detailed on pages one through three in this report. Seventy-five percent of all federal funds were spent as aid in the Low-Income Weatherization Assistance Program. Complete expenditure details can be found in Figure 9.

**Where the Money Came From as of June 30, 2000**

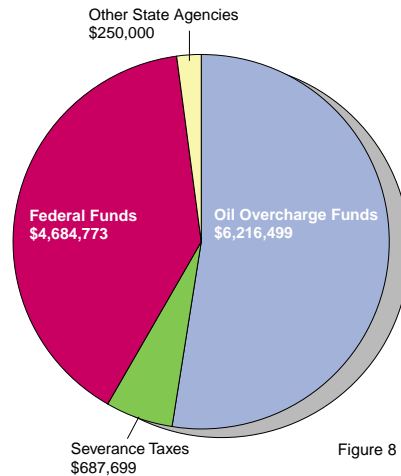


Figure 8

**Where the Money Went as of June 30, 2000**

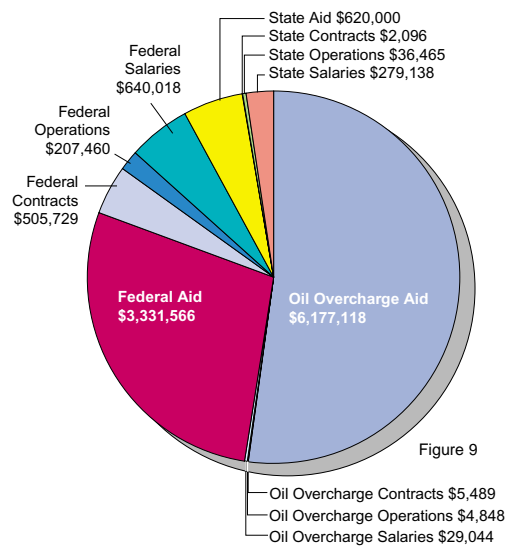


Figure 9

(1) On or before February 15 of each year, the Director of the State Energy Office shall transmit to the Governor and the Clerk of the Legislature a comprehensive report designed to identify emerging trends related to energy supply, demand, and conservation and to specify the level of state-wide energy need within the following sectors: Agricultural, commercial, residential, industrial, transportation, utilities, government, and any other sector that the director determines to be useful.

(2) The report shall include, but not be limited to:

(a) An assessment of the state's energy resources, including examination of the current energy supplies and any feasible alternative sources;

(b) The estimated reduction in annual energy consumption resulting from various energy conservation measures;

(c) The status of the office's ongoing studies;

(d) Recommendations to the Governor and the Legislature for administrative and legislative actions to accomplish the purposes of sections 70-625, 70-704, 81-1602, 81-1606, and 81-1607; and

(e) The use of funds disbursed during the previous year under sections 81-1635 and 81-1641. The use of such funds shall be reported each year until the funds are completely disbursed and all contractual obligations have expired or otherwise terminated.

Nebraska Revised Statutes  
81-1607

## Trends and Needs

The Nebraska Energy Office follows trends of different energy sectors under its mission. These trends can portend future energy use. In most cases, 1997 energy data is the latest available.

### State-wide Energy Need and Cost



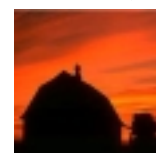
From 1993-1997, the state's energy need, or consumption, has continued to increase, on average, between two and three percent a year. Greater fluctuations have been recorded in the types of fuel used and in the end-use sectors. Weather, precipitation and economic factors typically account for these fluctuations.

In 1997, total energy consumption in the state was 613 trillion British Thermal Units (Btus), a 2.5 percent increase from 1996. Total energy expenditures for 1997 were \$3.809 billion, an increase of two percent from 1996.

A detailed look at the state's energy need and cost can be found in *Nebraska Energy Statistics, 1960-1997* and at the Energy Office's web site, [www.nol.org/home/NEO](http://www.nol.org/home/NEO), where energy data are continuously updated.

Within specific economic sectors — agricultural, commercial, residential, industrial, transportation, utilities and government — the state's energy supply, demand and conservation are summarized as follows:

### Agricultural



### Energy Supply

Energy supplies and needs for this sector of the state's economy have been met. Any supply

problems have been limited to sporadic shortfalls of petroleum products in the recent past.

### Demand

According to agricultural economists at the University of Nebraska, farmers spent between \$140-\$165 million on energy in 2000 — the highest amount in more than a decade — primarily because of drought conditions and higher energy prices. These figures do not include commercial trucking and grain drying associated with agricultural production.

An estimated 145 million gallons of diesel and gasoline are used annually for tillage, planting, cultivation, harvest and trucking. These figures do not include fuel used for grain drying or livestock production.

The university economists estimated 88 million gallons of diesel and gasoline was used for irrigation purposes in 2000, about 30 percent more than average. Some irrigators use other fuels — electricity, natural gas and propane — to power irrigation systems, and these costs are not included in that estimate.

### Conservation

Over the years, agricultural producers have utilized a number of different approaches to limit energy use. Energy reduction practices used have included conservation tillage, irrigation pump testing and load management. The Energy Office provides low-cost financing for irrigation efficiency projects that demonstrate energy savings such as low-pressure pivots and replacement pumps and motors. Other farming and ranching energy efficiency projects can also be financed with low-interest loans.

As in the past, high fuel costs or limited availability induces demand for efficiency practices.

### Energy Need

At one time, energy costs were the second largest agricultural expense. As farm size has increased, energy has replaced labor allowing fewer people to produce larger amounts of agricultural goods.

The energy needs of the state's agricultural producers can fluctuate

dramatically from growing season to growing season. For example, the 30 percent increase in gasoline and diesel use in 2000 was primarily because of increased irrigation use as a result of drought conditions in many parts of the state.

Of particular concern in 2001 will be supplies and cost of natural gas, which is used as an essential ingredient in the production of anhydrous ammonia and by some to power irrigation systems. One agricultural extension agent estimated fuel costs could increase by \$25 per acre in 2001. A coop manager illustrated the dramatic cost increases of fertilizer: Cost in 2000, \$195 a ton; cost in 2001, \$315 a ton and rising. Fertilizer supplies will likely also be a concern.

Fuel substitution or conversion to other types of fuel are very difficult or expensive for this sector.

## Commercial



This sector closely parallels consumer economic activity in the state and includes local, state and federal governments.

### Energy Supply

More than 90 percent of the energy used in this sector comes from two sources: electricity and natural gas. Supplies of both fuel types have been readily available. Trends indicate these fuel types will remain the predominant fuel choices of this sector in the near term.

### Demand

In the past 37 years (1960-1997), energy demand for this sector has nearly trebled, reaching 121.36 trillion Btus in 1997. During this period, natural gas demand has increased by 50 percent, while electrical use — including electric system losses — have increased more than five-fold.

In recent years, natural gas demand has been significantly more volatile, fluctuating by 5 trillion Btus or more — greater than ten percent — from one year to another. Over the past thirty-plus years, while the number of commercial consumers has increased

by 10,000, average annual consumption of natural gas has declined by about a third.

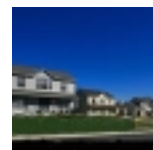
### Conservation

Reductions in energy use in the commercial sector generally follow patterns found in the residential sector. Efforts to conserve energy use tend to be economically driven, especially when fuel prices rise above historic levels. The last significant decline in energy use in this sector occurred in 1992 at the time of an economic downturn.

### Energy Need

The energy need of the commercial sector declined marginally by 1.4 percent in 1997 over the previous year. Future energy need in this sector is likely to be met with electricity and natural gas.

## Residential



### Energy Supply

More than 90 percent of the energy used by the residential sector comes from two sources: electricity and natural gas. There are adequate supplies of both fuel types.

### Demand

Demand in the residential sector has increased from 75 trillion Btus in 1960 to 137.23 trillion Btus in 1997. Population growth, a key demand component in this sector, has grown far slower from 1.411 million in 1960 to 1.657 million in 1997.

What has changed over the period, has been a dramatic departure in average consumption patterns. Between 1967 and 1997, residential average annual consumption of natural gas declined by nearly a third, from 179 thousand cubic feet to 106 thousand cubic feet, respectively. However, between 1970 and 1997, average annual consumption of electricity in primarily urban areas rose 26 percent and 45 percent in primarily rural areas.

### Conservation

Most natural gas use in the residential sector is for heating and minor

household use such as heating water, drying clothes and cooking.

Like most of the other sectors, residential users are extremely responsive to dramatic price rises. Increases in the price of natural gas at various times over the decades have resulted in reduced average annual consumption. From a peak of 183 thousand cubic feet a year in 1970 to 142 thousand cubic feet in 1974 — after the first oil price shock — consumption dropped to 111 thousand cubic feet in 1981. By 1997, average annual consumption had dropped to 106 thousand cubic feet.

Trends over the past thirty years, provide a clear picture of the application of more efficient technologies on demand in the residential sector as well as a certain level of fuel substitution — replacing natural gas furnaces with electric-powered heat pumps.

Beginning in the 1970s, heat pump technology began to make inroads in the traditional heating and cooling needs of homes in the state. This factor may, in part, account for the substantial increase in electricity demand.

But, the growth in electricity use cannot be attributed to this one cause alone. As new technologies — microwave ovens, computers and similar equipment — become widely adopted, the choice of fuel to power the equipment is electricity.

### Energy Need

Energy need in this sector for the two major fuel types — natural gas and electricity — are likely to travel in predictable ways.

Natural gas need will likely be determined by two factors: severity of winter weather and price volatility. The combined impact of a return to normal winters in the Plains, coupled with high natural gas prices, would likely result in typical consumer behavior: replacement of inefficient heating equipment with newer more efficient furnaces, reduction in use and fuel switching by replacing natural gas furnaces with electric heat pumps.

Electricity need will likely continue to rise because of several factors:

population growth and a continued increase in average annual consumption.

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## Industrial



The industrial sector includes manufacturing, construction, mining agriculture and forestry operations.

### Energy Supply

The industrial sector relies on more diverse types of fuel than other sectors of the economy. Natural gas, electricity and various petroleum products — gasoline, propane, diesel — are the primary energy inputs utilized in this sector's operations. Generally, supplies of all fuel types have been readily available.

### Demand

In nearly four decades, industrial sector total energy consumption has grown from 92.26 trillion Btus in 1960 to 169.64 trillion Btus in 1997. During that same period of time, the following changes in demand by fuel type have occurred (all figures are in trillion Btus):

- Coal use declined from 8.96 in 1960 to 5.66 in 1997
- Natural gas use rose from 38.27 in 1960 to 44.37 in 1997
- Diesel fuel use rose from 14.01 in 1960 to 29.98 in 1997
- Propane use rose from 1.77 in 1960 to 6.72 in 1997
- Gasoline declined from 11.27 in 1960 to 4.25 in 1997
- Other petroleum use rose from 7.44 in 1960 to 10.60 in 1997
- Electricity use, not including electric system losses, rose from 3.03 in 1960 to 22.45 in 1997. If electric system losses were added, electricity use rose from 10.53 in 1960 to 69.15 in 1997.

### Conservation

Over the years, the industrial sector has been more predisposed to make energy efficiency system and building improvements, especially if energy costs are a significant portion of the business' cost.

The impact of conservation efforts are most clearly seen in natural gas use when usage peaked in 1973 at 73.73 trillion Btus. Demand has remained in the 30 to 40 trillion Btus a year range from 1993-1997.

### Energy Need

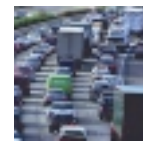
Energy use in the industrial sector is also subject to the vagaries of national and regional economic trends which, in turn, can cause a surge or plummet in energy demand.

Growth trends in this sector are also affected by industrial expansions in the state. For example, the dramatic increase in ethanol production in Nebraska in the mid-1990s, caused an increase in natural gas need within the industrial sector.

Projections of energy need in this sector are difficult to predict. However based on past trends, the need for electricity should continue to grow. The need for other fuel types used in the sector will likely remain volatile.

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## Transportation



In addition to tradition methods of transportation — public and private vehicles, aircraft and boats — this sector includes natural gas used to transport natural gas through pipelines.

### Energy Supply

The transportation sector in Nebraska is dependent on petroleum-based fuels almost exclusively. This level of dependence has not essentially changed since 1960, when record keeping began.

### Demand

Demand in the transportation sector has more than doubled in almost 40 years, rising from 87.80 trillion Btus in 1960 to 178.47 trillion Btus in 1997.

Between 1960 and 1997, diesel fuel demand increased nearly nine-fold from 8.17 trillion Btus in 1960 to 71.99 trillion Btus in 1997. The dramatic increase in diesel fuel may be attributed to growth in trucking operations in the state.

Only two fuel types comprised more than 96 percent of the demand in



1997: gasoline and diesel fuel. Recent demand trends indicate steady, and sometimes spurts, of growth.

Population growth, replacement of efficient vehicles with less efficient ones and average miles traveled per year, all of which are increasing, also influence demand in this sector.

### Conservation

The transportation sector is particularly immune to conservation efforts that are not mandated by the federal government under such auspices as corporate average fuel efficiency laws.

Besides technological changes, typical conservation approaches in this sector are driving modifications and speed limits on highways. Recent trends have run counter to conservation efforts in this sector.

Price rises can induce conservation and modification of consumer habits, but these trends have not been sustained in the long term.

### Energy Need

Given recent trends in this sector, continued growth in energy need seems assured.

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## Utilities



Information in this sector consists exclusively of energy trends and needs by the state's electric utility sector.

### Energy Supply

Trends in the electric utility sector in Nebraska have remained fairly constant: More than 90 percent of the fuels used to generate, distribute and transmit electricity has come from just two sources: coal and nuclear. While in-state hydropower resources rose between 1993 and 1997, the overall percentage of the power mix supplied remains fairly constant at about five percent.

### Demand

Since 1960, energy demand by electric utilities has increased six-fold from 49.68 trillion Btus to 304.35 trillion Btus in 1997.

## Conservation

Efficiency efforts in the electric utility sector are grounded in technological advances.

For example, any breakthroughs in minimizing resistance to lessen electricity line loss would translate into an efficiency improvement since nearly one-third of all electricity produced is lost during transmission and distribution.

Another example of efficiency gains in the utility sector was local: using experimental technology, Lincoln Electric System added ice to increase the generation capacity at its Rokeby station. A previous experiment at the plant using cold water injection had increased the power plant's capacity by six percent, or 4-5 megawatts.

Demand side activities undertaken by the state's electric utilities are not included in conservation savings of this sector since any savings would be credited to the sector where the energy was saved.

### Energy Need

While the state remains a net exporter of electricity, the continued growth in need will, over time, result in additional capacity requirements. Between 1992 and 1997, the state's utilities exported between 2,000 and 5,600 million kilowatthours, roughly 10 to 20 percent of the net generation in Nebraska. Growth in electricity need between 1996 and 1997 increased nearly four percent.

Recent or planned capacity additions by this sector have focused on fuel from three sources: natural gas, coal and wind.

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## State Energy Resources Assessment



### Current Supplies

Nebraska is not an energy resource-rich state.

Oil has been produced in the state since 1939. Oil production peaked in 1962 and has declined significantly since then. In 1997, in-state petroleum production met 7.6 percent of the needs

Nebraska's consumers. As petroleum consumption grows and in-state production declines, the ability to meet Nebraskans' needs will continue to decline.

Natural gas has been produced in the state since 1951. Natural gas production peaked in 1957 and has declined since. In 1997, in-state natural gas production represented only 1.3 percent of the natural gas consumed in the state in that year. If natural gas consumption continues to rise and production continues to decline, Nebraskans' need for imported natural gas will rise.

The state's coal resources are insignificant and not economical to mine. However, the state's proximity to Wyoming's low-sulfur coal beds in the Powder River Basin allows Nebraska ready access to this energy resource.

Uranium has periodically been mined in the state, but must be sent outside the state's border to process.

Four wind turbines at two locations became operational in 1999 and produce enough electricity to meet the needs of 1,000 homes.

### Feasible Alternatives

There are five main alternate energy sources: biomass, geothermal, hydropower, solar and wind.

In 1997, the Energy Information Administration estimated hydropower supplied 2.7 percent of the total energy consumed in the state. Biomass, including ethanol, supplied less than one percent of the energy used in Nebraska in 1997. Taken together, all five forms of alternate energy supplied less than four percent of the energy used in Nebraska in 1997.

Assessments of the five feasible alternatives follow:

#### Biomass

As of 1997, wood remains the primary alternate biomass fuel in use in Nebraska, followed by corn and grain sorghum used to produce ethanol. Consumption of ethanol in the state in 1997 topped 20.3 million gallons. Nearly one of every four gallons of gasoline sold in 1997 contained 10 percent ethanol. In 1997,

an estimated 330 million gallons of ethanol were produced at the six plants operating in the state at that time. Growth in the use of biomass resources continues to look positive.

### **Geothermal**

There are two types of geothermal resources that can be utilized: hydrothermal fluid resources and earth energy. According to the Energy Information Administration, there two pockets of high-temperature resources in the north central and northern Panhandle portions of the state. This resource might be suitable for electricity generation. Development of these resources appears unlikely in the near-term.

However, earth energy used directly to provide heat in a variety of applications is very promising. Growth in the use of geothermal heat pumps that can discharge waste heat into the ground in hot weather and extract heat from the ground during cold weather appears strong.

### **Hydropower**

In 1997, an estimated 15 percent of the state's electricity needs were met from hydropower resources coming from 11 dams in or on the border of the state and from power supplied by

Western Area Power Administration. At this time, is it not likely other potential hydroelectric resources will be developed.

### **Solar**

According to the Energy Information Administration estimates, a flat panel photovoltaic system about the size of a football field installed in an area of the state's better locations would generate more than 1 million kilowatthours a year, enough to meet the needs of more than 103 households. A tracking photovoltaic system installed in the state's best area that concentrated the solar power and covered 150 acres would produce more than 43 million kilowatthours a year, enough for 4,334 households. Current cost-effective use of photovoltaic cell technology is primarily limited to meeting the needs of cattle ranchers in remote parts of the state.

### **Wind**

An estimate from the Energy Information Administration suggested that 46 percent of the state had developable wind resources. If all this potential was developed with utility-sized wind turbines, the power produced each year would equal 869 million megawatthours, or more than

4,000 percent of the state's entire electricity consumption. Among all the alternate forms of energy, wind resources have the greatest potential for near-term development in the state.

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## **Estimated Energy Consumption Reduction**



According to several studies performed by the Energy Office and others, the following energy consumption reductions have been achieved:

- A typical home benefiting from services of the Low-Income Weatherization Assistance Program realized an average savings of 18.7 percent on energy used for heating.
- Replacement natural gas furnaces installed and financed with Dollar and Energy Saving Loans resulted in a 10.7 percent reduction in energy use for 80 percent efficient furnaces and 19.2 percent reduction in energy use for 90 percent efficient furnaces.

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## **Status of Ongoing Studies**

There are no ongoing studies being conducted by the Energy Office.

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