

# 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: 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.
- Utilize the Internet and computer technology to augment the delivery of information and services.

## 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 2001-2002 financial activity appears at the end of this section. The period covered by this report is from July 1, 2001 to June 30, 2002, 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 2001-2002, 1,251 homes were weatherized by Energy Office subgrantees. This effort received a total of \$4,021,402 from two sources: \$1,673,040 from the U.S. Department of

Energy's Low Income Weatherization Assistance Program and \$2,348,362 from the Low Income Home Energy Assistance Program.

Since the program's inception in 1979, \$83.7 million has been spent to make energy efficiency improvements in 53,055 homes. An estimated 56,000 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 \$58.0 million have been achieved. About \$4.2 million in new 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.

The Legislature requires the Energy Office to annually report on disposition of these funds. A summary of Nebraska

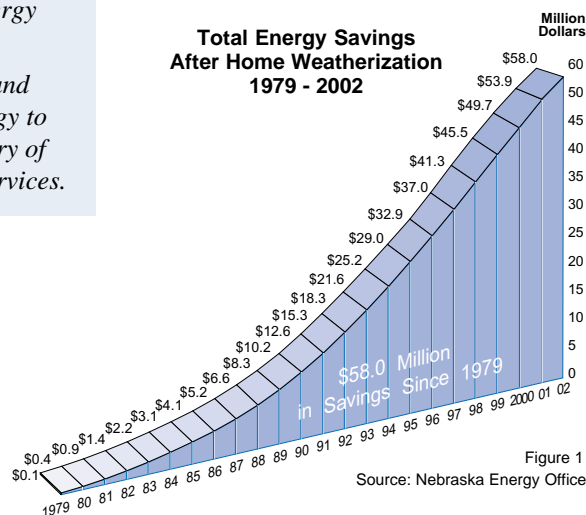


Figure 1  
Source: Nebraska Energy Office

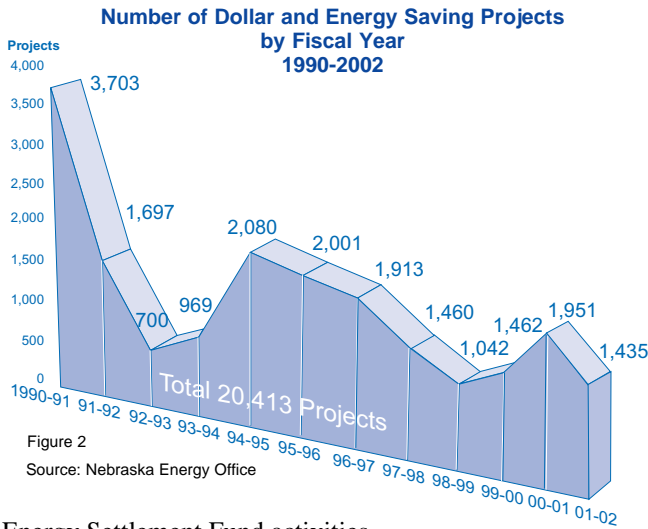


Figure 2  
Source: Nebraska Energy Office

Energy Settlement Fund activities follows and is detailed in Figure 4:

### 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, 266 participating lenders at 667 locations provide five percent interest rate financing for up to 15 years on loans for energy saving improvements.

By June 30, 2002, 20,413 projects totaling more than \$153.652 million have been financed with low-interest loans. Of that total, the Energy Office has provided more than \$72.06 million which leveraged more than \$81.58 million from Nebraska lenders. These projects also leveraged from borrowers an additional \$13.53 million that was spent on non-energy related improvements.

Loans have financed projects in all of the state's 93 counties. During the reporting period, 1,435 new projects were financed. The number of projects financed each year since 1990 are shown in Figure 2.

For reporting purposes, the agency categorizes loans into 11 types. Summaries of the major loan categories appear in Figure 3 and are detailed as follows:

#### Agricultural Improvements

Improvements in agricultural equipment and systems rank fourth in the use of low-interest financing.

More than 6.5 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 547

agricultural projects totaling \$10.02 million.

#### Energy Efficient Mortgages

The Energy Office began financing new home construction in 1996. To date, the agency and lenders have financed 144 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 the construction of very energy efficient homes. The Energy Office and lenders have financed construction totaling \$18.9 million, and lenders and homeowners have financed an additional \$3.87 million on the same projects. Currently, 12.3 percent of all funds used to finance energy efficiency projects has financed mortgages for new homes.

#### Residential Improvements

Ninety-two percent of the total number of the energy efficiency projects financed are in the homes of Nebraskans. More than 68.6 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. To date, 18,785 projects totaling more than \$105.46 million have been undertaken by Nebraskans.

#### Small Business Improvements

More than 8.4 percent of all energy efficiency financing, \$13.01 million, has been used to make improvements in 826 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.

#### Nebraska Green Buildings

A new category, Nebraska Green Buildings, was added in January 2002 and finances new homes that are built to the standards of the Energy Office's Nebraska Green Building Program in which builders use methods to reduce construction waste, integrate recycled materials, reduce water consumption and achieve high energy efficiency.

Exxon funds totaling \$902,100 were added to the Dollar and Energy Saving Loan pool to finance these projects.

Oil Overcharge Funds Invested In Types of Dollar and Energy Saving Loans as of June 30, 2002

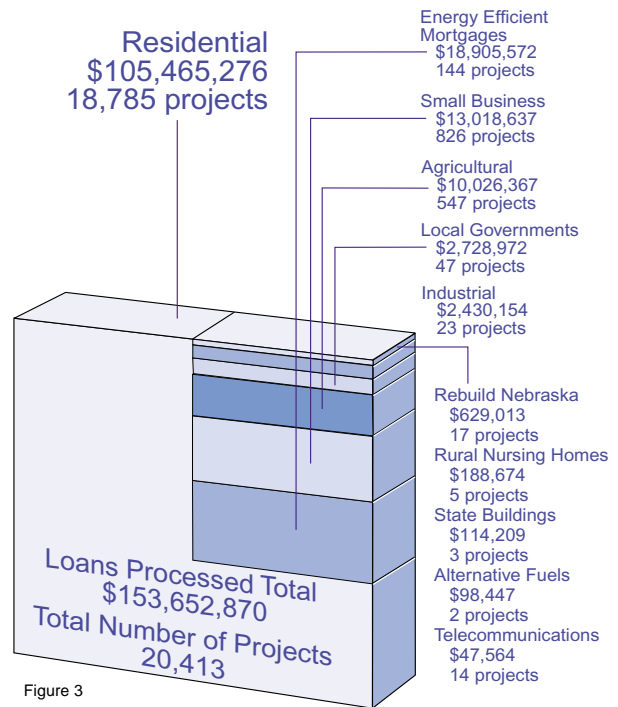


Figure 3  
Source: Nebraska Energy Office

**Nebraska Energy Settlement Fund  
A Summary of Exxon, Stripper Well and Diamond Shamrock  
Oil Overcharge Funds as of June 30, 2002**

	<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 and Miscellaneous Income	9,419,011	6,678,652	236,704	16,334,367
<b>Total</b>	<b>\$24,923,955</b>	<b>\$22,089,794</b>	<b>\$595,876</b>	<b>\$47,609,625</b>
<b>Funds Budgeted</b>				
Contracts	\$3,965,152	\$5,813,221	\$0	\$9,778,373
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	4,201,991	0	8,224,362
Emergency Preparedness	45,907	0	0	45,907
Dollar & Energy Saving Loan Program	14,798,524	8,832,307	0	23,630,831
Loan Program Delivery	915,117	440,000	0	1,355,117
Energy Office Special Projects	248,752	379,089	0	627,841
Designated Interest	213,583	1,499,705	0	1,713,288
Oil Overcharge Administration	0	384,199	580,256	964,455
Direct Restitution Project	0	0	9,186	9,186
Allocated to Native American Programs	\$0	\$92,187	\$0	\$92,187
<b>Low Income Designated</b>	<b>\$0</b>	<b>\$84,082</b>	<b>\$0</b>	<b>\$84,082</b>
<b>Uncommitted Balance</b>	<b>\$81,999</b>	<b>\$63,588</b>	<b>\$0</b>	<b>\$145,587</b>

Source: Nebraska Energy Office

Figure 4

During the reporting period, agency staff met with Green Builders Council members to draft green building construction standards. Specifications for prototype homes constructed under the standards were reviewed and approved, and contracts to build three Certified Nebraska Green Built homes were signed.

#### **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 totaled \$16.9 million.

#### **Native American Tribal Governments**

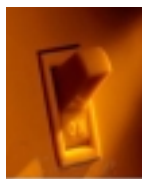
The Stripper Well court order requires the state to provide an

equitable share of oil overcharge funds to Native Americans. Based on their Nebraska population, \$92,187 have been set aside for eligible projects, of which \$23,715 remains unspent.

#### **Other Funds**

Another \$2,895 in *Diamond Shamrock* funds were spent on agency operating expenses.

#### **State Energy Program**



In 2001-2002, Nebraska received \$370,000 for this federally-funded effort and supplied \$74,000 in state funds from oil and natural gas severance taxes, as required matching funds.

These funds are used to provide energy efficiency services to consum-

ers 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 program 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 special projects grant during the reporting period is documented in this section.

#### **Biomass Power/Omaha Public Power District**

This \$55,000 grant was received October 2001. This project supplemented the Omaha Public Power District's promotional, informational and educational campaign targeted to

its ratepayers on the utility's newest generation resource: a landfill gas to energy generation unit located at a former municipal waste site.

During the reporting period, the utility developed and produced newspaper and statement inserts describing the project and utilized radio commercials and billboards to promote consumer interest. The utility also utilized telemarketing and other methods to increase participation in the District's Green Power Partner effort. This project was completed by June 2002 and all the funds were expended.

#### **Federal Energy Management Program/Army National Guard**

This federal grant of \$64,000 was received in August 1999. Under the project, the Nebraska Army National



Guard hired an energy manager to find and implement energy savings in federal and state military buildings.

In 2001-2002, the Guard's energy manager completed most of the energy audit recommendations and analyzed other potential energy saving projects. Typical projects completed included lighting retrofits, mechanical upgrades and furnace and boiler improvements.

The energy improvement projects resulting from the grant generated annual cost savings of \$105,052 and annual energy savings of more than 6,300 million British thermal units. Recurring annual cost savings are estimated to be \$49,000 and more than 3.7 million British thermal units.

During the reporting period, \$34,457 were spent and the project was completed.

### **Federal Energy Management Program/Omaha Public Power District**

This \$76,000 grant was received September 2001. In partnership with the Omaha Public Power District and the U.S. Air Force, the feasibility of using renewable geothermal power to displace natural gas at Offutt Air Force Base will be explored.

In 2001-2002, six test loops were installed at the Base so that a thermal conductivity test could be performed to ascertain if subsurface soil conditions were appropriate for ground source heat pumps. Computerized building energy use simulations were constructed and three types of systems were modeled to ascertain the most efficient approach for the project. An on-site geothermal field day was held in April 2002 to view the planned installation of a geothermal heat exchanger in one of the buildings.

During the reporting period, \$2,930 were spent. This project is scheduled to be completed by June 2003.

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

This \$50,000 federal grant was received in September 1999, and teamed three of the state's electric utilities – Nebraska Public Power District, Omaha Public Power District and Lincoln Electric System – 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.

In 2001-2002, 67 participants attended a one-day training session on geothermal heat pump system designs for engineers, architects and other professionals. Twenty-two people passed International Ground Source Heat Pump certification testing, the third testing opportunity funded by the grant.

A total of \$20,846 were spent during the reporting period and the project was completed.

### **Rebuild Nebraska 2000**

This \$189,751 grant was received in September 2000 and continued the targeted community approach to commercial buildings and multi-family housing begun under earlier grants. Rebuild Nebraska is part of the Rebuild America effort that assists building owners increase energy efficiency and reduce operating costs by identifying energy saving opportunities through energy audits.

In 2001-2002, the Energy Office continued its partnership with the Nebraska Public Power District in Auburn, Schuyler and Sheridan County and NMPP Energy in Fairbury. Sixty building partners were secured and 59 audits were completed on 61 buildings totaling 707,569 square feet.

During the reporting period, \$158,448 were spent and the project was completed.

### **Other Projects**

Some projects undertaken by the Energy Office are funded by sources other than the U.S. Department of Energy.

### **Department of Environmental Quality/Educating Home Builders to Use Recycled Construction Materials and Reduce Construction Site Waste**

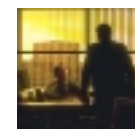
This \$42,092 grant was received in January 2002. Under the proposal, the agency would undertake an educational effort to increase awareness and understanding among consumers and the home building industry on how to design and build new homes so that

construction waste would be reduced by 25 to 50 percent and the use of recycled construction materials would be maximized.

The project includes developing a web-based resource library of recycled construction sources, green building construction details and a series of factsheets on related topics; providing home builder training; offering a newly built home for inspection by the public; and educating realtors, appraisers and the mortgage industry.

During the reporting period, \$16,634 were spent. The project is scheduled to be completed by June 2003.

## **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 29 members from Hawaii, Oregon and Washington in the West to the Carolinas in the East. There are also four international members. The members are identified in Figure 5.

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.

### **Governors' Ethanol Coalition Members**

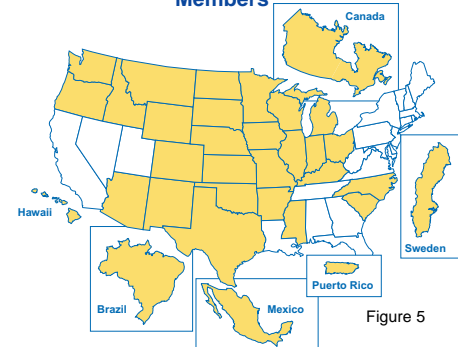


Figure 5

Nebraska Governor Johanns chaired the organization throughout 2001.

During the reporting period, the Coalition:

- Welcomed two new members: Oregon and Mississippi.

- Joined with members of the North-east States for Coordinated Air Use Management, the American Petroleum Institute and agricultural and ethanol interests to promote a renewable fuel standard that would increase the amount of ethanol used in vehicles over a period of time. The renewable fuel standard was incorporated into the Senate version of the Energy Bill and included:
  - ◆ Eliminated the oxygen requirement in reformulated gasoline
  - ◆ Banned MTBE — methyl tertiary butyl ether — over four years
  - ◆ Created the renewable fuel standard that tripled the amount of ethanol used in gasoline over ten years
  - ◆ Extended the small ethanol production tax credit to farmer-owned cooperatives
  - ◆ Extended federal income tax credits to retailers who sold 85 percent ethanol blends.

■ Continued publication of the *Ethanol Alert* and maintained the Coalition's web site.

■ Continued to work with the National Ethanol Vehicle Coalition to increase the number of public E85 fueling sites.

### Governors' Public Power Alliance

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

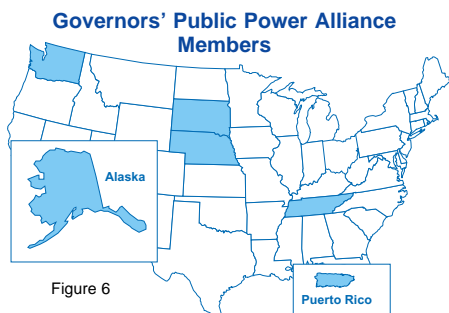


Figure 6

During the reporting period, the Alliance continued to monitor federal legislative restructuring activity, making its position known in a number of venues.

### Western Regional Biomass Energy Program

Since 1997, the Energy Office has administered this federal 13-state regional program. The 13-state Western region is illustrated in Figure 7. 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.

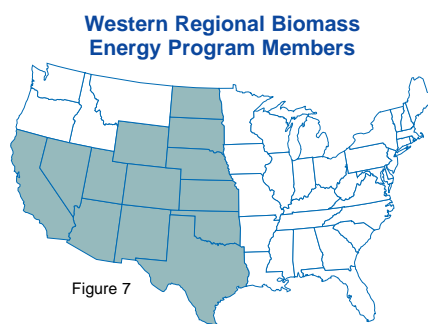


Figure 7

Over the years, numerous projects in Nebraska have been supported with funds from this program, especially the state's ethanol industry.

Since the Energy Office began administering this program, \$1.725 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 — Texas is the other — 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 2001-2002 reporting period, the agency had approved two area hearing phase loans and four district court appeal phase loans:

#### Area Hearing Phase

Peoples Natural Gas Area Two .....	\$50,075.60
Peoples Natural Gas Area Three .....	<u>\$40,678.32</u>
TOTAL .....	\$90,753.92

#### District Court Appeal Phase

KN Energy Rate Area Two .....	\$86,102.68
KN Energy Rate Area Three .....	\$80,642.12
KN Energy Rate Area Four .....	\$107,667.92
KN Energy Rate Area Seven .....	<u>\$121,279.74</u>
TOTAL .....	\$395,692.46

In addition, the agency has received requests for an additional \$522,507.54 which is in excess of the loan fund balance.

During the reporting period, two loans were repaid:

#### Area Hearing Phase

Peoples Natural Gas Area Two .....	\$50,075.60
Peoples Natural Gas Area Three .....	<u>\$81,870.78</u>
TOTAL .....	\$131,946.38

As of June 30, 2002, four loans had not been repaid:

#### Area Hearing Phase

KN Energy Rate Area Two .....	\$84,864.00
KN Energy Rate Area Three .....	\$79,482.00
KN Energy Rate Area Four .....	\$106,119.00
KN Energy Rate Area Seven .....	<u>\$119,535.00</u>
TOTAL .....	\$390,000.00

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

### Financial Activity



In 2001-2002, the expenditures for the agency totaled \$12,848,366 and includes federal, state, oil overcharge and miscellaneous state funds. The source of the funds is

illustrated in Figure 8. Approximately 50 percent of the funding came from oil overcharge accounts. More than 42 percent was derived from federal sources.

About 48 percent of all expenditures were used for oil overcharge aid and are detailed on pages one through three in this report. Sixty-eight 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, 2002

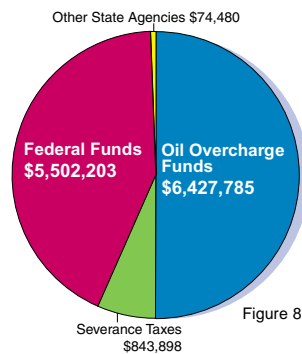


Figure 8

Where the Money Went as of June 30, 2002

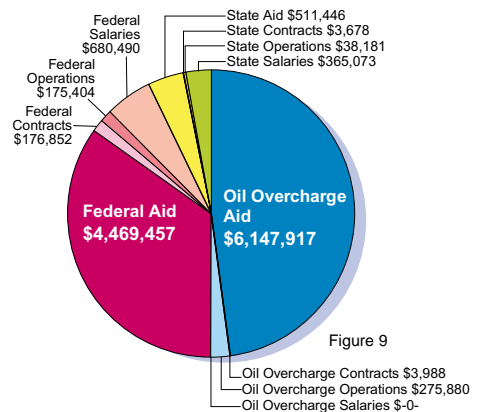


Figure 9

Oil Overcharge Contracts \$3,988  
Oil Overcharge Operations \$275,880  
Oil Overcharge Salaries \$-0-

(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 the trends of different energy sectors as part of its mission. These trends can portend future energy use.

In all cases, the most current energy data has been used in this report. Detailed energy data required to be maintained by the Energy Office can be found at the agency's web site <http://www.nol.org/home/NEO/statshtml/index3c.html>

### State-wide Energy Need and Cost



In 1999, the state's total energy consumption stood at 602 trillion British thermal units, a decline of 3.4 percent

from 1998. Increased nuclear power production was more than offset by declines in coal and natural gas. (1999 is the most recent year for which consumption, expenditure and price data are available.)

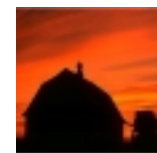
Total energy expenditures in 1999, rose by 2 percent above 1998 figures to \$3.571 billion. Almost all the growth was attributable to rising petroleum prices.

The prices for different types of energy, as compared to other states, reveals Nebraskans paid the lowest price for coal in the nation in 1999. The rankings are calculated by the Energy Information Administration (EIA). Electricity, 42<sup>nd</sup> in price, and gasoline, 41<sup>st</sup> in price, were slightly more expensive relative to other states in 1999. Natural gas, another key energy source for Nebraskans, ranked 36<sup>th</sup> in price.

According to the EIA, Nebraska ranked 37<sup>th</sup> in 1999 in total energy

expenditures among the 50 states and the District of Columbia (California was first and the District was last). The state was 23<sup>rd</sup> in the ranking of expenditures per person at \$2,144 (Wyoming was first and Florida was last).

### Agricultural Energy Supply



Energy supplies and needs for the agricultural sector of the state's economy have

been met. Any supply problems have been limited to infrequent shortfalls of petroleum products usually during periods of peak demand.

#### Demand

Energy demand information for the agricultural sector is not available on a consistent and annual basis. National energy databases merge agricultural energy use with data from the industrial sector.

#### Conservation

Over the years, agricultural producers have used a number of different approaches to conserve energy use. Energy reduction practices used have included conservation tillage and



irrigation pump testing, scheduling 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 such as grain dryers have also been financed with low-interest loans.

Typically, high fuel costs or limited availability of energy resources induces demand for efficiency practices in this sector.

### 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 volumes of agricultural goods.

The energy needs of the state's agricultural producers can fluctuate dramatically from growing season to growing season. For example, a 30 percent increase in gasoline and diesel use in 2000 was primarily due to increased irrigation use as a result of drought conditions in some areas of the state.

During the planting season in spring 2001, the greatest energy concern was the limited availability and high cost of ammonia fertilizer which is a natural gas based product. If natural gas price volatility continues, this sector could be adversely affected.

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

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## Commercial



This sector which includes non-manufacturing business establishments closely parallels consumer economic activity in

the state and includes energy use by local, state and federal governments.

### Energy Supply

In each year between 1997 and 1999, more than 94 percent of the energy used in this sector came from only two sources: natural gas and electricity. Supplies of both energy

resources were plentiful. However, prices for natural gas have departed substantially from historically stable price patterns.

Trends indicate these fuel types will remain the predominant fuel choices of this sector in the near term.

### Demand

The trend of the most recent three years, 1997-1999, has deviated from a fairly predictable route that prevailed earlier in the decade: steadily rising consumption. Percentage declines of 4.5 percent were recorded in 1998 and again in 1999. In 1998, coal and natural gas demand accounted for the decline, and in 1999, natural gas and electric system losses accounted for the decline.

The drop in natural gas use in 1998 and 1999, when prices were very low, likely came from two sources: efficiency improvements and declines in economic activity in this sector.

### Conservation

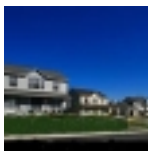
Reductions in energy use in the commercial sector generally follow patterns found in the residential sector. Efforts to conserve energy use tend to be economically driven, especially when fuel prices rise above historic levels.

### Energy Need

Because the predominant energy needs of the commercial sector are confined to readily available supplies of natural gas and electricity, no supply problems are likely if natural gas supplies are stable.

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## Residential



### Energy Supply

More than 91 percent of the energy used in the residential sector in 1998 and

1999 came from two sources: electricity and natural gas. More than half the energy used in this sector comes from natural gas. There are available supplies of both types of energy.

### Demand

Demand in the residential sector fell by nearly 10 trillion British thermal units between 1997 and 1999. In 1998, residential energy demand fell

3.0 percent and fell another 4.1 percent in 1999. Nearly the entire decline in 1998 came from natural gas use and the decline in 1999 was primarily attributed to electric system losses.

### Conservation

Most natural gas in the residential sector is used for heating and minor household uses 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. Higher than normal heating bills have propelled homeowners to make energy saving improvements such as replacing furnaces and adding insulation.

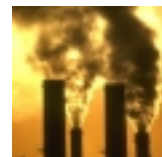
The 40-year trend of increasing use of electricity in households, from 6.51 trillion Btus in 1960 to 27.06 trillion Btus in 1999, illustrates the wide adoption by Nebraskans of energy-using technologies such as televisions, microwave ovens and computers.

### Energy Need

Energy need in this sector for the two major fuel types — natural gas and electricity — is likely to be determined in predictable ways: severity of winter and summer weather conditions and price volatility. The combined impact of a return to normal winter weather patterns coupled with high natural gas prices — as occurred in 2000-2001 — would likely result in predictable behavior: a surge in replacement of inefficient heating equipment, reduction in use and fuel switching by replacing natural gas furnaces with electric-powered heat pumps. A string of 100 degree summer days, can also lead to replacements of broken or old air conditioners with new energy efficient models which can reduce energy use.

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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. Natural gas, electricity and various petroleum products — gasoline, propane and 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, from 1960 to 1999, total energy demand in this sector has grown by more than 79.2 percent. Demand grew significantly for electricity, propane and diesel fuel while declines were recorded for coal and gasoline.

### Conservation

Over the years, the industrial sector has been more likely to make energy efficient system and building improvements, especially if energy costs are a significant factor in the cost of doing business.

The impact of conservation efforts are most clearly seen in natural gas use in this sector when usage peaked in 1973 at 73.7 trillion Btus. Demand subsequently fell precipitously after the energy price shocks of the 1970s to a low of 20.3 trillion Btus in 1986.

### Energy Need

Energy need in the industrial sector is also subject to the ebb and flow of national and regional economic trends which can cause spikes or declines in energy demand.

Growth trends in this sector can also be affected by industrial expansions in the state. For example, the significant increase in ethanol production in the mid-1990s caused a substantial increase in natural gas need in this sector.

Based on past use patterns, increased need for electricity by this sector is likely. Energy need for other energy resources is impossible to predict.

sector includes energy used to transport natural gas through pipelines.

### Energy Supply

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

### Demand

Demand in this sector has more than doubled since 1960, rising from 87.8 trillion Btus to 185.5 trillion Btus in 1999. Demand for diesel fuel has increased more than nine-fold in the same period from 8.17 trillion Btus to 76.9 trillion Btus in 1999. Gasoline and diesel fuel account for 97 percent of the resource types used in the transportation sector.

Between 1995 and 1999, growth in demand in this sector averaged between 2-3 percent a year. Factors that affect growth in this sector include population growth, replacement of vehicles with less efficient ones and the number of miles traveled a year.

### Conservation

The transportation sector is especially immune to conservation efforts. Over the decades, a variety of approaches by the state and federal governments have been tried: mandated Corporate Average Fuel Efficiency standards, reduced highway speed limits, introduction of efficiency technology in vehicles, and driving modifications such as right-turn-on-red lights and carpooling/ridesharing.

Recent trends in this sector have run counter to conservation efforts. Price rises can induce conservation behavior in this sector, but typically the actions are limited and have not been sustained in the long term.

### Energy Need

Based on past demand trends in this sector, continued growth in energy use in this sector seems likely.

## Energy Supply

Trends in the electric utility sector in Nebraska have remained generally constant over time: more than 90 percent — 93 percent in 1999 — of the fuels used to generate, distribute and transmit electricity has come from just two resource types: coal and nuclear. In-state hydropower resources used to generate electricity have also remained generally constant over the recent past, averaging about 5 percent a year.

### Demand

Since 1960, energy demand by electric utilities has increased more than six-fold from 49.7 trillion Btus to 320.6 trillion Btus in 1999. Increase in demand has been recorded each year between 1995 and 1999. Demand between those years grew 18.5 percent.

### Conservation

Efficiency efforts in the electric utility sector result from technological advances, either by the utility or the user.

One key target of efficiency improvements for utilities is reducing electricity losses during transmission. While technological breakthroughs can address part of the problem, other improvements can also be made. For example, local utilities estimate standard line loss at seven percent, but in some cases actual losses can be more than double that amount if preventive maintenance is not performed on a regular basis on the utility lines.

Between 1995 and 1999, estimated average line losses in Nebraska ranged from more than 10.5 billion kilowatthours in 1995 to 19.1 billion kilowatthours in 1999, and appears to be growing.

### Energy Need

Nebraska utilities remain net exporters of electricity. Between 1995 and 1999, the amount of electricity exported has increased each year, reaching a peak of 7.2 billion kilowatthours in 1999, up 29 percent from 1998.

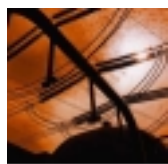
In time, however, continued growth in need will result in additional capacity requirements. Several of the state's largest utilities have begun the

## Transportation



In addition to traditional methods of transportation — public and private vehicles, aircraft and boats — this

## Utilities



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



process for adding generation assets. For new base load and peaking facilities, the utilities are planning on using coal and natural gas, respectively, and they have also identified smaller generation options using wind and biogas.

## 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 2001, oil production fell to 2.922 million barrels from 2.955 million barrels in 2000. Over the past five years, oil production has declined 12.5 percent. In 1999 (the latest year for consumption data), the state's crude oil production represented only 5.8 percent of the petroleum products used in the state in that year.

Natural gas has been produced in the state since 1951. Natural gas production peaked in 1960 and has declined precipitously since with only minor increases in production, the last one occurring in 1998. In 2001, 1.209 billion cubic feet was produced, a decrease of 0.8 percent from 2000. In 1999, natural gas production represented only 1.2 percent of the natural gas consumed by Nebraskans.

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 resource used in electricity production.

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

During the reporting period, there were five operational wind turbines generating electricity. One turbine near Valley, was dismantled, but is expected to again become operational in spring 2003. In October 2002, the Municipal Energy Agency of Nebraska

installed seven turbines near Kimball. Energy generated by the turbines is estimated to supply less than one percent of energy consumption in Nebraska, based on 1999 consumption data.

### Feasible Alternatives

There are five main alternate energy sources available in Nebraska: biomass, geothermal, hydropower, solar and wind. Maps and other specific information about the state's alternate energy resources can be found at [http://www.eere.energy.gov/state\\_energy/mystate.cfm?state=ne](http://www.eere.energy.gov/state_energy/mystate.cfm?state=ne)

In 1999, an estimated 4 percent of the state's total energy consumption was met from renewable resources. Total energy consumption in 1999 was 602 trillion Btus of which 24.156 trillion Btus came from renewable sources.

Assessments of the five feasible alternatives follow:

#### Biomass

In 1999, wood and waste provided an estimated 3.7 trillion Btus, less than one percent of the state's energy need.

The most significant biomass energy resource in Nebraska continues to be ethanol that is produced from corn and grain sorghum. In 1999, an estimated 2.1 trillion Btus – more than 18.5 million gallons – of ethanol was consumed in Nebraska and represented about 0.4 percent of the state's total energy need.

During the reporting period, there were seven operating plants that produced an estimated 352.451 million gallons of ethanol. The plant at Sutherland ceased operation in 2001. Projections for ethanol production for 2002 are estimated to top 365 million gallons. New ethanol plants in Plainview and Axtell are expected to be operational in 2003, so total ethanol production is anticipated to increase.

The state's ethanol board estimates that 20 percent of the state's corn crop and the equivalent of  $\frac{3}{4}$  of the state's grain sorghum crop is used to produce ethanol in a typical year. As production increases, these percentages should also increase.

### 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 are two pockets of high-temperature hydrothermal fluid 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 foreseeable future.

Earth energy, however, can be used directly to provide heat in a variety of applications, such as geothermal heat pumps and appears to offer Nebraskans a way to utilize this resource. 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 and is being promoted by the state's larger electric utilities.

In 1999, an estimated 0.32 trillion Btus were produced from geothermal resources in the state.

### Hydropower

In 1999, almost 75 percent, 18 trillion Btus, of the renewable energy used in Nebraska came from hydropower sources. The electricity generated by the hydro resources came from 11 dams in or on the border of the state and from power supplied by Western Area Power Administration. Typically, the amount of hydropower generated is relatively constant from year to year, unless affected by drought conditions. As the state's energy need continues to grow, less and less of the need will be met by hydro resources.

According to a study by the Energy Information Administration and the Idaho National Engineering and Environmental Laboratory, an estimated 2.348 million megawatt hours of electricity could be produced from hydropower resources, meeting about 9 percent of the state's electricity needs in 1998. At this time, however, it is unlikely any additional hydropower resources will be developed.

## Solar

According to the Energy Information Administration, Nebraska has good solar resources especially in the western part of the state. Based on that assessment, the federal agency estimated that a flat panel photovoltaic system the size of a football field would generate enough electricity to meet the needs of more than 103 households. A tracking-type photovoltaic system installed in western Nebraska on 150 acres would generate enough electricity to meet the needs of more than 4,330 households.

Current solar technology deployed by utilities in the state are limited to meeting the needs of cattle ranchers in remote regions where photovoltaic systems are less expensive than installing new power lines.

In 1999, an estimated 0.016 trillion Btus were generated from solar thermal and photovoltaic resources in the state.

## Wind

An Energy Information Administration analysis of Nebraska's wind resources concluded approximately 46 percent of the state contained good

wind speeds suitable for development. If all of these resources were developed, only 4.6 percent of the land would be used, and an estimated 869 million megawatt hours of electricity could be produced annually.

The prognosis for an increase in wind generation capacity appears very strong in the near term. Nebraska Public Power District is considering installing turbines capable of generating up to 50 megawatts. If demand materializes and other issues can be addressed, the Municipal Energy Agency of Nebraska has indicated up to 14 more turbines could be added to the Kimball site.

## Estimated Energy Consumption Reduction



Several evaluations have been conducted by the Energy Office that quantified energy consumption reductions that resulted from

activities sponsored by the agency:

- A typical home weatherized under the agency's federally-funded program achieves a 25 percent or

greater reduction in space heating needs, and saves an estimated \$152 a year in energy costs.

- Replacement natural gas fueled furnaces installed and financed with Dollar and Energy Saving Loans from the agency realized a 10.7 percent reduction in energy use for 80 percent efficient furnaces and a 19.2 percent reduction in energy use for 90 percent efficient furnaces.

## Status of Ongoing Studies



The Nebraska Energy Office continued work on an energy savings evaluation of the Low Income Weatherization Assistance Program. Homes weatherized between April and September of 2001 that used natural gas as the primary heating fuel are being studied. Pre-weatherization consumption data for 392 homes was obtained. Post-weatherization consumption will be requested and the Princeton Scorekeeping Method will be used to calculate the energy savings.

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