

# NEBRASKA ENERGY OFFICE

## The Programs

*The vision of the Nebraska Energy Office is for Nebraskans to have reliable and affordable sources of energy that support a cleaner environment and a more secure energy future.*

*The mission of the Nebraska Energy Office is to promote the efficient, economic and environmentally responsible use of energy. The agency's principles are that we value teamwork, is customer oriented, and is committed to excellence, creativity and innovation.*

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

- Maximize the efficient use of traditional energy resources.
- Encourage Nebraskans to adopt energy efficiency through low cost financing.
- Encourage the development and use of renewable energy resources.
- Advise the executive and legislative branches of state government on energy policy and security.

The Nebraska Energy Office operates a number of different programs. These programs can be categorized as follows: low-income weatherization, oil overcharge-funded activities and state energy program and organization activities. An overview of the 2005-2006 financial activity appears at the end of this section. The period covered by this report is from July 1, 2005 to June 30, 2006, except where noted.

### Low Income Weatherization Assistance Program



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

Generally, 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 the subgrantees, primarily community action agencies, that actually make the home weatherization improvements. In this reporting period, an estimated one-fifth of the homes weatherized were inspected by agency staff.

In fiscal year 2005-2006, 1,292 homes were weatherized by Energy Office subgrantees. This effort received a total of \$5,264,409 from two sources: \$2,596,874 from the U.S. Department of Energy's Low Income Weatherization Assistance Program and \$2,667,535 from the Low Income Home Energy Assistance Program.

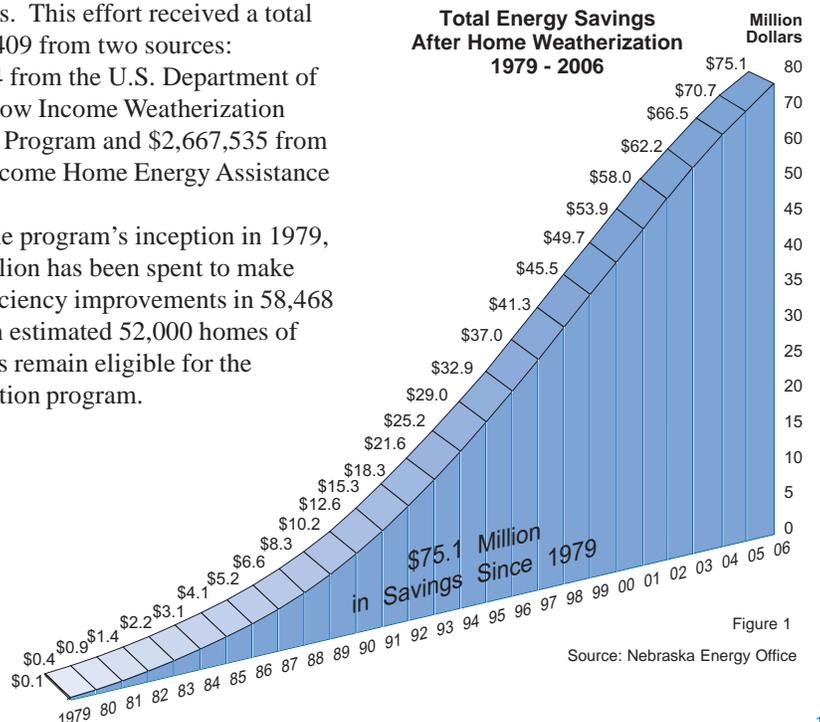
Since the program's inception in 1979, \$98.22 million has been spent to make energy efficiency improvements in 58,468 homes. An estimated 52,000 homes of Nebraskans remain eligible for the weatherization program.

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 \$75.1 million have been achieved. About \$4.4 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



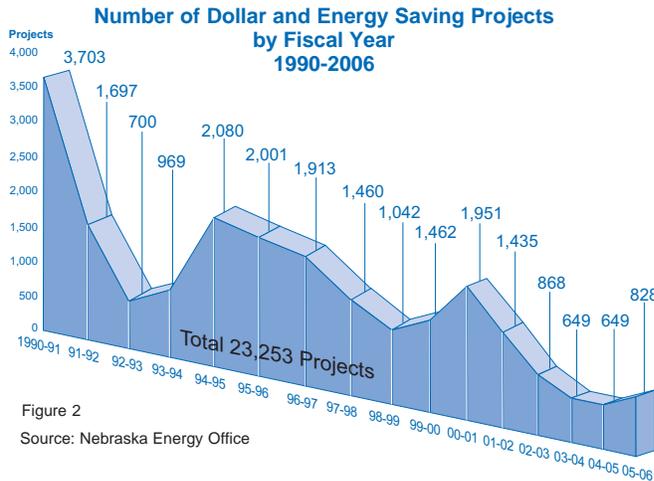


Figure 2  
Source: Nebraska Energy Office

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 Energy Settlement Fund activities follows and is detailed in Figure 4 on page 3.

### 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, 215 participating lenders at 736 locations provide five percent interest rate financing for up to 10 years on loans for energy saving improvements.

By June 30, 2006, 23,253 projects totaling more than \$197.9 million have been financed with a combination of low-interest loans from the Energy Office and participating lenders and funds from borrowers for non-eligible improvements. Of that total, the Energy Office has provided more than \$85.0 million which leveraged more than \$88.3 million from Nebraska lenders. These projects also leveraged from borrowers an additional \$15.8 million that was spent on non-eligible related improvements.

Loans have financed projects in all of the state's 93 counties. During the reporting period, 828 new projects

were financed. The number of projects financed each year since 1990 is shown in Figure 2.

For reporting purposes, the agency categorizes loans into 11 types. More than 80 percent of the loan funds have financed improvements in just three categories:

agriculture, residential and small business. Summaries of loan categories appear in Figure 3 and the three largest are detailed as follows:

### Agricultural Improvements

Improvements in agricultural equipment and systems rank fourth in the use of low-interest financing. More than 5.7 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 565 agricultural projects with 620 specific improvements totaling \$10.494 million.

### Residential Improvements

More than 92 percent of the total number of the energy efficiency projects financed are in the homes of Nebraskans. Nearly 70 percent of all

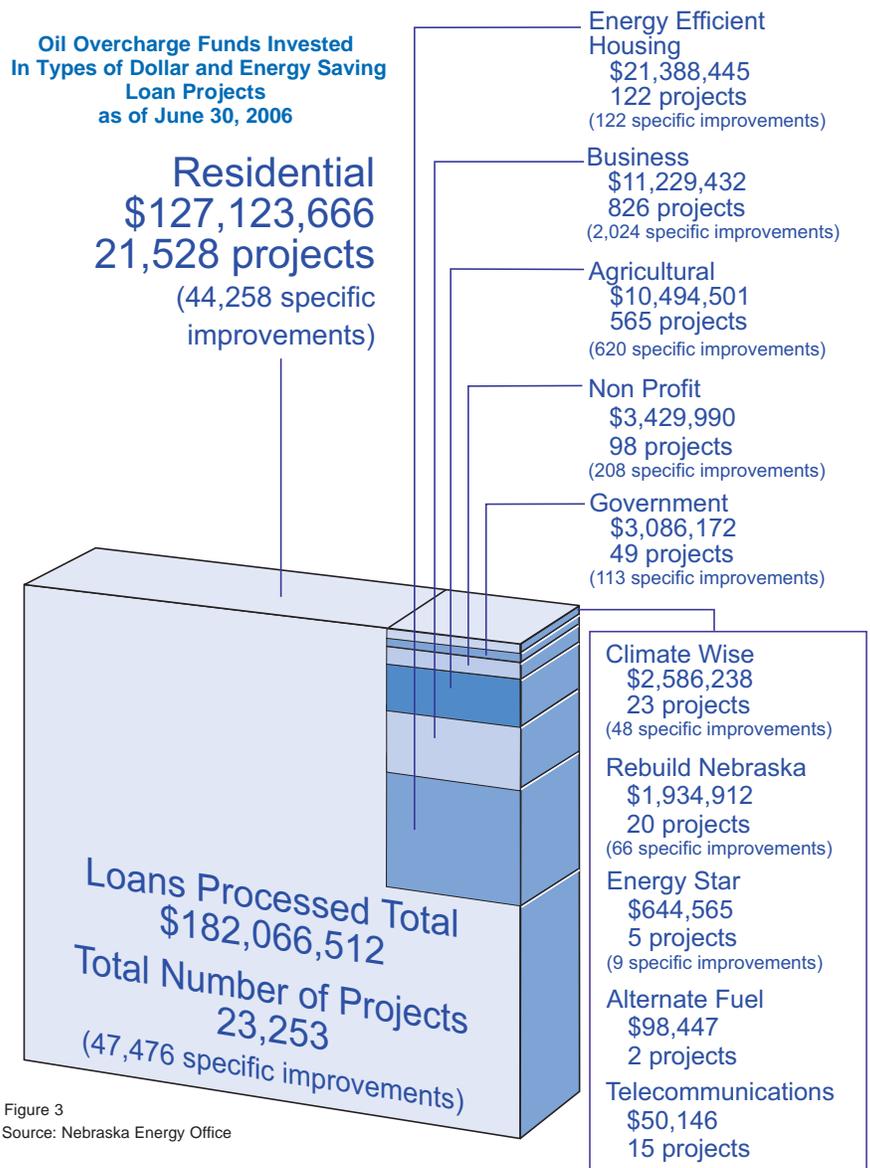


Figure 3  
Source: Nebraska Energy Office

**Nebraska Energy Settlement Fund  
A Summary of Exxon, Stripper Well and Diamond Shamrock  
Oil Overcharge Funds as of June 30, 2006**

	<i>Exxon</i>	<i>Stripper Well</i>	<i>Diamond Shamrock</i>	<b>Total</b>
Funds Received	\$15,504,944	\$15,475,224	\$359,172	\$31,339,340
Interest Earned and Miscellaneous Income	\$10,370,966	\$7,758,149	\$243,665	\$18,372,780
<b>Total</b>	<b>\$25,875,910</b>	<b>\$23,233,373</b>	<b>\$602,837</b>	<b>\$49,712,120</b>
<b>Funds Budgeted</b>	<b>\$25,875,910</b>	<b>\$23,021,620</b>	<b>\$602,837</b>	<b>\$49,500,367</b>
<b>Low Income Designated</b>	<b>\$0</b>	<b>\$95,617</b>	<b>\$0</b>	<b>\$95,617</b>
<b>Uncommitted Balance</b>	<b>\$0</b>	<b>\$116,136</b>	<b>\$0</b>	<b>\$116,136</b>

Source: Nebraska Energy Office

Figure 4

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, 21,528 projects with 44,258 specific improvements totaling more than \$127.123 million have been undertaken by Nebraskans.

#### *Small Business Improvements*

More than 6.1 percent of all energy efficiency financing, \$11.229 million, have been used to make 2,024 specific improvements in 826 buildings and systems in small businesses in the state, ranking second-highest among all loan categories. Typical small business improvements include replacement of furnaces and air conditioners as well as insulation, lighting and replacement doors and windows.

### State Energy Program



In 2005-2006, Nebraska received \$428,000 for this federally-funded effort and supplied

\$85,600 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 program support for a wide array of activities that include energy shortage management and emergency preparedness, education and information, Dollar and Energy Saving Loans, residential and commercial building energy efficiency. The agency also manages competitive federally-funded State Energy Program Special Projects grants secured by the agency.

The Energy Office reviews state-financed plans for affordable homes assuring compliance with the Nebraska Energy Code. Periodically, the agency performs on-site inspections of completed homes, sharing compliance findings with the funding source.

For homes being constructed as Nebraska Certified Green Built, the agency conducts inspections throughout construction. The Energy Office owns the service mark for Nebraska



*Affordable Green Built Home*

Certified Green Built and offers metal plaques for homes built to established standards. The agency also provides technical assistance, builder training and certifies housing plans. Information about green built homes is at [http://www.neo.ne.gov/home\\_const/greenbuilthomes.htm](http://www.neo.ne.gov/home_const/greenbuilthomes.htm)

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.

### *Applying Building America Strategies to Buildings*

This project was financed, in part, with a SEP *Building America* Special Projects grant totaling \$99,334 and received in October 2003. In collaboration with its design partner, the agency designed and built a value-engineered green built affordable home. The home was constructed by a certified green builder and served as a learning and training tool for builders, subcontractors and suppliers.

A Nebraska climate specific design manual was developed and posted on the agency's web site. The house designs and specifications include the demonstration home constructed and researched through this project.

This project was completed by June 30, 2006 and all funds spent. The agency will continue to provide technical assistance to builders interested in affordable green built homes.

### *Putting the Pieces Together in Nebraska*

This \$29,855 SEP Special Projects *Building America* grant from the U.S. Department of Energy was received in September 2002. An Energy Office partner, the Nebraska State Home Builders Association advanced the knowledge and technical skills of its members through training and education for home remodelers and production builders.

During the reporting period, an educational symposium was organized for Nebraska builders at the National Renewable Energy Laboratory. The 11 participating builders were provided information about *Building America* concepts and use of value engineering in home construction.

This project was completed and all funds spent.

### **From 1983 Model Energy Code to 2003 International Energy Conservation Code**

The Special Projects Codes and Standards grant of \$32,223 was received from the U.S. Department of Energy and enabled the Nebraska Energy Office to provide 16 training workshops to local code officials, architects, engineers, homebuilders, heating and air conditioning installers and utility personnel before the July 1, 2005 effective date of the 2003 International Energy Conservation Code as the new Nebraska Energy Code. A total of 571 participants were trained at these workshops.

This project was completed and all funds spent.

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### **Other Projects**



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

### **Advanced Training Equips Building Officials to Enforce the New Nebraska Energy Code**

A Special Projects Codes and Standards grant of \$24,725 was received from the U.S. Department of Energy to enhance and expand the knowledge base and capabilities of local code officials, inspectors and designers through advanced energy code training. The grant will enable the Energy Office to provide two training workshops to persons involved in Nebraska's construction industry,

and to pay for certification examinations for up to 75 local code officials. The training is scheduled for March of 2007, while the three certification examinations will be offered in April and May of 2007.

### **Biomass Roadmap**

A \$30,000 grant from the U.S. Department of Energy was received in October 2002 to begin the development of a Nebraska-based Biomass Roadmap. As part of the development process, Nebraskans were surveyed in eight biomass areas: agricultural residues, biodiesel, ethanol, methane, biopower, tallow, switchgrass and bioproducts. A web site, <http://webvideo.unl.edu/downloads/CASSMANPRESENTATION.pdf>, incorporating the roadmap development was also created. The project was expanded to include the development of the Biomass Roadmap — Phase II. As approved by the Department of Energy, funds from this project and the Biopower Steering Committee were combined for this work. A one-day Nebraska Biomass Energy Roadmap Workshop was held in July 2005.

This project was completed and all funds spent.

### **Biopower Steering Committee**

A \$24,000 grant from the U.S. Department of Energy was received in October 2002 to support activities of the state's Biopower Steering Committee, which was created in 1999. No state funds have ever supported Committee activities. Information about the Steering Committee is at <http://www.neo.ne.gov/renew/biomass-biopower.htm>. The project was expanded to include development of the Biomass Roadmap — Phase II. As approved by the U.S. Department of Energy, funds from this project and the Biomass Roadmap were combined for this work. A one-day Nebraska Biomass Energy Roadmap Workshop was held in July 2005.

This project was completed and all

funds spent.

### **Develop and Implement Industrial Technologies Programs in Large Energy Consumption Industrial Plants**

The Energy Office received a \$100,000 Industries of the Future grant from the U.S. Department of Energy in October of 2005 to develop and demonstrate advanced Industrial Technologies Programs using two case studies and to initiate a statewide effort in Nebraska's industrial sector. Advanced Industrial Technologies Programs allow industry owners to implement major energy efficiency improvements with little or no capital investment. During the reporting period, 13 building owners were recruited and two comprehensive energy studies were completed for two selected facilities. The project is scheduled for completion by September 30, 2007.

### **Energy Star: Using Promotion Activities and Financing Incentives to Increase Use of Energy Star-labeled Products in Nebraska**



In July 2005, the agency received a \$20,000 grant from the U.S. Department of Energy to increase the use of Energy Star products in the state through the use of promotion, marketing and coordinating the national Energy Star effort with the agency's Dollar and Energy Saving Loans.

Energy Star is a joint effort of the Environmental Protection Agency and the U.S. Department of Energy to identify the most energy efficient appliances, lighting, heating and cooling equipment as well as electronics and office equipment.

During the reporting period the agency began the work outlined in the project submission. This project is scheduled to be completed by December 31, 2006.

## Rebuild Nebraska Partners Identify and Implement High Performance Building Strategies

The Energy Office received a \$100,000 Rebuild America grant from the U.S. Department of Energy in October of 2005 to continue Rebuild Nebraska work and boost the implementation of Continuous Commissioning technologies in commercial buildings, university buildings, K-12 schools and state and local government buildings. During the reporting period, 38 building owners were recruited, 26 buildings were evaluated, and dedicated energy meters were installed in nine buildings. The project is scheduled for completion by September 30, 2007.

## State Heating Oil and Propane Program

During the reporting period, the Energy Office began its fifth year of participation in the U.S. Department of Energy's State Heating Oil and Propane Program. This activity collects price information from a sampling of Nebraska suppliers selected by the Energy Information Administration from October through March which, in turn, is shared with the Energy Information Administration and then posted on the agency's web site at <http://www.neo.ne.gov/statshhtml/86.html> and <http://www.neo.ne.gov/statshhtml/87.html>. The U.S. Department of Energy provided a grant of \$6,000 for this activity. By the end of the reporting period, all funds were expended and the project was completed.

## Western Governors' Association: Life Cycle Bioenergy and Environmental Impact Simulator

In November 2005, the agency received a competitively awarded grant for \$70,000 to develop an easy-to-use computer software model to estimate energy yield, energy efficiency and environmental impact of biorefinery corn-to-ethanol, stover, and grain sorghum production systems based on component technologies and environ-

mental conditions. The University of Nebraska-Lincoln Agronomy and Horticulture Department is developing the software.

At the end of the reporting period, no funds had been expended. This project is scheduled for completion July 31, 2007.

## Wind Powering America 2005 and 2006

For a number of years, the agency has received annual grants from the U.S. Department of Energy to promote wind energy understanding, production and consumption in the state.

In April 2005, the agency received \$20,000 and received another grant of \$20,000 in June 2006. Both grants supported wind energy outreach informational activities at the Nebraska State Fair, Husker Harvest Days as well as other venues. The grant also provided support for agency wind activities.

The April 2005 grant work was completed by June 30, 2006 and all the funds were spent. Work continues on the grant received in 2006.

## Nebraska Ethanol Board Support for the Governors' Ethanol Coalition

A grant from the U.S. Department of Energy for \$37,500 was, in part, passed through to the Nebraska Ethanol Board to support the meetings and work for the Governors' Ethanol Coalition.

As of June 30, 2006, \$37,500 was spent and the project was completed.

## Peer Exchange

A \$3,500 grant from the U.S. Department of Energy enabled agency staff to participate in various activities such as training, regional meetings or national conferences. As of June 30, 2006 all funds were spent and activities were completed.

## Organizations



tions:

The Energy Office serves as the headquarters for four state, regional, national and international organiza-

## Governors' Ethanol Coalition Members

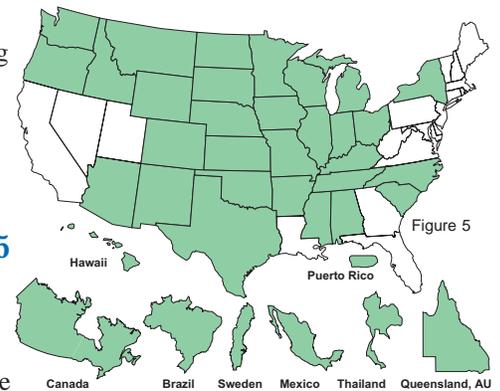


Figure 5

## Governors' Ethanol Coalition

Nebraska was the driving force in the Coalition's creation in 1991. Today, there are 35 members from Hawaii, Oregon and Washington in the West to the Carolinas and New York in the East. There are also six international members. The members are identified in Figure 5.

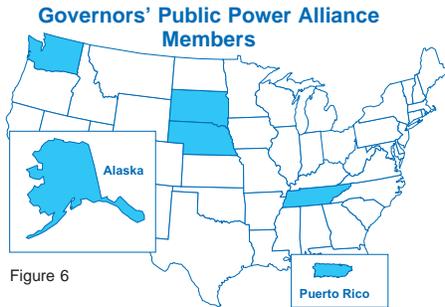
An Energy Office staff member is one of the Nebraska governor's representatives for the group. The Energy Office serves as the Coalition's administrative headquarters, handling fiscal, media and operational matters.

In late 2006, the Governors' Ethanol Coalition released a report, *Ethanol from Biomass: How to Get to a Biofuels Future*, <http://www.ethanol-gcc.org/information/biomassstoethanol2006.htm> which has four recommendations:

- ◆ Expand the Renewable Fuels Standard (RFS) to include a short-term target of 12 billion gallons a year of ethanol and biodiesel utilization by 2010, and longer-term British thermal unit-based targets of 15 percent of total motor fuels consumption by 2015 and 25 percent by 2025, with equal incremental steps provided for each year in between;
- ◆ Assign a financial value to the RFS cellulosic ethanol 2.5:1 trading credit into a more practical credit.
- ◆ Establish a timetable for delivering 85% ethanol/15% gasoline infrastructure on a regional basis within five years.

- ◆ Provide adequate funding for the *Energy Policy Act of 2005* authorized biofuel research, demonstration and incentive programs. Nebraska's Governor will head the Coalition in calendar year 2007.

### Governors' Public Power Alliance



This bi-partisan coalition of six governors was formed in 1998 so consumers served by publicly-owned electric systems would not be disadvantaged as the electric industry was restructured. The governors of Nebraska and Tennessee serve as co-chairs of the Alliance.

Nearly one-quarter of the nation is served by consumer-owned systems, including all electric utilities in Nebraska.

During the reporting period, the Alliance monitored federal legislative activity — especially the *Energy Policy Act of 2005* — making its position known.

### Western Regional Biomass Energy Program

Since 1997, the Energy Office has had a variety of roles for the federally-funded Western Regional Biomass Energy Program: grant recipient, administrator of the 13-state region,

and host and maintenance operator of the program's web site.

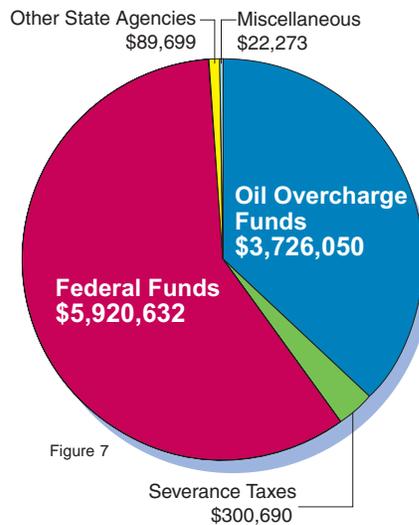
Since the agency began administering the program in 1997, \$1.725 million in grants were competitively selected and awarded for various biomass projects in the 13 states in the region. The grant program ended December 31, 2003. Since that time, the U.S. Department of Energy authorized the Energy Office to continue grant administration, maintain the web site and pass-through federal funds to the Nebraska Ethanol Board to provide continued support to the Governors' Ethanol Coalition. The agency's involvement with the regional program ended in December 2005.

This grant was completed on December 31, 2005.

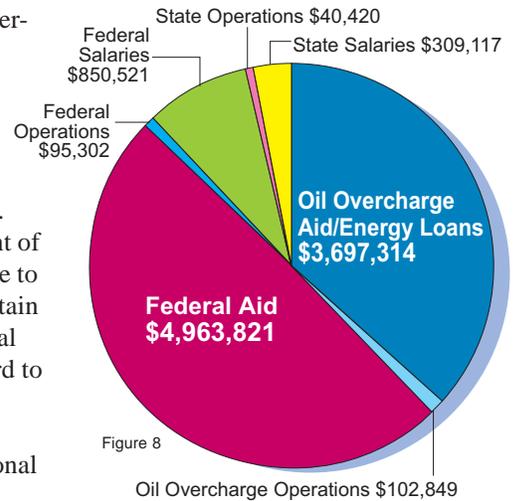
### Biopower Steering Committee

Authorized by the Legislature through 2008, the Energy Office provides assistance to this 12-member group. The Committee's task is to foster the use of bio-based resources as energy production resources.

**Where the Money Came From as of June 30, 2006**



**Where the Money Went as of June 30, 2006**



### Financial Activity



In 2005-2006, the expenditures for the agency totaled \$10,059,344 and includes federal, state,

oil overcharge and miscellaneous state funds. The source of the funds is illustrated in Figure 7. More than 67 percent was derived from federal sources. Nearly 29 percent of the funding came from oil overcharge accounts.

More than 56 percent of all federal funds were spent as aid in the Low-Income Weatherization Assistance Program. More than 28 percent of all expenditures were used for oil overcharge aid primarily in the form of Dollar and Energy Saving Loans and are detailed on pages one through three in this report. Complete expenditure details are found in Figure 8.

(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, 81-161, 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 in 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.neo.ne.gov/statshtml/index3c.html>

### State-wide Energy Need and Cost



In 2003, the state's total energy consumption was 646.1 trillion British thermal units, an increase of less than one percent from 642.4 trillion British thermal units in 2002. Petroleum, renewable energy and coal demand increased in 2003 as compared to 2002. Use of nuclear and natural gas decreased in 2003 over 2002.

(2003 is the most recent year for which consumption, expenditure and price data are available.)

Total energy expenditures in 2003 increased almost 1.3 percent above 2002 figures to nearly \$4.7 billion. Expenditures in 2003 for petroleum, accounted for 52.7 percent of the total and natural gas accounted for 16.5 percent of the total.

The 2003 prices for different types of energy, as compared to other states, reveals Nebraskans paid the lowest price for coal in the nation, and less than half the national average. The rankings are calculated by the Energy Information Administration (EIA). Retail electricity ranked at 43 in price, and gasoline at 35. Natural gas, another key energy source for Nebraskans, ranked 31 in price.

According to the EIA, Nebraska ranked 37 in 2003 in total energy expenditures among the 50 states and the District of Columbia (California was the highest and the District was the lowest). The state was 21 in the ranking of expenditures per person at \$2,704 (Wyoming was the highest and Utah was the lowest).

### Agricultural Energy Supply



Energy supplies 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.

For example, record high prices for natural gas and diesel fuel caused farmers to alter practices such as when and how much anhydrous ammonia fertilizer — a natural gas product — is used. To combat high diesel fuel prices, some farmers have adopted conservation tillage practices.

## Energy Need

Energy costs are a significant agricultural expense. In 2005, the U.S. Department of Agriculture stated that energy costs, on average, account for about 15 percent of total agricultural expenses. In Nebraska in 2004, farm expenditures rose by 7.3 percent to \$9.88 billion. Increases were due to the rise in costs for tractors and machinery, fuels, fertilizer, feed and labor. Expenditures per farm or ranch averaged \$204,555 in 2004, up from \$189,897 according to the USDA Nebraska Agriculture Statistics Service.

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 2001 was primarily due to increased irrigation use as a result of drought conditions in some areas of the state.

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

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## Commercial



The commercial 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

For the most recent five year reporting period, 1998-2003, at least 93 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 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

A multi-year trend — from 2001-2003 — of declining demand in the commercial sector continued. Net energy use decreased 1.7 percent to 61.8 trillion British thermal units. Total energy use also decreased by 4.5 percent to 126.8 trillion Btus. Demand by types of fuel: electricity, down 6.1 percent from 2002; natural gas up by less than 1 percent; petroleum use increased 2.2 percent; and renewable energy use up 10.9 percent.

## 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 readily available.

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## Residential

### Energy Supply



Nearly 88 percent of the energy used in the residential sector in 2003 came from only 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 in 2003 decreased in net energy use by 2.4 percent over 2002 to 82.8 trillion British thermal units. Decreases in 2003 were reported in electricity, down 1.2 percent, natural gas, down 3.8 percent and petroleum down 2.7 percent.

The 40-plus-year trend of increasing use of electricity in households, from 6.51 trillion Btus in 1960 to 30.2 trillion Btus in 2003, illustrates the wide adoption by Nebraskans of energy-consuming technologies such as televisions, microwave ovens and computers.

## Conservation

Most natural gas in the residential sector is used for home 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, windows and adding insulation.

## 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 increased natural gas prices — as occurred in 2002-2003 when natural gas prices increased from \$6.17 to \$7.83 per million Btus — 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 replacement 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, coal and various petroleum products — gasoline, asphalt, road oil and propane and diesel — are the primary energy types utilized in this sector's operations. Generally, supplies of all fuel types have been readily available.

## Demand

In four decades, total energy demand in this sector has grown from 93.0 trillion Btus in 1960 to 198.4 trillion Btus in 2003. In 2003, electricity use increased 11.3 percent and petroleum use increased 5.6 percent from 2002. Natural gas use decreased 5.8 percent, coal use decreased 2.1 percent and renewable energy use decreased 0.3 percent.

## 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, and has only climbed to 38.4 trillion Btus in 2003.

## 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 state has 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.

## Transportation



In addition to traditional methods of transportation — public and private vehicles, railroads, aircraft and boats — this 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 nearly doubled since 1960, rising from 94.2 trillion Btus to 170.9 trillion Btus in 2003. In 2003, energy demand increased by 2.2 percent from 2002, rising to 167.25 trillion British thermal units. Demand for diesel fuel increased almost seven-fold since 1960 from 8.17 trillion Btus to 54.8 trillion Btus in 2003. Gasoline and diesel fuel account for nearly 90 percent of the resource types used in the transportation sector.

Factors that affect this sector include population growth, replacement of vehicles with more or less efficient ones and the number of miles traveled each 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. The price rise in petroleum-based fuels since 1999 has had an impact on demand. Peak total energy consumption was reached in 1999 at 194.4 trillion Btus. The following four years have recorded significant declines in consumption, primarily in the use of diesel fuel. Gasoline use during those four years generally remained static.

## Energy Need

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

## Utilities



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

## Energy Supply

Trends in the electric power sector in Nebraska have remained generally constant over time: more than 90 percent — 95 percent in 2003 — of the fuels used to generate, distribute and transmit electricity has come from just two resource types: coal and nuclear electric power. In-state hydropower resources used to generate electricity have declined over the past three years because of drought conditions. Wind generated electricity became measurable in 2002, quadrupling to 0.391 trillion Btus in 2003.

## Demand

Since 1960, energy demand by electric utilities increased more than six-fold from 50.2 trillion Btus to 318.7 trillion Btus in 2003. Demand in the past five years, from 1999 to 2003, has seesawed back and forth — up one year, down the next.

## Conservation

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

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.

## Energy Need

Nebraska utilities met customers needs and more, remaining net exporters of electricity. The amount of electricity exported reached a peak of 7.2 billion kilowatthours in 1999. In 2003, utilities exported 4.4 billion kilowatthours, an estimated 14.1 percent of net generation that year.

Continued growth in need will result in additional capacity requirements. Several of the state's largest utilities have begun the process for adding generation assets. For new base load and peaking facilities, the utilities are planning to use 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 2005, oil production declined to 2.413 million barrels from 2.507 million barrels in 2004, a decrease of 4 percent from 2004. In 2003 (the latest year for consumption data), the state's crude oil production represented only 6.4 percent of the petroleum products used in the state in that year.

Natural gas has been produced in the state since 1950. Natural gas production peaked in 1960 and has declined precipitously since with several infrequent and minor increases in production, the last ones occurring in 2003 and 2004. In 2005, 1.2 billion cubic feet of natural gas was produced, a decrease of nearly 300 million cubic feet, or 20 percent, over natural gas production in 2004. In 2003, natural gas production represented only 1.3 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 48 operational wind turbines

generating electricity. In 2006, more than 260 million kilowatthours — enough for more than 40,000 homes — were generated. Energy generated by the turbines is estimated to supply less than one percent of energy consumption in Nebraska, based on 2003 consumption data, the latest available.

### 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 alternative energy resources can be found at [http://www.eere.energy.gov/states/alternatives/resources\\_ne.cfm](http://www.eere.energy.gov/states/alternatives/resources_ne.cfm)

In 2003, an estimated 4 percent of the state's total energy consumption was met from renewable resources. Total energy consumption in 2003 was 646 trillion Btus of which 23.24 trillion Btus came from renewable sources.

Assessments of the five feasible alternatives follow:

#### Biomass

In 2003, wood and waste provided an estimated 9.1 trillion Btus, less than two percent of the state's energy need that year.

A small but growing amount of electricity is being generated from methane at former landfills and at sewage facilities.

The most significant biomass energy resource in Nebraska continues to be ethanol that is produced from corn and grain sorghum. In 2003, an estimated 3.22 trillion Btus — more than 38 million gallons — of ethanol were consumed in Nebraska.

In 2005, there were 17 operating plants that produced over half a billion gallons of ethanol, an increase of more than 5 percent over the volume produced in 2004. More ethanol plants are expected to be operational or complete expansions in 2007.

The state's ethanol board estimates that 25 percent of Nebraska's corn crop and the equivalent of three-quarters of the state's grain sorghum crop were used to produce ethanol in 2005. As production increases, these percentages will 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, however, development appears unlikely in the foreseeable future.

Earth energy 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 2003, an estimated 0.48 trillion Btus were produced from geothermal resources in the state.

#### Hydropower

In 2003, 43 percent, 10.04 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. However, it is unlikely any additional hydropower resources in Nebraska will be developed.

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## 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 is limited to meeting the needs of cattle ranchers in remote regions where photovoltaic systems are less expensive than installing new power lines.

In 2003, an estimated 0.01 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 outlook for an increase in wind generation capacity appears optimistic.

Interest in residential scale wind turbines, capable of meeting the needs of a single household, is also rising.

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### 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.

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### Status of Ongoing Studies



The Nebraska Energy Office had no ongoing studies underway during this period.

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