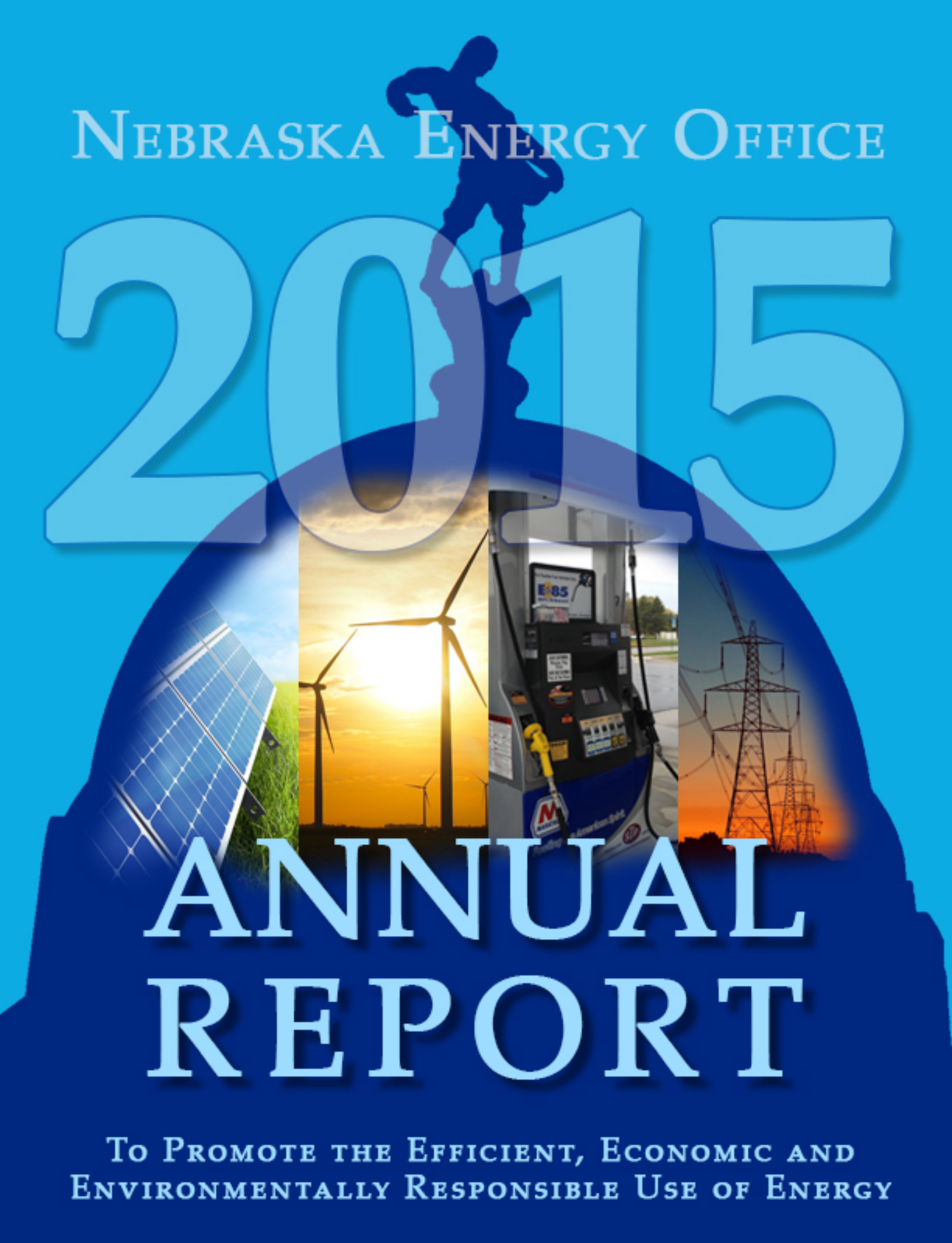
Nebraska Energy Office

2015



Annual Report

To Promote the Efficient, Economic and Environmentally Responsible Use of Energy

STATE OF NEBRASKA

Pete Ricketts
Governor

NEBRASKA ENERGY OFFICE
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February 12, 2016

Patrick J. O'Donnell
Clerk of the Legislature
Room 2018, State Capitol
Lincoln, NE 68508

Dear Mr. O'Donnell:

Enclosed is the Nebraska Energy Office's Annual Report for Fiscal year 2014-2015 as required by Nebraska State Statutes, Section 81-1607, and (R.S. 2012). It should be noted that 2015 statistics for many of the categories were not yet available from the applicable reporting sources. In those cases, the most current year's statistics were used. A copy of the Annual Report has also been posted at the agency's website at http://www.neo.ne.gov/annual_rept/NEOAnnualReport.pdf .

Sincerely,

David L. Bracht
Director

Nebraska Energy Office

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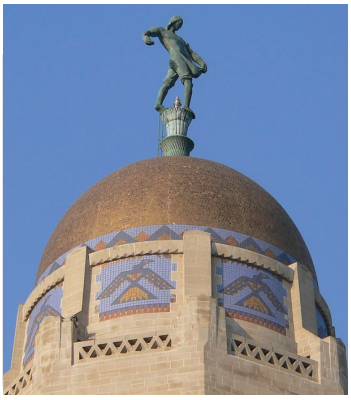
Trends and Needs



The vision of the Nebraska Energy Office is to provide leadership that maximizes the benefits of energy efficiency and renewable energy through communications, outreach, technology and partnerships.

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, are customer oriented and are committed to excellence, creativity and innovation.

The Energy Office accomplishes this mission by administering innovative programs, implementing projects and services that inform, educate and involve energy consumers and decision makers. The Energy Office also collects essential statistical energy data and is the State's lead Agency responsible for developing recommended responses during energy related emergencies.

Goals:

- ❖ Expand opportunities to implement energy efficient projects through partnerships and collaborations.
- ❖ Develop and administer programs that promote efficient uses of energy resources in everyday lives.
- ❖ Support economic development activities including sustainable existing state businesses and attracting new energy investment to the state.
- ❖ Support a broad energy portfolio that meets the state's energy needs in a reliable, clean, cost-effective manner and integrates renewable options.
- ❖ Continue the compilation and analysis of energy statistics and information that identify emerging trends related to energy supply, demand and conservation.
- ❖ Provide objective perspectives on energy policy to the public and elected officials.

The Programs

The Nebraska Energy Office operates several different annually-funded federal and state programs. These programs are:

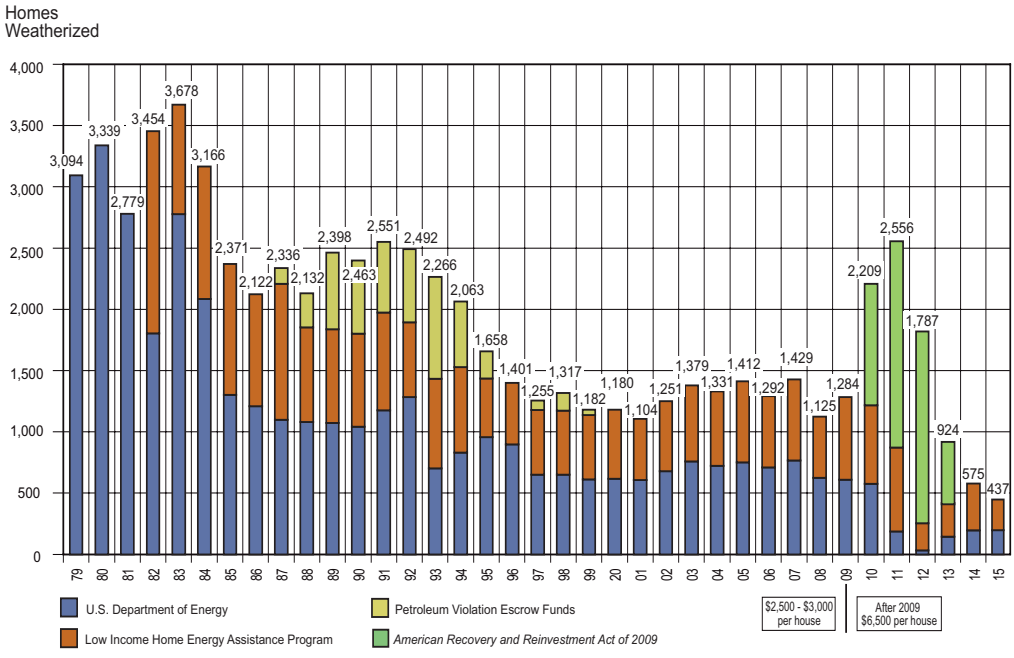
- ❖ Weatherization Assistance Program
- ❖ State Energy Program and special projects
- ❖ State Heating Oil and Propane Program
- ❖ Oil overcharge-funded activities, primarily Dollar and Energy Saving Loans
- ❖ Statutorily-required state activities such as data collection and reporting.

An overview of the 2014-2015 financial activity appears at the end of this section. The period covered by this report is from July 1, 2014 to June 30, 2015, except where noted.

Weatherization Assistance Program

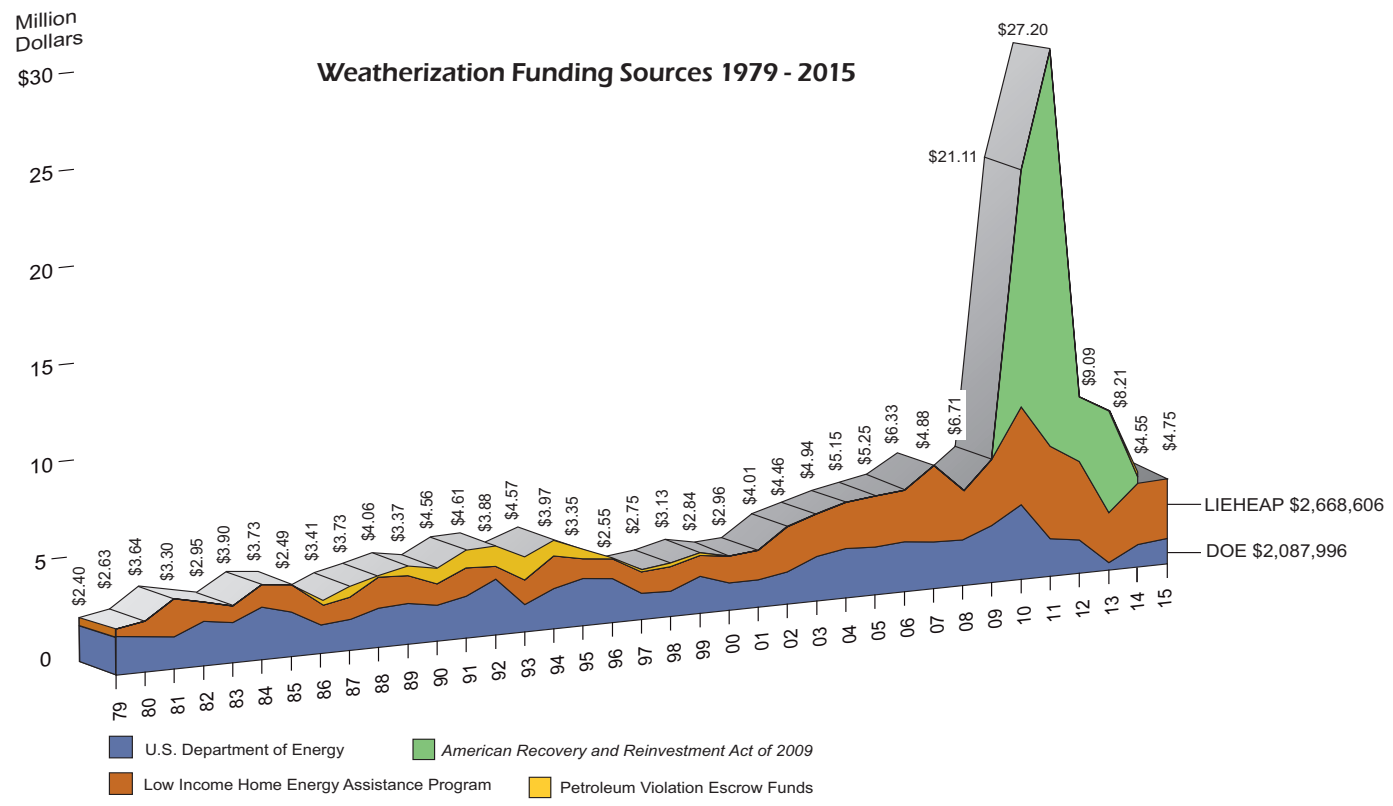
The Energy Office administers the federally-funded program for weatherizing homes to save energy and money for those with limited incomes. The agency is responsible for inspecting the homes that are weatherized and for monitoring the sub-grantees, primarily community action agencies, that are responsible for the home weatherization improvements. Community action agency crews or private contractors are responsible for completing the work on the homes. The Energy Office staff inspects a minimum of 30 percent of all completed homes to ensure the quality of work performed.

Number of Homes Weatherized by Source of Funds, 1979 - 2015



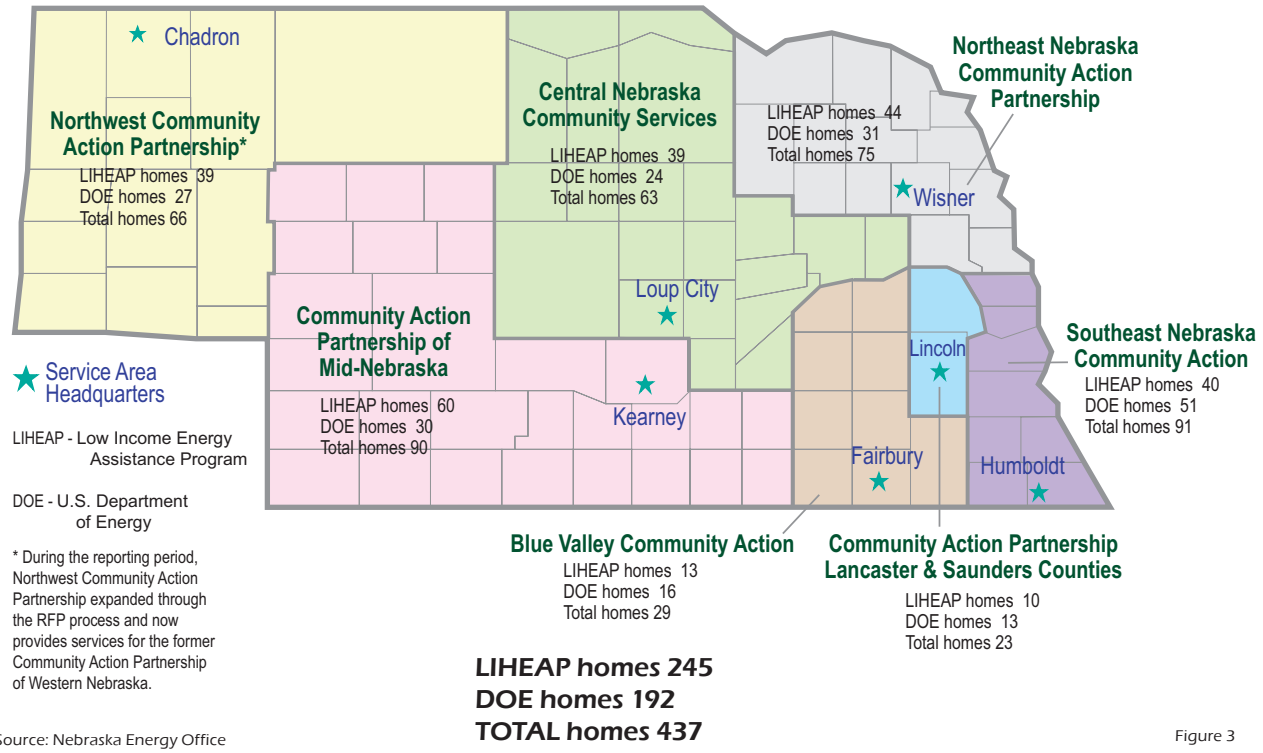
Source: Nebraska Energy Office

Figure 1



Source: Nebraska Energy Office

Figure 2



Source: Nebraska Energy Office

Figure 3

The Weatherization Assistance Program received funding from two sources during the reporting period:

- $2,668,606 from the Low-Income Home Energy Assistance Program. Annually, the Nebraska Department of Health and Human Services transfers a portion of the funds received to pay utility bills to the agency to weatherize homes so that the need for utility bill paying assistance is reduced or eliminated.
- $2,087,996 from the U.S. Department of Energy's Weatherization Assistance Program.

More about how these funds have been spent throughout the state are in figure 3.

Between 2014-2015, 437 homes were weatherized with these funds as illustrated in figure 3.

The types of improvements may vary based on an analysis of the home and averages between $4,000 and $6,500 per home, excluding the cost of health and safety improvements such as furnace repairs. Prior to mid-2009, the average amount spent on homes ranged from $2,500 to $3,000. The average cost of a home is set by the U.S. Department of Energy. The kinds of improvements made to homes vary by the home type: frame, mobile or multi-family. In a frame home, the most common improvements generally are: adding insulation to attics and walls, insulating box sill areas and crawl spaces, replacing or repairing the furnace, and replacing a primary door. In mobile homes, the most frequent improvements are: replacing a primary door, replacing a primary window, replacing or repairing the furnace, insulating the underbelly and replacing or repairing the water heater. In multi-family homes, the two most common improvements are: adding insulation to the attic and replacing a primary window. Most homes that are weatherized also receive low-cost improvements such as caulking, weatherstripping, pipe wrap and, in some instances, water heater jackets.

Since the Weatherization Assistance Program began in 1979, $195.43 million has been spent to make energy efficiency improvements in 68,013

"In multi-family homes, the two most common improvements are: adding insulation to the attic and replacing a primary window."

On average, about half of the energy used in Nebraskan homes is used to keep the home warm or cool.

(Nebraska Energy Quarterly October 2015)

Nebraska Energy Office Investment in the Weatherization Assistance Program October 2014 - September 2015	
NEO Investment (federal funds)	$1,536,763
Energy Impacts	
Electric Dollar Savings	$151,100
Natural Gas Dollar Savings	$37,708
Annual Total Dollar Savings	$188,808
Present Discount Value of Future Savings	$1,134,763
Economic Impacts	
Output	$1,014,714
Value-Added	$659,026
Labor Income	$740,335
Job-Years	23.45
Environmental Impacts (Pounds)	
Carbon Dioxide (CO2)	9,619,729
Sulfur Dioxide (SO2)	26,347
Nitrogen Oxide (NOX)	18,123
Particulate Matter < 2.5 micro-meters (PM2.5)	459.54
Volatile Organic Compounds (VOC)	1,015.25
Particulate Matter < 10 micro-meters (PM10)	736.93

Source: Nebraska Energy Office

Figure 4

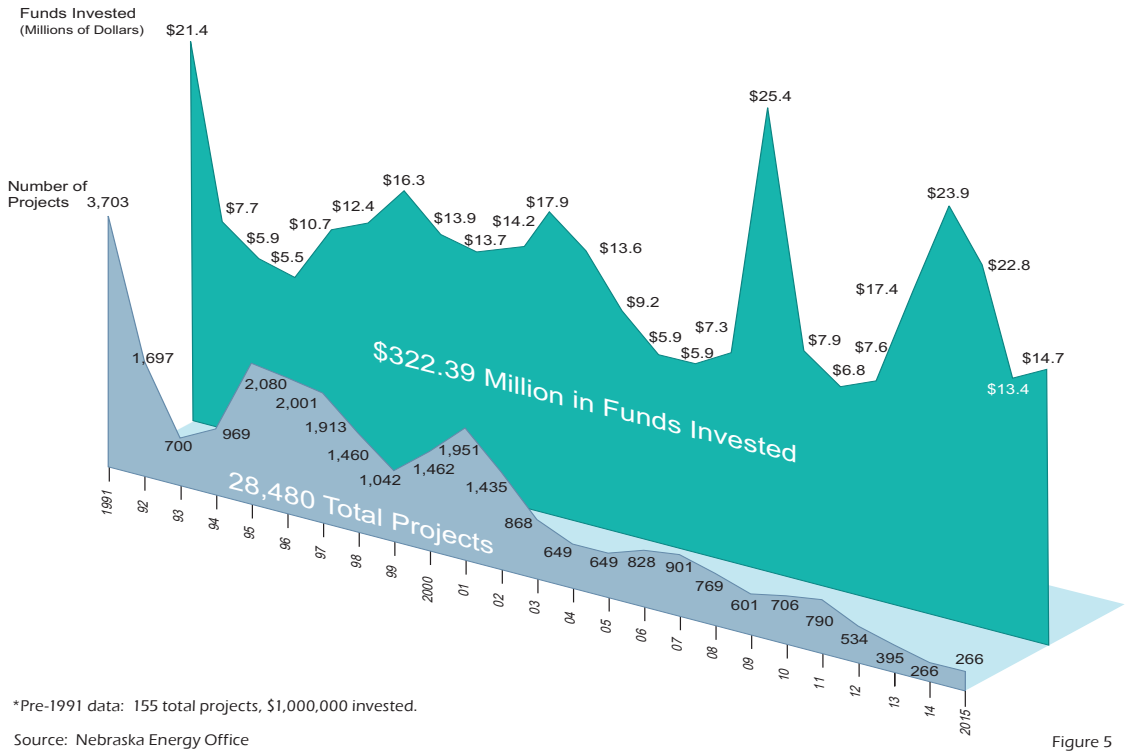
homes. In 2010, maximum household income levels were revised to 200 percent of the federal poverty guidelines, making free home weatherization available to thousands more Nebraskans than in prior years.

Energy savings resulting from the energy efficiency improvements made to homes typically last 20 years or longer and most have a one year payback. Conservatively, estimated energy savings for the 36 years total $110 million. In 2012, an extensive analysis quantified the energy, economic and environmental benefits of the Weatherization Assistance Program and these quantifiers are used today to determine the impact on the program.

Beginning in January 2014, data from Weatherization Assistance Program activities were entered into the database. The energy, economic and environmental benefits from October 2014 through September 2015 are illustrated in Figure 4.

Dollar and Energy Saving Loans

The Dollar and Energy Saving Loan program was initially capitalized with Oil Overcharge Funds, later augmented with *American Recovery and Reinvestment Act* funds and is continually re-charged with loan repayments from borrowers.



*Pre-1991 data: 155 total projects, $1,000,000 invested.

Source: Nebraska Energy Office

Figure 5

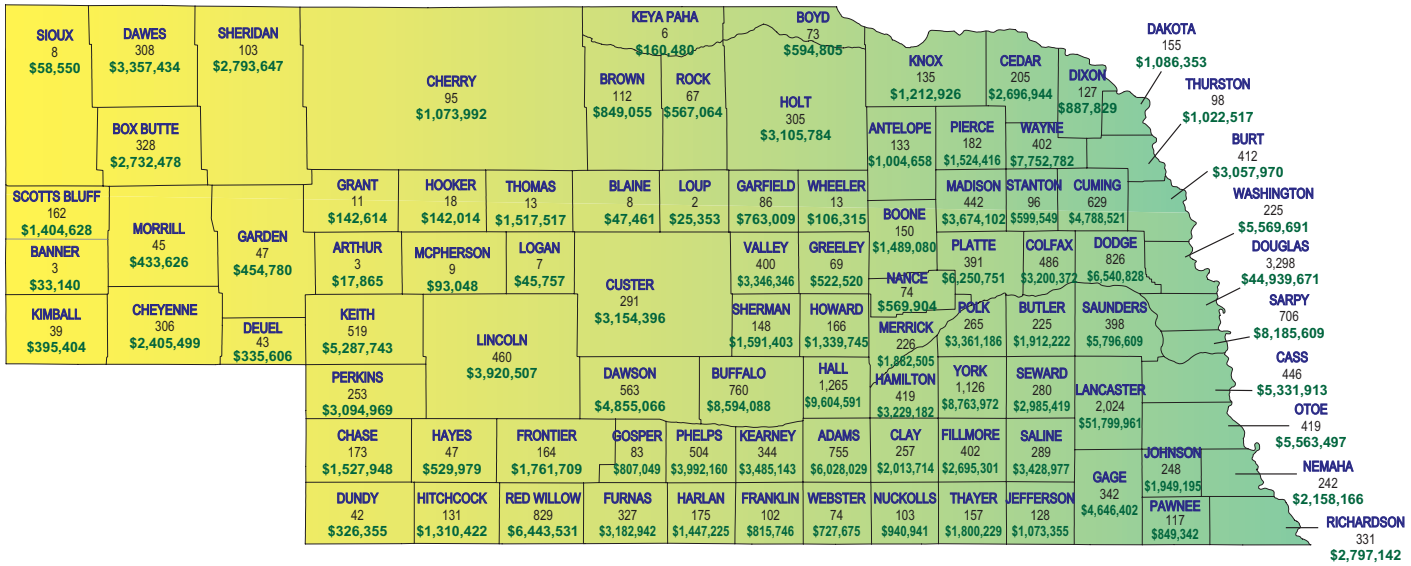
The Energy Office, in conjunction with 252 Nebraska lending institutions at 901 locations, continues to transform the energy market through access to statewide reduced interest rate loans. Energy efficiency, renewable energy and waste minimization projects in all sectors can be financed. Focus has been on homes, businesses and operating systems, alternative fuel vehicles, fueling facilities and equipment, telecommunications equipment, ENERGY STAR® certified home appliances and ENERGY STAR® five star plus homes. Interest rates ranged from 2.5 to 3.5 to 5.0 percent during 2014-2015 depending on the project eligible for financing and the lender, and one percent for schools willing to benchmark energy consumption through the life of the loan.

In March 2009, Nebraska Public Power District added $500,000 — and provided a second $500,000 in January 2010 — to the agency's Dollar and Energy Saving Loan program to finance 1.5 percent loans for air source, ground water or ground coupled heat pumps, qualifying thermostats and back-up natural gas or propane furnaces with a 95 AFUE rating or higher for the utility's retail and wholesale customers. More information about these loans may be found at the Energy Office's website (www.neo.ne.gov/loan/loans1.5.htm).

From March 1990 to June 30, 2015, 28,480 energy saving projects totaling more than $322.39 million have been financed using low-interest loans from the Energy Office and participating lenders and funds from borrowers including any non-eligible improvements. More than $151.32 million of the $322.39 million has come from the agency's revolving loan fund. The state's participating lenders provided more than $123.11 million. The balance, more than $47.96 million, was spent by the borrowers for the remaining cost of eligible improvements along with any non-eligible related items.

Loans have financed projects in all of the state's 93 counties as illustrated in Figure 6. Douglas

Dollar and Energy Saving Loan Projects, Number of Projects by County and Total Dollar Amount of Projects as of June 30, 2015



Source: Nebraska Energy Office

Figure 6

County with 3,298 projects totaling $44.9 million tops the list with the most projects. Lancaster County co-anchors the top spot with the most dollars invested at $51.8 million, albeit on fewer projects — only 2,024. Looking at a regional perspective, the Third Congressional District leads with 14,315 projects; First Congressional District with 10,027 projects still totaling and the Second Congressional District with 4,138 projects.

During this reporting period, 266 new projects totaling $14.77 million were financed. The number of energy efficiency projects financed since 1990 are shown in Figure 5 and total 28,480.

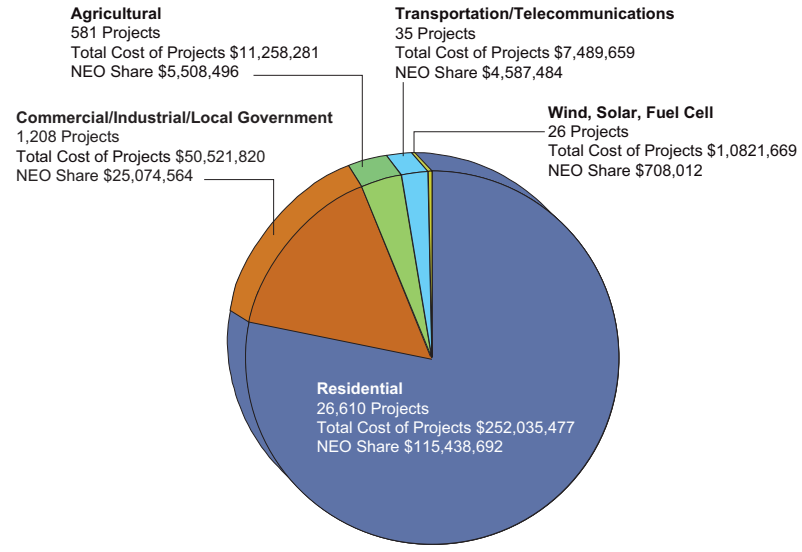
Figure 7 quantifies loans in five different areas: residential, commercial/industrial/local government, agricultural, transportation/telecommunications, wind, solar and fuel cells. The number of projects by category and the total cost in each category also appear in Figure 7. Several of the largest categories are detailed as follows:

Residential

More than 93.4 percent of all the energy efficiency projects financed with loans from the agency are in the homes of Nebraskans. More than 76.29 percent of NEO funds from all categories — $115.44 million — has been used to finance residential energy saving improvements such as replacement of inefficient furnaces, air conditioners and heat pumps, replacement of windows and doors and insulation of walls and ceilings. New energy efficient housing construction is also included in the category. Since 1990, 26,610 residential energy efficiency projects have been undertaken by Nebraskans using loan program funds.

"From 1990 to June 30, 2014, 28,480 energy saving projects totaling more than $322.39 million have been financed with low-interest loans from the Energy Office and participating lenders..."

Total NEO Funds Invested In Types of Dollar and Energy Saving Loan Projects as of June 30, 2015



TOTALS
28,480 Projects
Cost of Projects $322,387,915
NEO Share $151,317,248

Source: Nebraska Energy Office

Figure 7

Commercial/Industrial/Local Government

More than 15.67 percent of funds from all categories — $50.52 million — has been used to make building and system improvements in 1,2028 projects since 1990, ranking second-highest among all loan areas. Typical improvements in this category include replacement of heating and cooling equipment, installation of insulation, lighting upgrades and replacement of doors and windows.

Agricultural

Improvements in agricultural equipment and systems rank third in the use of low-interest financing. More than 3.9 percent of all improvement funding — $11.26 million — has been used to finance projects such as low-pressure irrigation systems, replacement of irrigation pumps and motors, replacement of grain dryers and well modifications. Since 1990, 581 projects have been financed with $5.50 million from the Energy Office, $5.37 million from participating lenders and $383,733 from borrowers.

Energy, Economic and Environmental Impacts

In 2012, a study analyzing the energy, economic and environmental impacts of the Dollar and Energy Saving Loan program was completed by the University of Nebraska - Lincoln. Beginning in January 2014, data from Dollar and Energy Saving Loans has been entered into the database. The energy, economic and environmental benefits from July 1, 2014 through June 30, 2015 are illustrated in Figure 8.

Residential Dollar and Energy Saving Loans July, 2014 - June, 2015	
Investment	$2,712,593
Residential Projects	229
Energy Impacts	
Electric Energy Savings (kWhs)	110,617
Natural Gas Energy Savings (therms)	40,676
Present Discount Value of Future Savings	$807,750
Present Day Value Economic Impacts	
Output	$2,747,895
Value-Added	$1,627,159
Labor Income	$1,227,159
Job-Years	31.98
Emissions Reductions (Pounds All Years)	
Carbon Dioxide (CO2)	10,443,583
Sulfur Dioxide (SO2)	11,213
Nitrogen Oxide (NOX)	12,809
Particulate Matter < 2.5 micro-meters (PM2.5)	195
Volatile Organic Compounds (VOC)	403
Particulate Matter < 10 micro-meters (PM10)	314
Total Present Discount Value of Environmental, Comfort, Health and Safety	$1,027,832

Source: Nebraska Energy Office

Figure 8

“Since 2008, the Nebraska Energy Office has helped produce a state-wide Wind and Solar Conference.”

State Energy Program Formula Grant

In 2014-2015, Nebraska received $392,610 for this federally-funded effort and supplied $78,522 in state funds from oil and natural gas severance taxes, as required 20 percent 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 (neo.ne.gov/statshtml/index3c.html) and agency website (neo.ne.gov).

These funds also provide program support for a wide array of activities that include energy supply shortage tracking and management and emergency preparedness, education and information, Dollar and Energy Saving Loan operations, support of renewable energy activities and residential and commercial building energy efficiency activities.

Building Energy Codes Collaborative

In March 2013, the Energy Office established a Building Energy Codes Collaborative, using existing agency funding. The Collaborative is a group of more than 25 members that represent state and local governments, homebuilders, utilities, architects, home energy raters, suppliers, banks, and advocacy groups including Midwest Energy Efficiency Alliance, Nebraska League of Municipalities and Association of General Contractors.

It's activities included:

- Hosted a second Senator Information Session to explain the benefits of energy codes, current legislation and past training activities, resulting in an Interim Study about the Nebraska Energy Code conducted by the Urban Affairs Committee of the Nebraska Unicameral.
- Worked on the mechanics of financing code compliance activities as well as workshops and ways for utilities and local code jurisdiction staff to become involved.

Nebraska Wind and Solar Conference

Since 2008, the Nebraska Energy Office has partnered with stakeholders interested in wind and solar energy to produce a state-wide Wind and Solar Conference. Agency staff members develop and execute communications for the conference including news release development, and distribution and active social media promotion. They also help to develop conference content including selection of speakers and topics; host an educational booth about services provided by the agency, and assist with IT equipment and services. The November 2015 conference was held in Omaha, NE and hosted over 350 attendees.

National Association of State Energy Officials

Participation in National Association of State Energy Officials (NASEO) programs is also included under the State Energy Program. The agency's Statistical Analyst serves as a Co-Chair-

"Between September 2014 and September 2015, the Energy Office began its 13th year of participation in the U.S. Department of Energy's State Heating Oil and Propane Program."

person for the Energy Security Committee, which provides a forum for discussing energy data collection, analysis issues and energy assurance. The agency also participates in NASEO webinars and conference calls, and attends national and regional NASEO meetings and conferences concerning energy issues.

Nebraska Energy Efficiency Partnership

The Nebraska Energy Office is a founding member of the Nebraska Energy Efficiency Partnership (NEEP), which includes representatives from Nebraska's three largest electric utilities: Omaha Public Power District, Nebraska Public Power District and Lincoln Electric System. The group meets to share knowledge, program ideas and other information including Demand Side Management programs for electric utility customers.

State Energy Program Competitive Funding

Nebraska Energy Extension Partnership — Agricultural Efficiency Nexus: Energy, Water and Food

With this U.S. Department of Energy grant, the Energy Office worked cooperatively with University of Nebraska Extension in several areas:

- Expand the water management demonstration network;
- Develop methodology for an irrigation energy efficiency rating system, and
- Expand building energy codes and weatherization consumer education.

Additionally, the following activities were added:

- Identification of potential pre-qualified projects for the Dollar and Energy Saving Loans in the agricultural sector;
- Evaluation of 79 homes for actual savings experienced after weatherization by the Weatherization Assistance Program, as well as the economic and environmental impacts;
- Assessment of 26 homes receiving energy efficient housing loans comparing projected versus actual savings, and
- A survey of Nebraska Extension Educators to determine their awareness of the Energy Office's programs.

This competitive State Energy Program Special Project funded grant was awarded $186,195 in September 2011 and matched with $37,239 in state funds. The project was originally scheduled for completion in 2014, but was extended by the U.S. Department of Energy until September 30, 2015 when the grant activities were completed.

State Heating Oil and Propane Program

Between September 2014 and September 2015, the Energy Office began its 13th 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 website (www.neo.ne.gov/statshtml/86.html and www.neo.ne.gov/statshtml/87.html).

U.S. Department of Energy provided a grant of $6,000 for this activity which is required to be matched one-for-one using state cash funds. By the end of the reporting period, all funds were expended and the project was completed.

Oil Overcharge Funds

Beginning in 1982, Nebraska received oil overcharge — or petroleum violation escrow — funds as a result of several court actions against oil companies that overcharged their customers during the period of federal price controls from 1973 to 1981. Since direct restitution to injured consumers was not practical, the courts ordered the money be distributed to the states and used, within parameters established by the courts and a federal regulator, to fund energy assistance and efficiency programs. The final petroleum violation escrow payment from the U.S. Department of Energy to the Energy Office was received September 7, 2007.

The Legislature and the U.S. Department of Energy require the Energy Office to annually report on the disposition of these funds. A Nebraska Energy Settlement Fund Summary of activities and expenditures is detailed in Figure 9.

Financial Activity

Total Energy office expenditures for the year were $16,885,169; an increase of 10.9 percent. Energy loans accounted for 57.8 percent of expenditures, aid payments accounted for 30.2 percent and the remaining 12 percent of expenditures were for salaries and operations.

Of the funding for these expenditures, 51.5 percent came from Oil Overcharge Funds, 43.5 percent from federal funds, and five percent from state and other funds.

How Funds Were Spent by Source is illustrated in Figure 10.

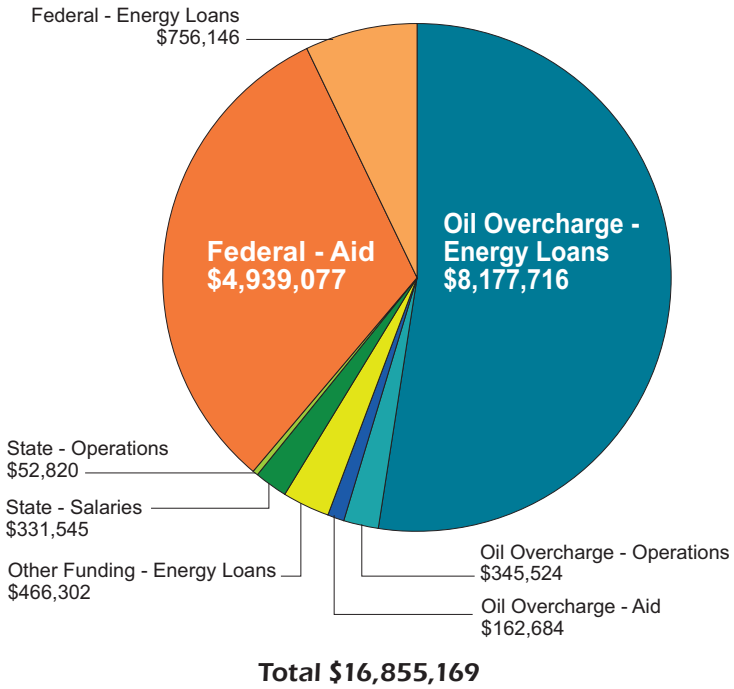
Nebraska Energy Settlement Fund
Summary of Exxon, Stripper Well and Diamond Shamrock
Oil Overcharge Funds as of June 30, 2015

	Exxon	Stripper Well	Diamond Shamrock	Total
Funds Received	$15,504,944	$15,674,042	$359,172	$31,538,158
Interest Earned and Miscellaneous Income	$12,504,084	$11,244,052	$257,580	$24,005,716
Total	$28,009,028	$26,918,094	$616,752	$55,543,874
Funds Budgeted	$28,009,028	$26,566,448	$616,752	$55,192,228
Low Income Designated	$0	$15,834	$0	$15,834
Uncommitted Balance	$0	$335,812	$0	$335,812

Source: Nebraska Energy Office

Figure 9

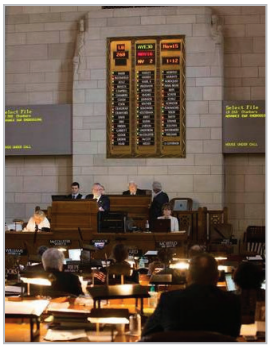
How Funds Were Spent by Source
July 1, 2014 - June 30, 2015



Total $16,855,169

Source: Nebraska Energy Office

Figure 10



State Capitol Legislative Chamber.

Nebraska Revised Statutes 81-1607

(1) On or before February 15 of each year, the Director of the State Energy Office shall transmit to the Governor, Clerk of the Legislature and State Library Commission a comprehensive report designed to identify emerging trends related to energy supply, demand, and conservation and to specify the level of statewide 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 to 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 Energy Trends and Needs

The Nebraska Energy Office tracks trends in different energy sectors as part of its mission. These trends can forecast future energy use. In all cases, the most current energy data available from all sources has been used in the *Annual Report*. Energy statistical data required by statute to be maintained by the Energy Office can be found on the agency's website at http://www.neo.ne.gov/statshtml/index3c.html .

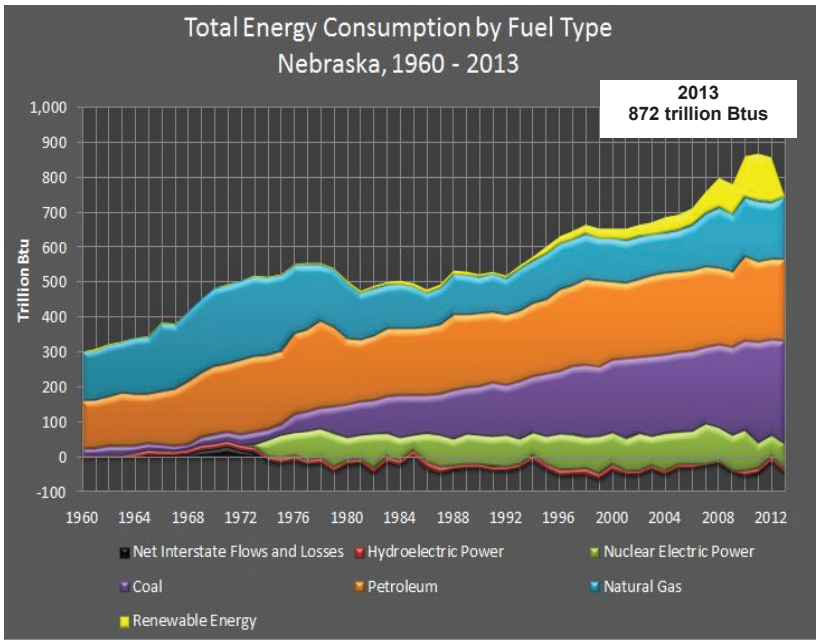
State-Wide Energy Need and Cost

Need

2013. Nebraska's total energy consumption in 2013 was 872 trillion British thermal units (Btus), an increase of 21 trillion Btus — or 1.5%, from 2012 to 2012. A British thermal unit is a standard measure of heat energy. It takes one Btu to raise the temperature of one pound of water by one degree Fahrenheit at sea level. Overall, the use of all fuel types increased. Among all the states, Nebraska ranked 19th lowest in total energy consumption in the nation in 2013. Based on energy consumption per capita, Nebraska ranked 7th highest in the country among the states.

1960-2013. Energy use over the past 53 years has changed markedly. Overall, total energy consumption has more than doubled from 308.3 trillion Btus in 1960 to 872 trillion Btus in 2013.

- Coal use has increased more than twelvefold from 20 trillion Btus to 292.96 trillion Btus between 1960 and 2013 — an increase of 20.37 trillion Btus from 2012. Peak use of coal was reached in 2013, surpassing the high set in 2011. Virtually all of this growth is attributable to coal used to generate electricity.
- Natural gas consumption has increased and declined at different times during the 53 years from 140.4 trillion Btus in 1960 to 179.61 trillion Btus in 2013. Natural gas consumption peaked in 1973 at 230.7 trillion Btus. The rise, fall and recent rise in consumption of natural gas is a result of increased equipment efficiency, fewer homes using natural gas as a



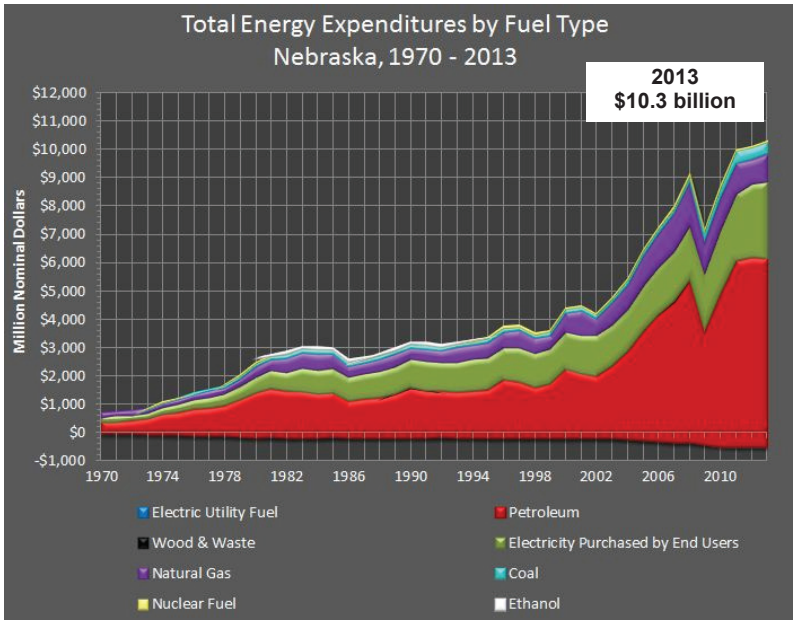
Sources: State Energy Data Report. Energy Information Administration, Washington, DC.
Nebraska Energy Office, Lincoln, NE.

State-Wide Energy Need and Cost

"Use of petroleum products nearly doubled over the past 53 years from 136.1 trillion Btus in 1960 to 233.38 trillion Btus in 2013."

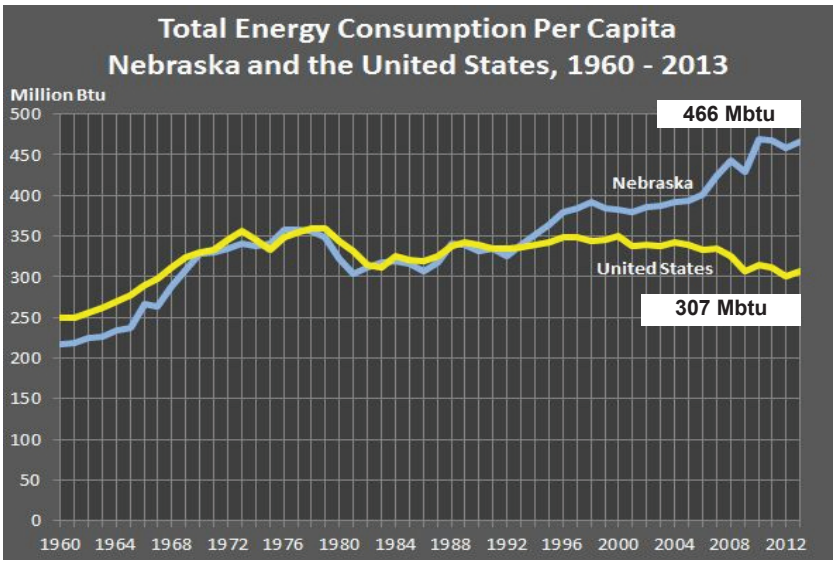
primary heating source, electric utilities using natural gas for peak power production and use by ethanol plants.

- Use of petroleum products nearly doubled over the past 53 years from 136.1 trillion Btus in 1960 to 233.38 trillion Btus in 2013. Gasoline and distillate fuel oil — primarily diesel fuel — comprise the bulk of refined petroleum products consumed. Both types of refined petroleum products increased between 1960 and 2013. Diesel fuel consumption more than quadrupled from 24.1 trillion Btus in 1960 to 110.11 trillion Btus in 2013. This increase is attributable to increased trucking and agricultural use. Gasoline consumption only increased by less than a quarter during the period from 78.7 trillion Btus in 1960 to 97.46 trillion Btus in 2013. Gasoline consumption peaked in 1978 at 115.9 trillion Btus, just before the second Oil Price Shock. Changes in gasoline consumption can be traced to increased fuel efficiency of vehicles, relative lack of population growth and incremental changes in miles traveled annually. Motor vehicle miles traveled increased from 12.0 billion miles a year in 1978 to 19.6 billion miles a year in 2014, surpassing the peak in 2010 of 19.5 billion miles. Overall, petroleum consumption peaked in 1978 at 246.6 trillion Btus.
- Nuclear power was not generated commercially in the state until 1973-1974. Nuclear consumption has increased significantly over the period, rising from 6.5 (1973) and 44.6 (1974) trillion Btus to 71.74 trillion Btus in 2013. Nuclear consumption peaked in 2007 at 115.7 trillion Btus.
- Renewable energy consumption from 1960 to 2013, rose and fell over the decades from 13.4 trillion Btus in 1960 to 137.2 trillion Btus in 2012. Energy production from renewables peaked in 2011. Between 1960 and 1994, the primary renewable energy source was hydropower. Beginning in 1995, biofuels — ethanol — production began and continued to soar, initially equaling hydropower production. By 2000, biofuels production began to double the amount of hydropower generated. By 2012, 76.3 percent of all renewable energy produced in that year came from biofuels, 8.7 percent from hydroelectric power, 8.9 percent from wind and 5.2 percent from wood and wood waste. Very minor amounts came from geothermal and solar.



Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

State-Wide Energy Need and Cost



Sources: State Energy Data Report. Energy Information Administration, Washington, DC.
Nebraska Energy Office, Lincoln, NE.

Cost

2013. Nebraska's total energy expenditures increased 2.1 percent to $10.3 billion in 2013, an increase of $218.9 million over 2012. Expenditure increases were reported in natural gas, nuclear and wood waste. Expenditures for coal and petroleum decreased.

Among the states, Nebraska ranked 35th in energy expenditures in 2013, the same as in 2012. Petroleum products in 2013 accounted for 64 percent of all energy expenditures. More than 9.7 percent of expenditures in 2013 went for natural gas, 4.1 percent for coal, 0.58 percent on nuclear fuel and 0.15 percent for renewable energy. On a per capita basis, Nebraska ranked 9th in energy expenditures among the states at $5,508 in 2013. North Dakota ranked first with a per capita expenditure of $10,540. New York ranked last with a per capita energy expenditure of $3,350. The United States' average of energy expenditures per capita in 2013 was $4,345.

2013 prices for different types of energy, as compared to the other 49 states and the District of Columbia, shows that Nebraskans paid the 49th lowest price for coal in the nation at $1.44 (measured in nominal dollars per million British thermal units). Alaska paid the highest at $4.90 per million Btus. At the other extreme, Nebraskans paid the 17th highest price for petroleum at $27.62 in nominal dollars per million British thermal units. Prices in 2013 for natural gas in Nebraska were $5.78 in nominal dollars per million British thermal units and ranked 43rd when compared to other states. Retail electricity prices in the state were $25.61 in nominal dollars per million British thermal units, ranking 38th. The price for motor gasoline in Nebraska, which include ethanol-blended fuels, was $28.85 in nominal dollars per million British thermal units placed the state at 26th among the states.

Looking at the prices differently and in more common units of measurement, in 2013 Nebraska average prices by fuel type:

- Residential electricity: 10.05 cents per kilowatt-hour
- Residential natural gas: $8.30 per billion cubic feet

1970-2013. Total energy expenditures in 1970 were $667.8 million and increased by nearly fifteenfold 43 years later in 2013 to $10.29 billion. The peak in expenditures was reached in 2013. Peak expenditures by specific fuel types were reached as follows:

- Coal, $437.9 million in 2011
- Natural gas, $1.565 billion in 2008
- Nuclear, $76.0 million in 2010
- Petroleum, $6.662 billion in 2012

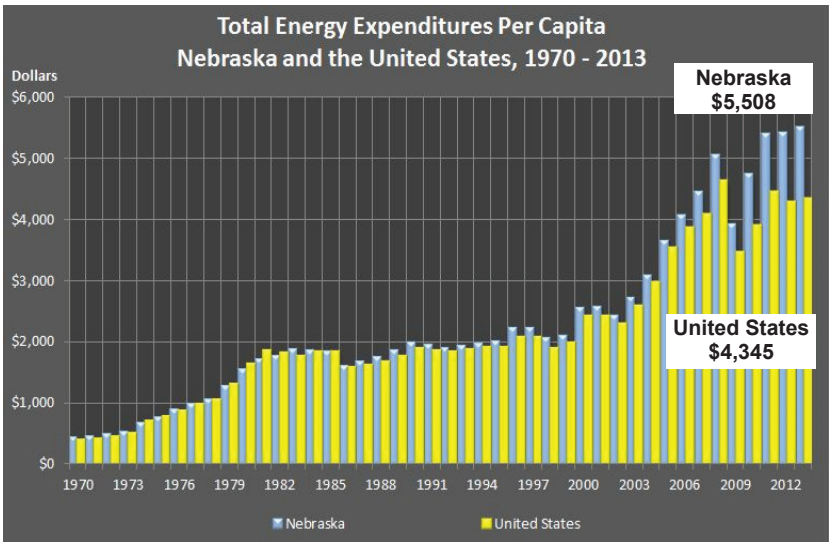
The percentage share of personnel income has not varied much: In 1970, 11.8 percent was spent on energy and in 2012, 12.1 percent was spent on energy. The peak percentage occurred in 1980 at 17.1 percent.

State-Wide Energy Need and Cost

"After 1994, and through 2013, a chasm opened and widened as the state's per capita energy consumption vastly outpaced that of the nation."

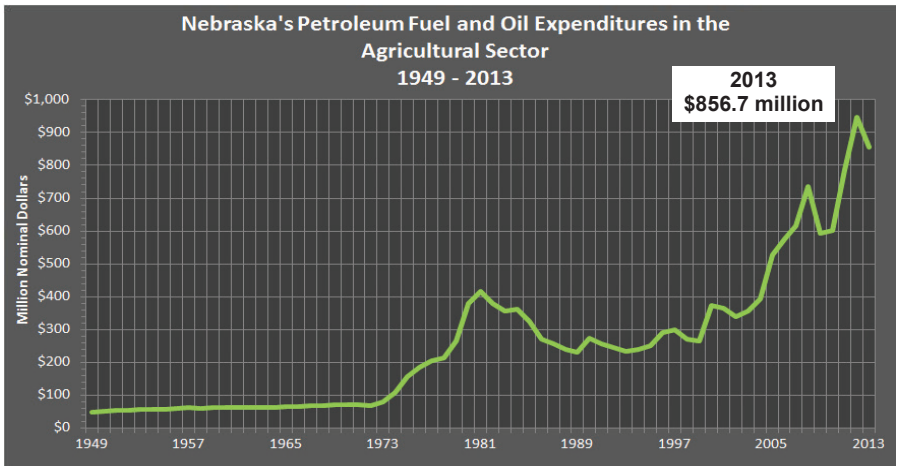
- Coal expenditures increased from $9.8 million in 1970 to $423.1 million in 2013.
- Natural gas expenditures increased nearly nine-fold from $104.1 million in 1970 to $994.6 million in 2013.
- Petroleum expenditures also increased more than sixteen-fold from $405.7 million in 1970 to $6.601 billion in 2013.
- Nuclear expenditures soared from $1.1 million in 1973 — the first partial year of operation of one of the state's two nuclear plants — to $60 million in 2013.
- Electricity purchased by end users totaled $170.3 million in 1970 and rose to $2.683 billion in 2013.

In comparing total energy consumption per capita between Nebraska and the United States between 1960 and 2013 shows that during the first decade, Nebraska's per capita energy consumption was considerably less than the nation's. Over the next several decades and prior to 1994, Nebraska and the nation were somewhat parallel in per capita energy consumption, seesawing back and forth. After 1994, and through 2013, a chasm opened and widened as the state's per capita energy consumption vastly outpaced that of the nation. Why? For the most part, the state's population showed little growth during this period. Nebraskans' individual energy use likely paralleled that of other Americans. What happened in Nebraska beginning in 1994 that sparked a growing increase in per capita energy consumption? Looking deeper into the data, one finds a surge of energy consumption in the industrial sector. In Nebraska, that sector includes agriculture. Looking at ethanol production in 1994, only 78.9 million gallons of ethanol were produced. By 2015, 1.8 billion gallons of ethanol were being produced in the state, which is 12 percent of the nation's capacity of 151.1 billion gallons. Ethanol facilities use both electricity and natural gas in considerable volumes. The state's agricultural producers also changed what was planted. More than 604 million, or 35 percent of Nebraska's 1.602 billion bushels of corn produced, went into production for ethanol. Corn under irrigation is a more energy intensive crop than soybeans, wheat or grain sorghum as several recent studies have noted.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Agricultural



Sources: United States Department of Agriculture. Nebraska Energy Office, Lincoln, NE.

Agricultural

According to the U.S. Department of Agriculture National Agricultural Statistics Service, there were 49,100 farms and ranches on 45.2 million acres in Nebraska in 2014 encompassing about 93 percent of the state's total land area. The average farm size contained 921 acres. In 2014, Nebraska had 95,768 active irrigation wells supplying water to more than 8.3 million acres of cropland and pasture. Data for the number of irrigation wells in 2012 and 2013 were not available. Approximately forty-six percent of total cropland in Nebraska was irrigated.

Agricultural energy data is aggregated with other data in the industrial sector. As such, separate agricultural energy data is not always available on a consistent or annual basis.

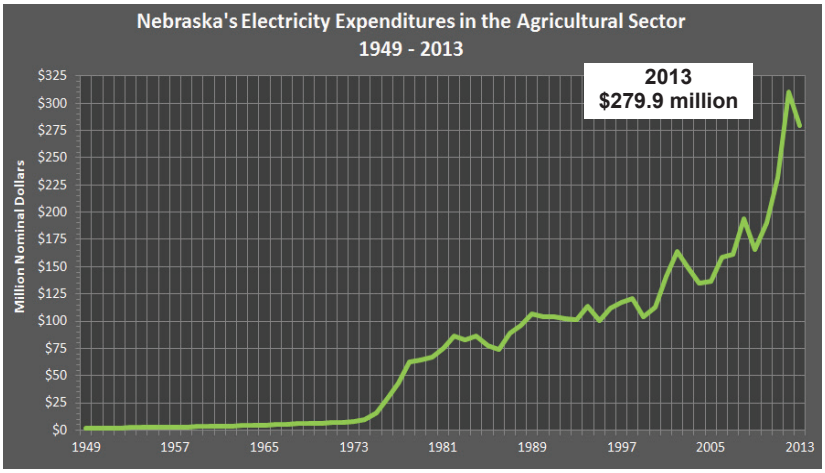
Energy Supply

Energy supplies for the state's agricultural sector have been met. Over the years, any energy supply problems have been limited to infrequent shortfalls of petroleum products or fertilizer — reliant on energy inputs — usually during periods of peak demand or energy shortfalls because of worldwide demand.

In the summer of 2012, a unique situation arose for a very small number of the state's irrigators that use electricity. The state's drought forced growers to irrigate to a greater extent than ever before. As a result, some growers were briefly "shed" by electrical utilities around July 4, 2012, to protect the integrity of the energy infrastructure. Since that episode, the large utility supplier has upgraded local transmission lines and acquired mobile generators to forestall that problem from happening again.

Demand

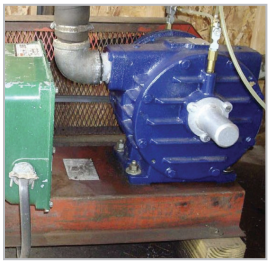
As indicated earlier in this section, energy demand information for the agricultural sector is not available on a consistent or annual basis. One of the primary tracking tools, the Census of Agriculture, is only conducted every five years, and the 2012 census of Agriculture has not yet been released. National energy databases commingle agricultural demand with data from the industrial sector.



Sources: United States Department of Agriculture. Nebraska Energy Office, Lincoln, NE.

Agricultural

"Low-interest Dollar and Energy Saving Loans have also been used to finance grain dryers, no-till equipment, dairy vacuum pumps and related agricultural equipment."



Conservation

As with most consumer behavior, high fuel costs or limited availability of energy resources induces demand for efficiency practices in this sector. Historically, when natural gas prices have reached record highs, farmers alter practices such as when and how much anhydrous ammonia fertilizer — a natural gas product — is used. High diesel prices have motivated farmers to adopt conservation tillage practices, resulting in reduced cultivation on crop land, and to switch from using natural gas, diesel and propane to electricity to power irrigation systems.

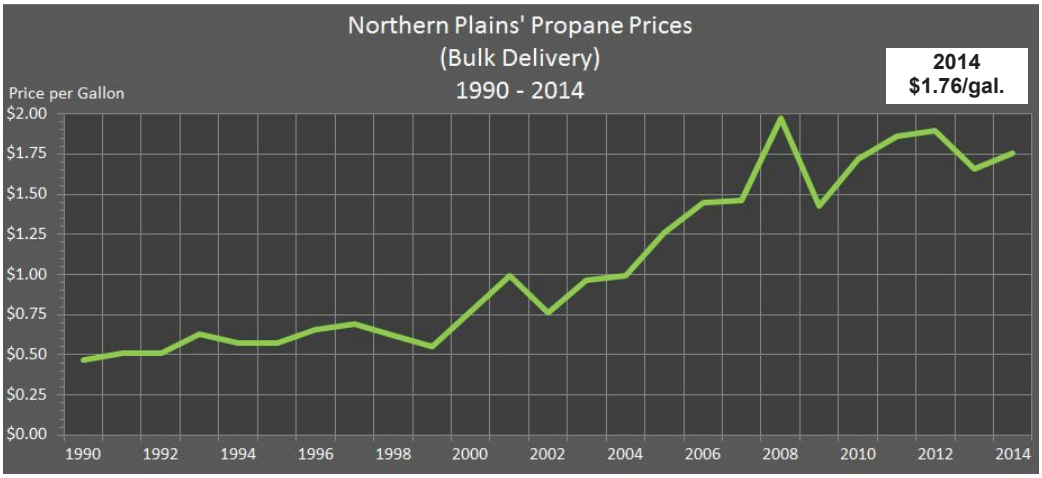
As energy costs have increased, the state's agricultural producers — with assistance from the agricultural extension agents and research — have adopted a variety of practices that have reduced energy use: conservation tillage and irrigation efficiency improvements, scheduling and load management, and soil moisture measurement practices. For example, the Nebraska Energy Office provides low-cost financing for irrigation efficiency projects that demonstrate energy savings such as low-pressure pivots and replacement pumps and motors. Low-interest Dollar and Energy Saving Loans have also been used to finance grain dryers, no-till equipment, dairy vacuum pumps and related agricultural equipment. Over the past number of years, U.S. Department of Agriculture's Rural Energy for America Program grants have partially financed hundreds of irrigation efficiency improvements that also included switching fuel sources from diesel, propane and natural gas to electricity. As long as federal funding remains available and fossil fuel prices remain high or fluctuate dramatically, this trend in irrigation is likely to continue.

In 2006, the U.S. Department of Agriculture estimated that 15 percent of the total cash production expenses went for energy, directly or indirectly.

In 2008, the U.S. Department of Agriculture issued a report that found farmers have adopted energy conservation practices: Since the 1970s, farm energy consumption has fallen 26 percent as farm output has increased 63 percent.

Energy Need

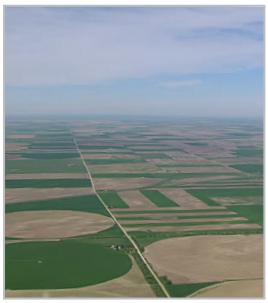
Energy need in the ag sector can be influenced by the cost of inputs which are a significant factor in modern farming. Over the decades farms have increased in size and energy has replaced labor, allowing fewer people to produce larger harvests of agricultural goods. Another long-term trend has been the increase in irrigation. In 1966, only 3.1 million acres were irrigated, but by 2014, nearly 8.3 million acres were under irrigation. As ethanol production in the state has grown, so has the amount of corn needed as a feedstock. In 2011, more than 40 percent of the corn crop



Sources: "Nebraska Agri-Facts". United States Department of Agriculture. Nebraska Energy Office, Lincoln, NE.

Agricultural

"Corn requires ten inches of evapotranspiration to produce the first bushel — the highest of all the crops grown in the state. As a result, any rainfall shortage is made up from irrigation which requires an energy input."



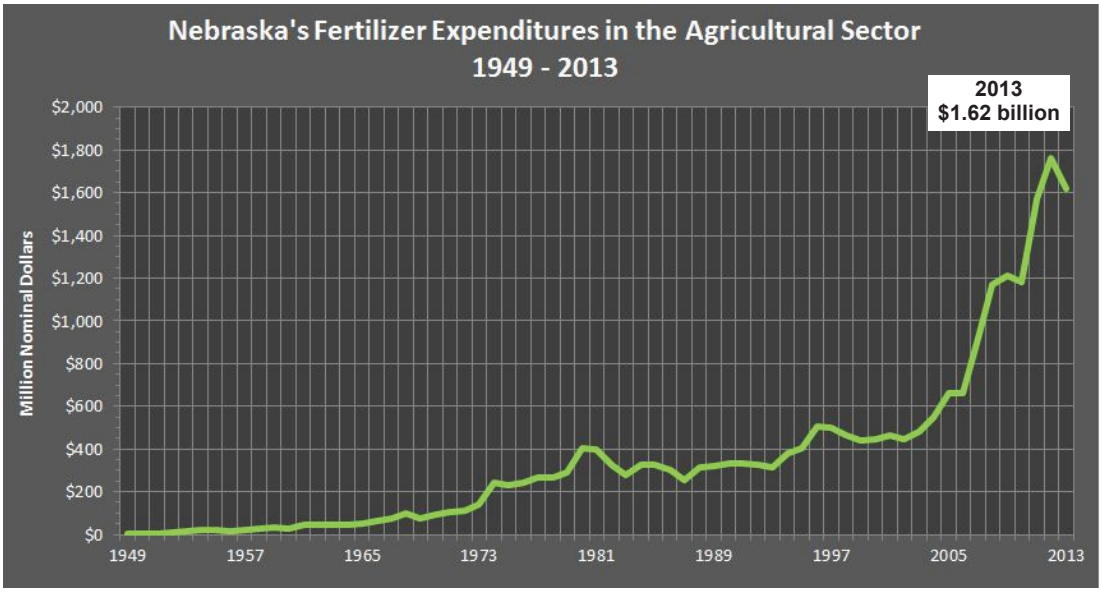
was utilized in ethanol production. Corn requires ten inches of evapotranspiration to produce the first bushel — the highest of all the crops grown in the state. As a result, any rainfall shortage is made up from irrigation which requires an energy input. The fuel used to power irrigation pumps in 2013 was diverse (2008 figures in parentheses): electricity, 55 percent (52 percent); diesel, 26 percent (31 percent); natural gas, 10 percent (11 percent); propane, 7 percent (5 percent) and gasoline/ethanol, 0.2 percent (less than one percent). The fuel shifts over the past five years show the near ten percent increase in electricity came at the expense of natural gas, diesel and propane.

According to the U.S. Department of Agriculture, Nebraska farm expenditures in 2014 were as follows:

- $1.58 billion for fertilizer, a 2.5 percent decrease from 2013. Peak expenditures for fertilizers used in agriculture occurred in 2012.
- $851 million for fuel and oil, a .67 percent decrease from 2013. Peak expenditures for fuel and oil in agriculture occurred in 2012.
- Electricity expenditures in 2014 totaled $294.4 million, a 14.5 percent increase from 2013. A record high was set in 2012 at $310.2 million.

Since 1949, Nebraska's fuel and oil, electricity and fertilizer expenditures by the agricultural sector have been tracked. Between 1949 and 1973-1974, energy prices were stable and showed mostly marginal increases over time. However, after the impact of the first Oil Price Shock in the early 1970s, agricultural energy expenditures deviated markedly from historic patterns, becoming far more erratic and costlier.

- Fertilizer expenditures in the state have shown the most substantial change between 1949 and 2014, rising from $2.1 million to $1.58 billion. The increase in the cost of fertilizer and the impact of oil prices is illustrated between 1973 and 1974, when expenditures in 1973 totaled $142.6 million and only a year later totaled $239.9 million. Since 2004, except for 2008-2009, fertilizer expenditures have increased at least $100 million a year, and between 2006 and 2008 increased $260 million. Only in 2010 and 2014, did fertilizer prices decline. That decline



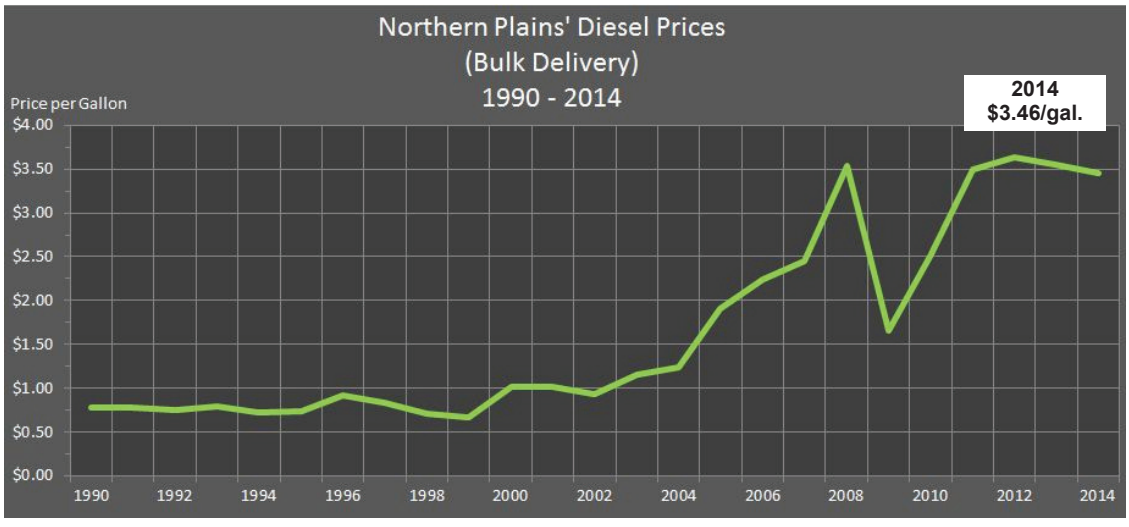
Sources: United States Department of Agriculture. Nebraska Energy Office, Lincoln, NE.

Agricultural

reversed in 2011, rising to $1.57 billion, a 33 percent increase from 2010. In 2013, fertilizer expenditures decreased $140 million, lowering to $1.620 billion.

- Fuel and oil expenditures decreased to $856.7 million in 2013, which was a 9.6 percent decrease from 2012 expenditures of $948.0 million. A record high was set in 2012 at $948.0 million. In 1949, fuel and oil expenditures totaled only $47.5 million. Between 1973 and 1975, fuel and oil expenditures nearly doubled from $78.5 million to $155.8 million, and increased more than two and half times by 1981 when expenditures totaled $416.7 million. What followed was a two-decades long period of declines with periods of stability and incremental rises beginning in 2000. That changed in 2005 when expenditures leaped more than $135 million in one year. After that expenses continued to rise, peaking in 2012 at more than $948.0 million.
- Electricity expenditures in agriculture are marginal, compared to petroleum-based inputs. Its primary use is for irrigation, and the trend is for less fossil fuel powered irrigation. An increasing number of growers who use irrigation are fuel switching from diesel, propane and natural gas to electricity, in part, because of its price stability and favorable cost structure. In 1949, only $1.6 million was spent for electricity. The peak year for expenditures occurred in 2012 when $310.2 million was spent. Expenditures decreased 9.8 percent in 2013 to $279.9 million. The impact of timely and sufficient rainfall — negating the need for irrigation — can be seen in the dramatic decline in expenditures from 2008 to 2009, a drop of nearly 15 percent. In 2011, less timely rainfall resulted in a 22 percent increase from 2010, rising from $190.8 million to $232.0 million.
- Diesel fuel, the workhorse of the petroleum-based inputs in agriculture, illustrates the volatility of the petroleum fuel prices. Records since 1990 for "Agricultural Prices for Bulk Delivery of Diesel Fuel in the Northern Plains" tell the story of a cheap fuel that increasingly became more expensive. In 1990, diesel prices were just $0.78 a gallon (excluding federal and state excise taxes and road taxes). From 1990 to 2002, prices were very uniform, fluctuating within a narrow price band of $0.67 to $1.02 a gallon. Between 2003 and 2008, prices rose inexorably from $1.16 to $3.54 a gallon, tripling in price in six years. Prices in 2008, 2009, 2010 and 2011 have illustrated the extreme price volatility of the fuel: $3.54, $1.66, $2.50 and $3.49 a gallon, respectively. Prices in 2014 were $3.46 a gallon, down from $3.55 in 2013. Prices for diesel in agriculture peaked in 2012 at $3.64 a gallon.
- Records in the "*Agricultural Prices for Bulk Delivery of Propane in the Northern Plains*" show a very inexpensive fuel priced at $0.47 a gallon (excluding state road taxes) in 1990 quadrupling in price to $1.89 a gallon in 2012, a 23-year period. Propane prices decreased slightly to $1.66 in 2013 and increased in 2014 to $1.76. Prices for propane in agriculture peaked in 2008 at $1.97 a gallon.

Fuel substitution, or conversion to other types of fuel, is very difficult for this sector to utilize without costly changes in



Sources: United States Department of Agriculture. Nebraska Energy Office, Lincoln, NE.

Commercial

"Nearly 94 percent of all fuel used in the commercial sector was supplied by natural gas and electricity."

equipment. Agricultural and residential sectors may be the least able to engage in fuel substitution.

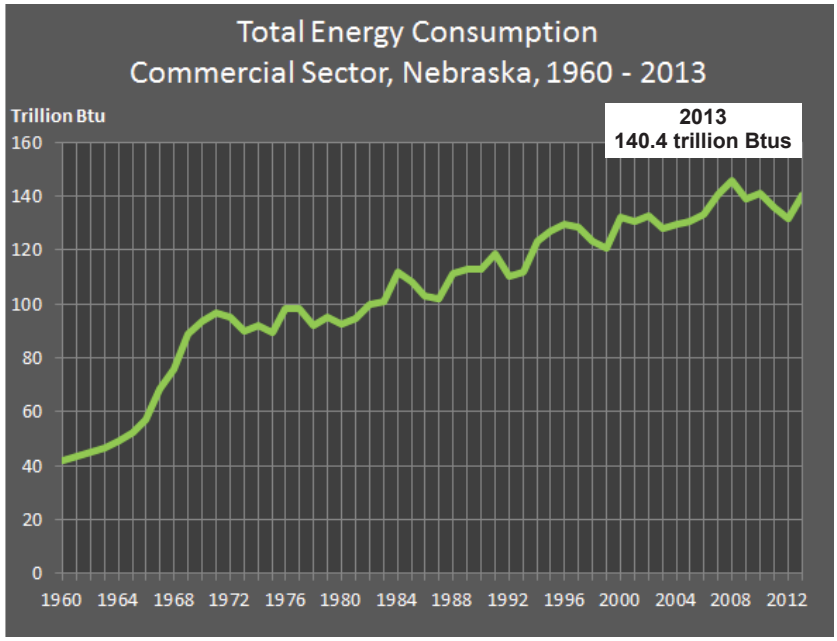
Fuel switching can be difficult in the ag sector, but opportunities do exist in the equipment like irrigation. A close look at irrigation pumps by fuel type between 1994 and 2013 from U.S Department of Agriculture surveys documents the shift in fuel use over a 19 year period:

- Electricity: 55.45 percent (2013); 44.08 percent (1994)
- Diesel: 26.37 percent (2013); 22.62 percent (1994)
- Natural gas: 10.37 percent (2013); 17.85 percent (1994)
- Propane: 7.6 percent (2013); 15.01 percent (1994)
- Gasoline/ethanol: 0.21 percent (2013); 0.44 percent (1994)

The ten percent growth in electricity came at the expense of propane and natural gas.

Commercial

The commercial sector, which includes non-manufacturing business establishments, closely parallels consumer energy use and economic activity in the state. Energy use by local, state and federal governments is also included in this sector.



Sources: State Energy Data Report. Energy Information Administration, Washington, DC.
Nebraska Energy Office, Lincoln, NE

Energy Supply

2012 and 2013. The long-standing use of two fuel types — natural gas and electricity — in this sector continued in 2012 and 2013. Nearly 94 percent of all fuel used in the commercial sector was supplied by these two fuel types. Supplies of both types of fuel have been sufficient to meet this sector's energy needs. The only disruptions have been to weather –related electric transmission issues.

1960-2013. For 53 years, natural gas and electricity have remained the top two fuel types used in the commercial sector. Trends indicate that the long dominance of natural gas has ended and a period of near parity between the two fuel types is likely into the near future.

Demand

2013. Since 2008, the commercial sector's energy demand as a percentage of total energy consumption in the state had dropped about one percent a year from 18.2 percent in 2008 to 15.3 percent in 2012, but slightly rose to 16 percent in 2013. In 2013, 140.4 trillion British thermal units of energy were consumed in the sector, up 8.6 trillion British thermal units of energy from 2012, an increase of 6.5 percent.

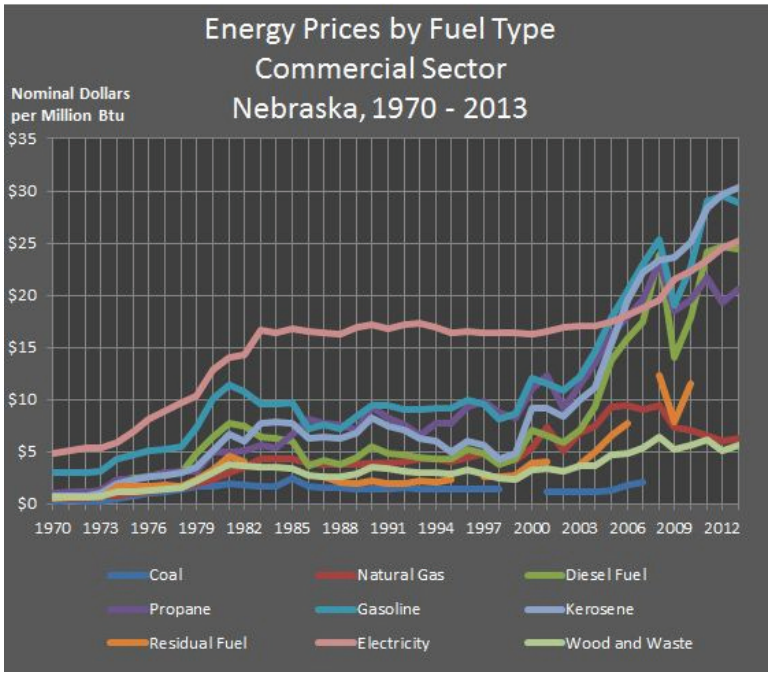
2013. When data collection began in 1960, the commercial sector demand was 42.16 trillion British thermal units, less than one-third of the amount of energy used in this sector in 2013. The peak year of demand in this sector was 2008 when consumption reached 145.8 trillion British thermal units, surpassing 141.1 trillion British thermal units used in 2010.

Conservation

Efforts to conserve energy use tend to be economically driven, especially when fuel prices rise above historic levels. Reduced energy use often results from economic downturns in the larger economy. For

Commercial

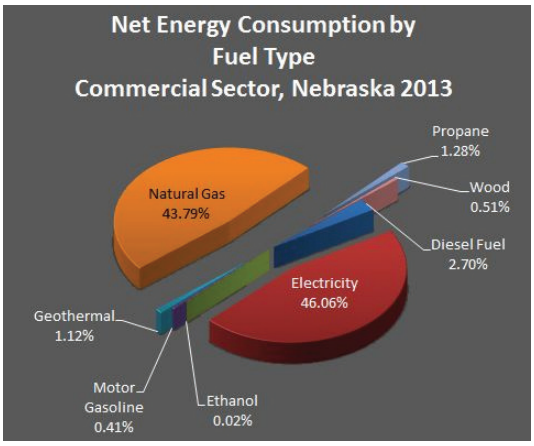
example, energy use in this sector declined by almost 10 trillion British thermal units from 1991-1992, which paralleled a national recession. The economic decline that started in late 2008 and continued in 2009, shows a similar decline in energy use in this sector because of economic conditions. Despite a small decline in 2012, demand increased in 2013, only 5.4 trillion British thermal units less than 2008.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Energy Need

Since the primary needs of the commercial sector are confined to readily available supplies of natural gas and electricity, no issues relating to energy need are foreseen since supplies of both fuel types are ample.



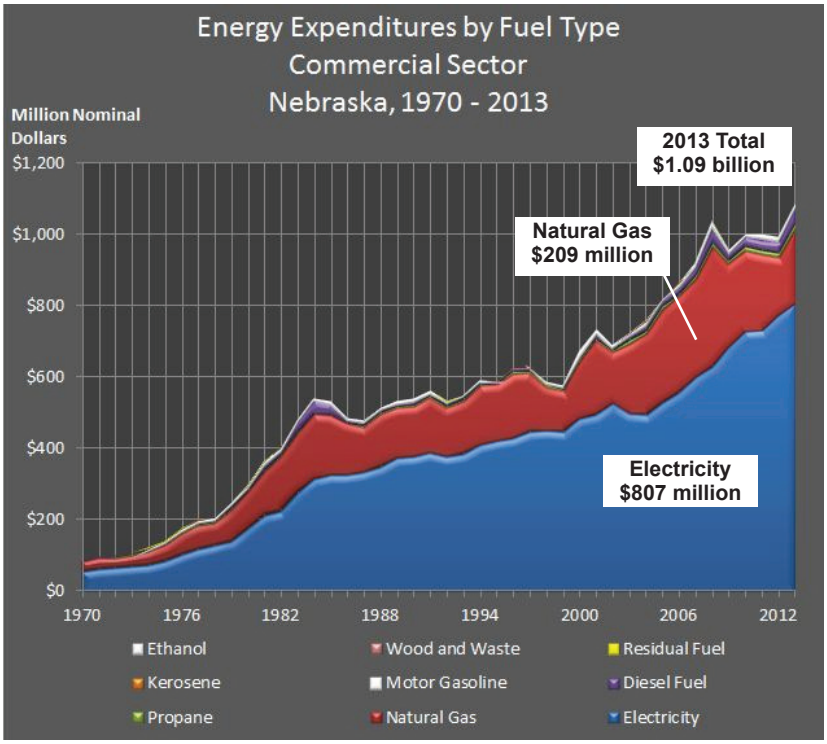
Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE

2012 and 2013. Energy prices for the two primary fuel sources — natural gas and electricity — moved in different directions in 2013. Natural gas prices increased from $6.08 (measured in nominal dollars per million British thermal units) in 2012 to $6.26 in 2013. Electricity prices increased from $24.57 (measured in nominal dollars per million British thermal units) in 2012 to $25.21 in 2013. The annual average decreased from $16.26 (measured in nominal dollars per million British thermal units) in 2012 to $15.58 in 2013.

1970-2013. One factor of need is price. A commercial business' need for energy can differ markedly if the price of energy doubles in a short period of time. Expenditures in the commercial sector have changed markedly over the 43-year period. In 1970, the commercial sector's energy expenditures totaled $88.4 million (in nominal dollars) and in 2013 it totaled $1,090.8 million (in nominal dollars) surpassing the previous peak year for expenditures for this sector in 2008 at $1.037 billion (in nominal dollars), a 12-fold increase over the decades-long reporting period.

Residential

Historical expenditure trends for the two primary fuels used in the commercial sector have followed a predictable upward path: electricity expenditures totaled $58.3 million in nominal dollars in 1970 and increased to $807.5 million in 2013; natural gas expenditures totaled $24.7 million in nominal dollars in 1970 and increased to $209.1 million in 2013 a $45 million increase from 2012. Electricity expenditures in 2013 were nearly three-quarters of all money spent in the commercial sector, with natural gas comprising about 19 percent. Nominal percentages of diesel fuel, motor gasoline, propane and wood waste comprised the remaining expenditures.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Residential

Energy Supply

2012 and 2013. More than 87 percent of the energy used in the residential sector in 2012 and 2013 came from two primary sources: natural gas and electricity. Two other fuels, propane at 8.2 percent and wood at 3.4 percent were used in the residential sector in 2013. More than half the energy used — 48.6 percent — in this sector came from natural gas in 2013. Natural gas use in this sector is used primarily for home heating and lesser household uses such as water heating, clothes drying and cooking. Residential electricity use in 2013 decreased to 39 percent of all energy used in Nebraska in this sector. Electricity is used throughout the home for heating, cooling, water heating, appliances, lighting and miscellaneous activities and equipment. Supplies of both natural gas and electricity are readily available.

1960-2013. Supply trends and fuel types used in the residential sector have not changed substantially over 53 years of data collection, with the exception of a slow decline in natural gas and an equally slow rise in electricity use.

Demand

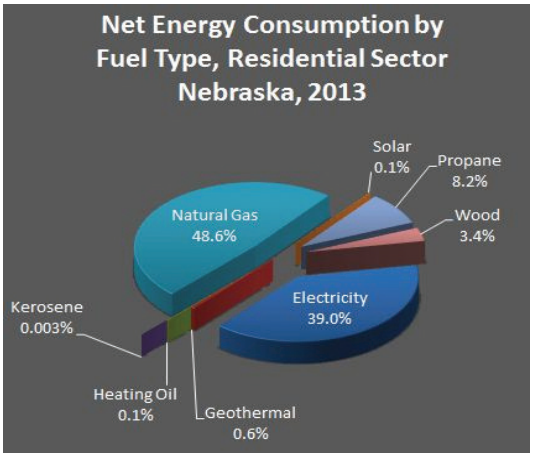
2012 and 2013. More than 17 and 19 percent — 147.0 and 163.8 trillion British thermal units — of the state's total energy demand was consumed in the residential sector in 2012 and 2013, respectively. In 2013 demand increased to 168.3 trillion British thermal units, from 147 trillion British thermal units in 2012. Most types of fuel used in the residential sector increased from 2012 to 2013: renewable fuels — geothermal, solar and wood — increased by 30.6 percent,

Residential

electricity use increased 4.0 percent, natural gas use increased 34 percent and petroleum use decreased 23.7 percent.

1960-2013. Total energy consumption in 1960 in the residential sector was 78.54 trillion British thermal units, of which slightly more than half — 40.87 trillion British thermal units came from natural gas. By 2013, the total energy consumption in this sector was 163.76 trillion British thermal units, up 16.76 trillion British thermal units from 2012. Natural gas consumption showed a measurable increase in 2013 to 42.72 trillion British thermal units, up from 31.88 trillion British thermal units in 2012.

Changes in how and how much this sector uses energy becomes clear over the 53-year span. In 1960, electricity use totaled only 6.51 trillion British thermal units, but by 2013 electricity demand totaled 34.33 trillion British thermal units. Natural gas demand was 40.87 trillion British thermal units in 1960, peaked at 60.86 trillion British thermal units in 1972 and has generally declined by about a third since then. Propane demand in 1960 was 7.49 trillion British thermal units, and was 7.3 trillion British thermal units in 2013, an increase of 1.35 trillion British thermal units over 2012. Electric system line losses are accounting for a larger share of the energy used in this sector as electrical use increases. In 1960, electrical line losses accounted for 16.09 trillion British thermal units, but by 2013 amounted to 75.80 trillion British thermal units, 46.3 percent of all the energy used in this sector in 2013.



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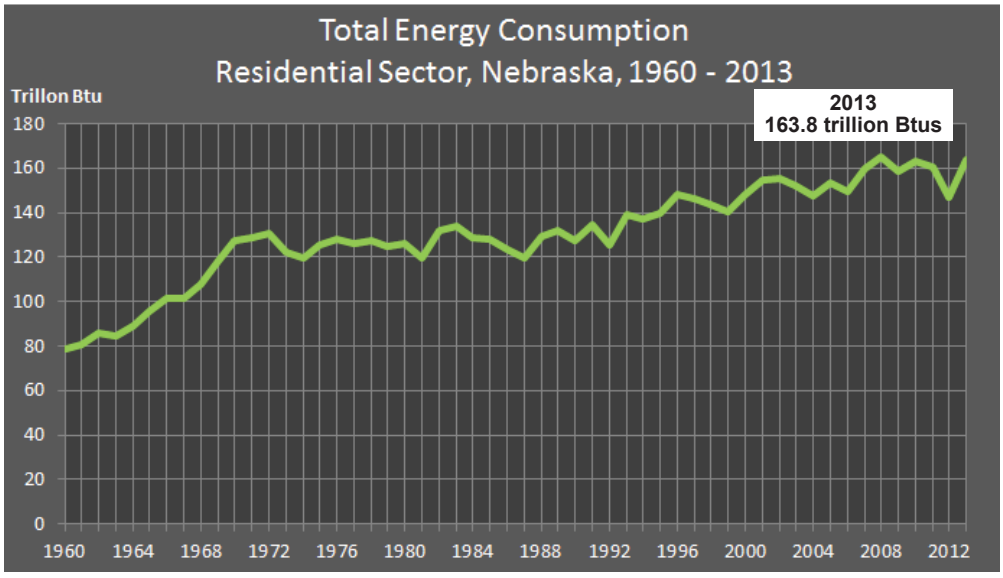
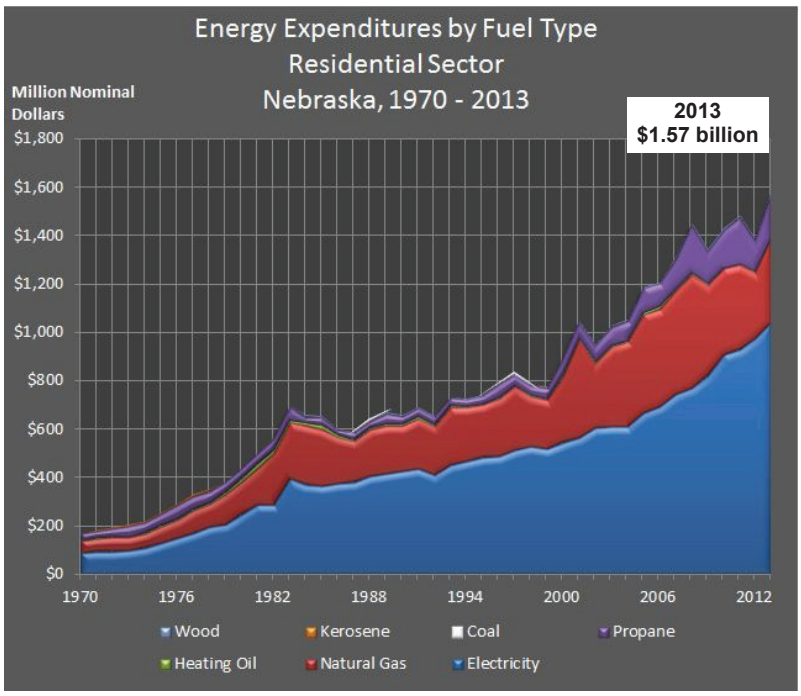


Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE

Conservation

Conservation in the residential sector is influenced by price, weather and efficiency actions. Like most sectors, residential users are extremely responsive to dramatic price rises. Increases in the price of natural gas, at various times over the decades,

Residential



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

"One of the simplest reactions by people to higher energy bills is to adjust the thermostat which can also result in savings."

have resulted in reduced average annual consumption. Higher than normal heating bills have propelled homeowners to make energy saving improvements such as replacing aged furnaces with new efficient models or efficient electric heat pumps, adding insulation and replacing windows and doors with more energy efficient ones. One of the simplest reactions by people to higher energy bills is to adjust the thermostat which can also result in savings.

Energy Need

2013. In 2013, prices for the two primary fuel types in the residential sector, natural gas and electricity, declined and rose respectively compared to 2012 levels. Specifically, natural gas decreased from $8.52 in nominal dollars per million British thermal units in 2012 to $8.10 in 2013. Conversely, electricity increased from $29.44 in nominal dollars per million British thermal units in 2012 to $30.23 in 2013. The annual average decreased from $19.42 in nominal dollars per million British thermal units in 2012 to $18.48 in 2013. Among the states, Nebraska ranked 9th lowest in natural gas prices in 2013 at $5.78 measured in nominal dollars per million British thermal units and 14th lowest in retail electricity prices at $25.61 in nominal dollars per million British thermal units.

Using more common measurements, residential natural gas prices in October 2015 were $13.92 a thousand cubic foot and ranked 25th — or in the middle — of the states. Residential electricity prices in October 2015 were 10.95 cents a kilowatthour, ranking 10th lowest among all states.

1970-2013. Price is a factor determining energy need. A household's energy needs can differ considerably if the price of a necessary fuel increases dramatically in a short period of time. The energy needs of the residential sector come from two major fuel types: natural gas and electricity. Those needs are likely to be determined in predictable ways: severity of winter and summer weather conditions and price volatility. In several of the first years of the 21st century, winter weather that was colder than normal, combined with high gas prices to lower demand by residential users. In 2000-2001, residential natural gas prices rose from $6.40 to $8.57 in nominal dollars per million British

Industrial

thermal units. Between 2002 and 2008 natural gas prices in the residential sector rose dramatically — from $6.13 in nominal dollars per British thermal unit to $10.99 in 2008 — a rise of 45 percent in six years and peaked at $11.169 in nominal dollars per British thermal unit in 2006. As a result, consumers replaced inefficient heating equipment with high-efficiency models reducing energy consumption and switched fuels from natural gas to electricity by installing an efficient heat pump.

In the 43 years since records have been kept, residential electricity prices have increased from $6.21 in 1970 to $25.61 in nominal dollars per million British thermal units in 2013, more than quadrupling in price. Residential natural gas prices have risen from 84 cents in 1970 to $5.78 in nominal dollars per million British thermal units in 2013 slightly less than a seven-fold increase in 43 years, surpassing the price rise in electricity prices. The annual average has also risen from $1.83 in 1970 to $18.48 in nominal dollars per million British thermal units in 2013.

Annual residential energy expenditures totaled $170.0 million in 1970. By 2013, total expenditures had risen to $1.576 billion, a more than nine-fold increase.

Between 1960 and 2013, the number of occupied housing units in the state rose from 433,374 to 730,579, a 68.58 percent increase over 53 years. Of that, 62.1 percent or 453,769 units, used utility gas as their home heating source; 27.33 percent or 199,699 units used electricity, and 7.88 percent or 57,576 units used propane.

"Natural gas, renewable energy, electricity, coal and a variety of petroleum products — gasoline, asphalt, road oil, propane and diesel — are the primary fuel types utilized in industrial sector operations."

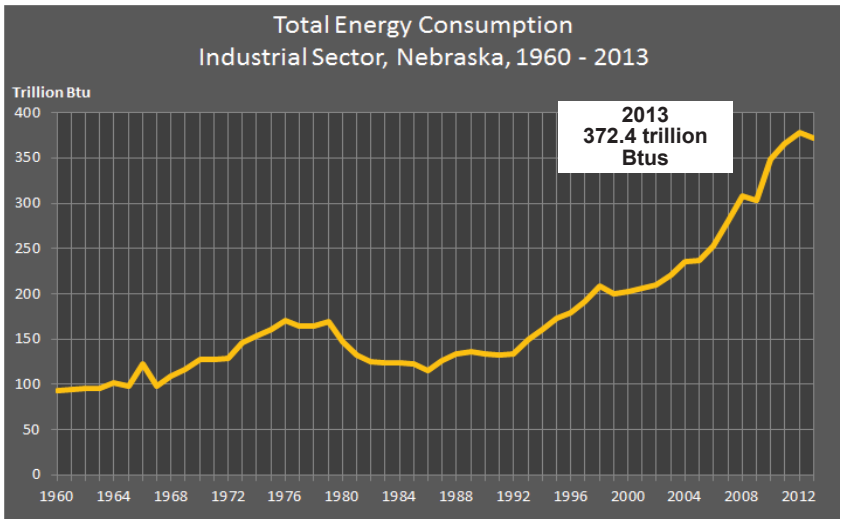
Industrial

The industrial sector includes manufacturing, construction, mining, agriculture and forestry operations. This sector relies on more diverse fuel types than the other sectors of the economy. Natural gas, renewable energy, electricity, coal and a variety of petroleum products — gasoline, asphalt, road oil, propane and diesel — are the primary fuel types utilized in industrial sector operations.

Energy Supply

2013. Biofuels supplanted the very long dominance by natural gas in the industrial sector beginning in 2010 which continued into 2013. Nearly 34 percent of net energy used in the industrial sector in 2013 (over 35 percent in 2012) came from renewable energy: ethanol, losses and co-products and wood and waste. The following fuels were used by the sector in 2013: natural gas (31.8 percent), electricity (13.3 percent) and petroleum products (13.9 percent).

Generally, supplies of these fuel types have been readily available to industrial users.

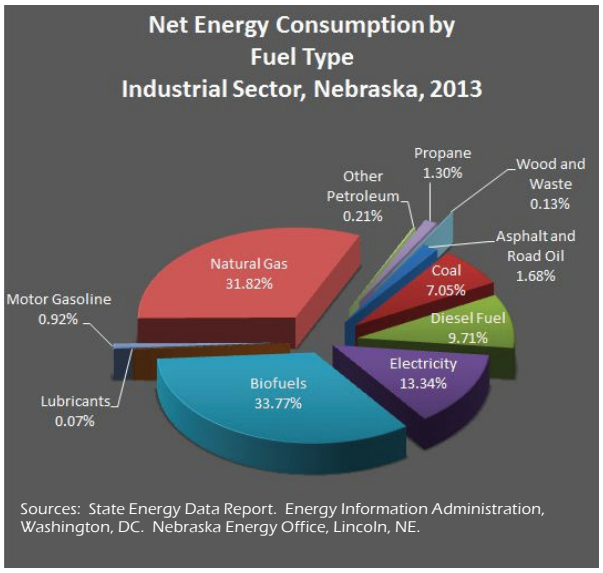


Sources: State Energy Data Report. Energy Information Administration, Washington, DC.
Nebraska Energy Office, Lincoln, NE.

Industrial

1960-2013. Trends in fuel types used in the industrial sector illustrate the dynamic needs of this sector and how industries can switch fuel types over time. The emergence of new industries such as ethanol plants can also alter fuel use patterns. For example, natural gas use in 1960 was 38.27 trillion British thermal units and soared in 1973 to 73.72 trillion British thermal units. Subsequent energy price spikes and other factors reduced natural gas consumption to 19.88 trillion British thermal units by 1986. Natural gas has fluctuated considerably since then. A new historical peak occurred in 2013 at 91.54 trillion British thermal units.

The rise of renewable fuels, primarily ethanol and co-products, in this sector is illustrated over time. For the first 20 years, there was no biofuel used by this sector. From 1981 to 1990, less than 1.0 trillion British thermal units were used annually. The next 23 years from 1991 to 2013 saw a rise from 1.003 to 97.53 trillion British thermal units.



Consumption of distillate fuel nearly doubled from 1960 to 2013, rising from 14.01 trillion British thermal units to 27.944 trillion British thermal units. Motor gasoline consumption dropped by nearly 77 percent between 1960 and 2013 from 11.27 trillion British thermal units in 1960 to 2.644 trillion British thermal units in 2013. The growing use of electricity in this sector is demonstrated by the nearly thirteen-fold increase from 3.03 trillion British thermal units in 1960 to 38.39 in 2013.

Demand

2013. Nearly half of the state's total energy consumption — 43 percent or 372.5 trillion British thermal units — was used in the industrial sector in 2013. The decrease in industrial sector energy consumption in 2013 was 3.2 percent.

1960-2013. In 1960, the industrial sector was the second largest energy user after transportation, 93.0 trillion British thermal units to 94.2 trillion British thermal units, respectively. Industrial sector energy consumption surpassed the transportation sector in 1993. By 2013, the industrial sector was the largest energy using sector at 372.5 trillion British thermal units, surpassing the transportation sector by 177.4 trillion British thermal units.

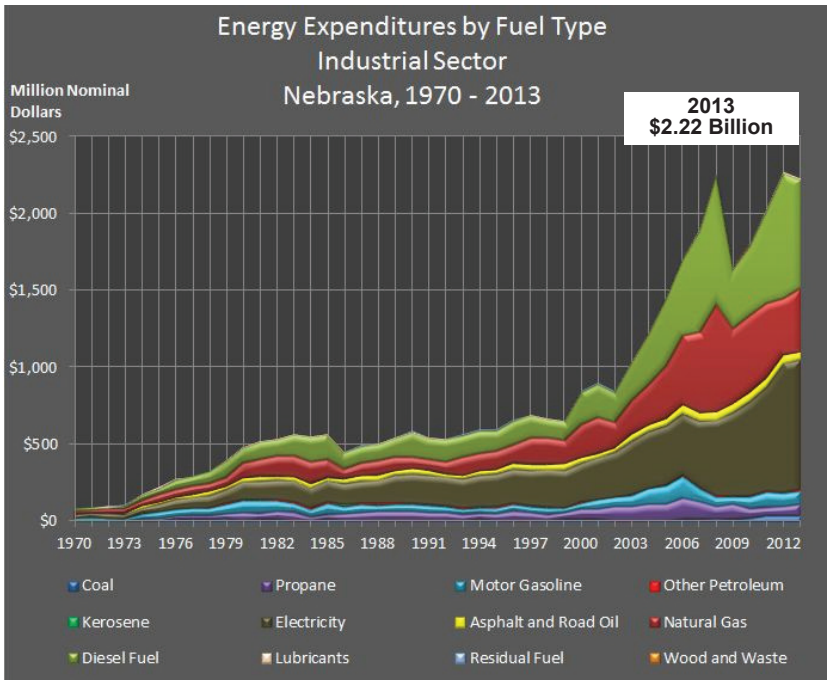
Conservation

The industrial sector is more pre-disposed to making energy efficient system, lighting and building improvements than other sectors. If energy costs are a significant factor — and rising — industrial sector users are likely to find ways to reduce the costs and impacts of energy on their operations. The roller coaster consumption of natural gas over the past 50 years noted in the energy supply section is an indicator of the impact of conservation of use, fuel switching and the impact of new industries.

Industrial

Energy Need

Energy need in the industrial sector is subject to the ebb and flow of the business cycle and national, regional and local economic trends which can cause a spike or reduction in energy need and demand. As noted earlier, the surge in ethanol industry growth in the state added to this sector's energy needs for electricity and natural gas. The phenomenal growth in the renewable energy category — which includes ethanol, losses and coproducts, and wood and wood waste — is the story of the rise of ethanol production in Nebraska. In 1985, losses and co-products accounted for .705 trillion British thermal units. By 2013, losses and coproducts had soared to 97.167 trillion British thermal units, surpassing natural gas and electric system energy losses in this sector. "Losses and coproducts" are measurements of ethanol feedstock minus fuel ethanol production, excluding denaturant.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

2012. Price can be a need-altering factor in the industrial sector, which is more adept at fuel switching and conservation practices than other sectors. In 2012, the industrial sector spent $2.29 billion for energy, an increase of $25 million in nominal dollars over 2011 a 12.3 percent increase.

1970-2013. In 1970, the industrial sector spent $92.4 million in nominal dollars, 13.8 percent of total energy expenditures for all sectors. In 1970, industrial sector energy spending ranked third among the four sectors. By 2013, industrial sector expenditures of $2.2 billion in nominal dollars had risen to 21.6 percent among all sectors, and now ranked second after transportation among energy-using sectors.

In 1999, expenditures in the industrial sector totaled only $661.2 million in nominal dollars. Since then, spending in the industrial sector has increased by more than $1.556 billion in nominal dollars. In 2013, the industrial sector spent $837.4 million for electricity, $696.8 million for diesel fuel, $416 million for natural gas, $80.7 million for motor gasoline, $77.9 million for propane, $49.7 million for asphalt and road oil, $36.5 million for coal, $19.2 million for other petroleum products, $13.2 million for lubricants, $0.3 million for wood and waste, and $0.1 million for kerosene. Annual average prices between 1999 and 2013 rose from $5.33 in nominal dollars per million British thermal units to $11.71.

Transportation

Transportation

"Trends in fuel types used in the transportation sector illustrate the static nature of this sector and how modes of transportation have changed little since record-keeping began in 1960."

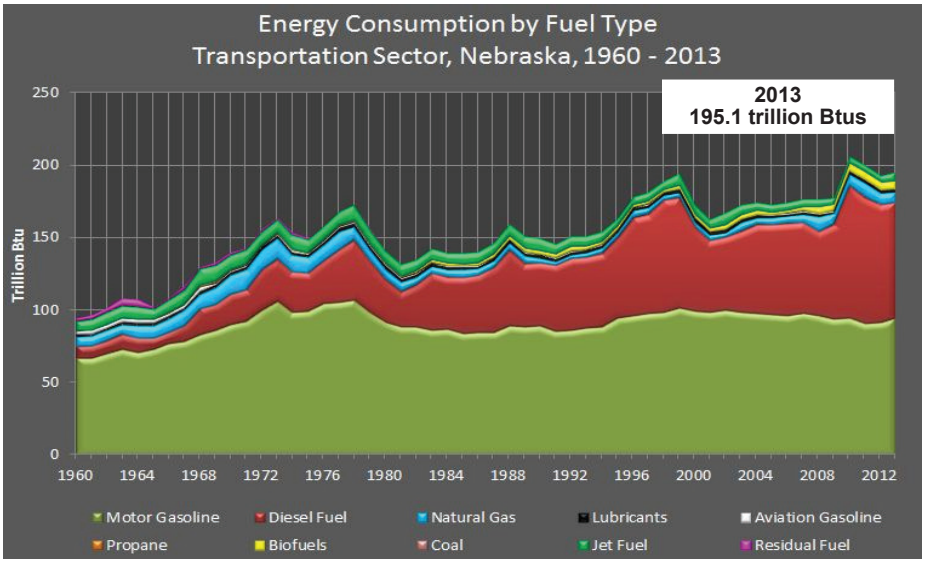
Traditional methods of transportation such as public and private vehicles, railroads, aircraft and boats are included in the transportation sector as well as energy used to transport oil and natural gas through pipelines.

Energy Supply

2013. In 2013, 94 percent of energy used — 182.47 trillion British thermal units in the transportation sector was in the form of petroleum products, especially distillate oil (e.g. diesel) and gasoline. The next two fuel types used of any consequence in 2013 were natural gas at 7.244 trillion British thermal units and biofuels at 5.418 trillion British thermal units.

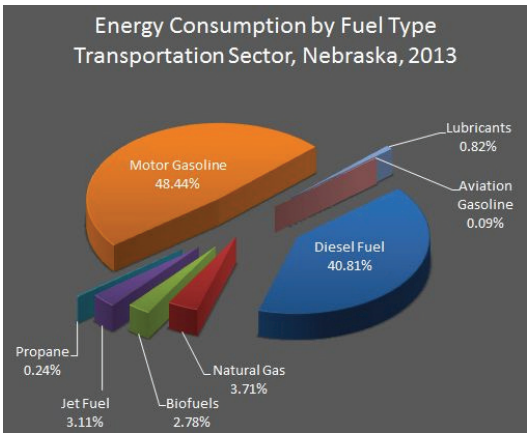
Generally, supplies of these fuel types have been readily available to transportation users.

1960-2012. Trends in fuel types used in the transportation sector illustrate the static nature of this sector and how modes of transportation have changed little since record-keeping began in 1960. The transportation sector was nearly totally dependent upon petroleum-based fuels in 1960 and remained nearly as dependent in 2013. The changes that occurred in the 53-year period primarily related to increased fuel use. Renewable fuel, specifically ethanol, use began marginally in 1981 at 0.27 trillion British thermal units and hit a new historical peak of 5.444 trillion British thermal units in 2012. Ethanol use in 2013 declined by .026 percent to 5.418 trillion British thermal units. Diesel fuel use in 1960 was 8.16 trillion British thermal units, declined to 58.87 trillion British thermal units in 2008, and peaked at 91.432 trillion British thermal units in 2010. Diesel fuel use declined in 2013 to 79.638 trillion British thermal units. Motor gasoline use in 1960 was 67.07 trillion British thermal units, peaked in 1978 at 106.77 trillion British thermal units and by 2013 had declined to 94.53 trillion British thermal units.



Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Transportation



Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Demand

2013. More than a fifth — specifically 22 percent of the state's total energy consumption — 195.1 trillion British thermal units — was used in the transportation sector in 2013. The increase in demand from 2012 to 2013 totaled 2.1 trillion British thermal units, a increase of 1.08 percent.

1960-2013. In 1960, the transportation sector was the largest energy using sector at 94.2 trillion British thermal units, 30.5 percent of consumption in all sectors. By 2013, the transportation sector had been eclipsed as the largest energy using sector by the industrial sector.

The number of vehicles registered in the state has risen from 1.09 million in 1970 to 2.31 million in 2013, according to the Nebraska Department of Motor Vehicles.

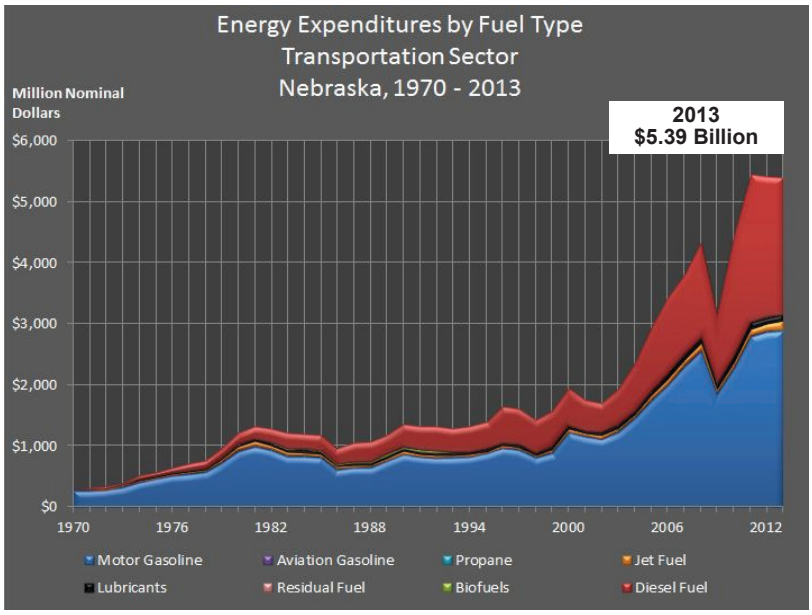
In 2013, ethanol sales were 1.82 billion gallons. On a yearly basis, about four percent of ethanol produced in Nebraska is consumed in the state.

After mid-September, 2014, refiners began to supply 84-octane gas to eastern Nebraska terminals in lieu of the minimum 87-octane gas required by law. In the western quarter of the state, where 85-octane is the standard because of higher elevations, refiners supply 82-octane gasoline. Refiners continue to supply 91-octane premium gasoline to Nebraska terminals. This action was initiated by refiners in response to the Renewable Fuel Standard, a federal law requiring renewable fuels in the country's fuel mix. Nebraska and Iowa are among the last states to see this practice implemented. Local suppliers are using either ethanol or premium gasoline to increase the octane levels to state required minimums.

Conservation

The transportation sector is particularly resistant to conservation efforts. Over the decades, a variety of approaches by the state and federal governments have been tried to make this sector less dependent upon petroleum products: mandated Corporate Average Fuel Efficiency standards, reduced highway speed limits, introduction of efficiency technology in vehicles, lighter weight vehicles and ethanol-blended fuels.

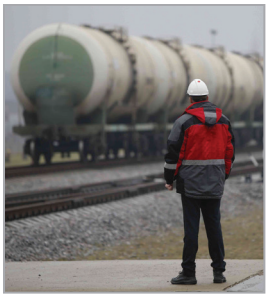
Trends in this sector — such as sport utility vehicles and large trucks used for personal transportation — have thwarted conservation efforts. However, fuel price rises can induce conservation behavior.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

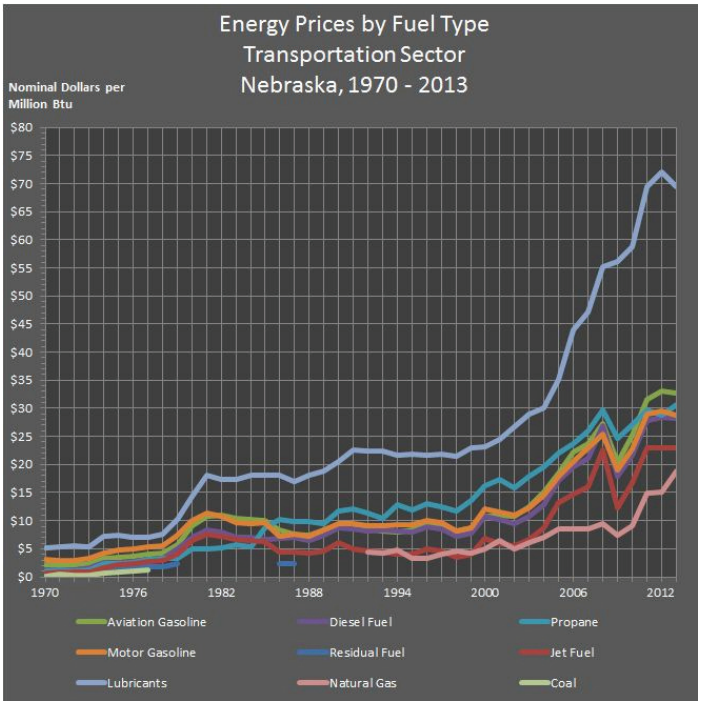
Transportation

"Trends in price and vehicle technology as well as federal government initiatives such as more efficient vehicles are expected to have an impact on energy use in this sector in the future, leading to declines in consumption."



Rising pump prices for petroleum-based fuels since 1999 have had an impact on demand. Peak total energy consumption in this sector was reached in 2010 at 205.7 trillion British thermal units. The precipitous decline in transportation sector use from 1999 to 2000 — from 194.4 trillion British thermal units to 172.8 trillion British thermal units — continued into 2001 and was caused by dramatic price increases. Since 2001 when demand was 162.6 trillion British thermal units, demand marginally inched upwards nearly every year until 2011.

In 2010, total energy consumption in this sector soared from 176.9 trillion British thermal units in 2009 to 205.7. This dramatic increase occurred in the use of diesel fuel which leapt from 66.05 trillion British thermal units in 2009 to 81.9 trillion British thermal units in 2012. Factors causing this 38 percent increase could be rail and truck shipments of oil from the North Dakota Bakken field, coal supplies from Wyoming and/or increased ethanol shipments crossing the state. There was a decline of 1.54 trillion British thermal units in diesel use in 2013 from 2012.



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Energy Need

Trends in price and vehicle technology as well as federal government initiatives such as more efficient vehicles are expected to have an impact on energy use in this sector in the future, leading to declines in consumption. An offsetting trend has been the gradual increase in the number of motor vehicle miles traveled nearly every year since 1979, when the annual total was 11.53 billion miles. By 2014, that figure was 19.612 billion miles traveled.

In 2014, the average age of cars in the U.S. was 11.4 years; a historic high was set in 2013. Nebraska's average fleet age may even be higher since traditionally the state has been one of the top five states with older vehicles.

The impact of hybrid, compressed natural gas and electric vehicles is marginal at this time, but could have a significant impact if consumer acceptance of the technologies is high and more infrastructure is developed.

2013. In 2013, the transportation sector spent $3.98 billion in nominal dollars for energy, a slight decrease of $22 million in nominal dollars over 2012.

1970-2013. In 1970, the transportation sector spent $3.98 million in nominal dollars, more than 47.5 percent of total energy expenditures for all four end-use sectors, and ranked first. By 2013, transportation sector expenditures of $5.398 billion in nominal dollars

Electric Utilities

had increased to 52.4 percent among all sectors, and still ranked first among the four end-use sectors.

The 43-year span of energy prices in this sector provides dramatic illustrations of the financial impact of petroleum dependency on Nebraskans' wallets. In 1970, diesel fuel was $1.14 in nominal dollars per million British thermal units, but by 2013 diesel fuel was $28.17, rising an eye-popping $10.35 between 2009 and 2014. Motor gasoline was $3.03 in nominal dollars per million British thermal units in 1970 and $28.85 in 2013.

Electric Utilities

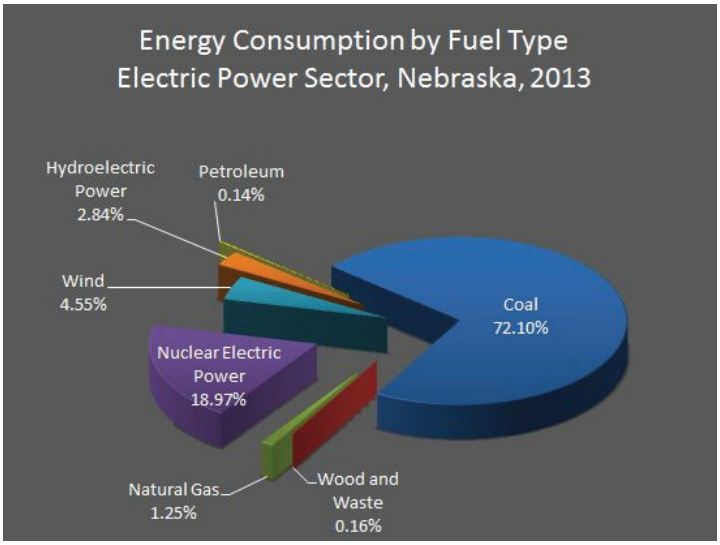
Information in this section consists exclusively of supply, demand, conservation and need by the state's electric utilities.

Energy Supply

2013. In 2013, 72.1 percent of the electric utilities energy feedstocks came from coal, 272.66 trillion British thermal units out of a total of 378.19 trillion British thermal units. The second most used fuel in this sector, nuclear, supplied nearly 19 percent, 71.74 trillion British thermal units. Three lesser fuel sources supplied nearly all the remainder: hydropower, 2.8 percent, 10.72 trillion British thermal units; wind, 4.55 percent, 17.19 trillion British thermal units (3.5 percent in 2012); and natural gas, 1.3 percent, 4.72 trillion British thermal units.

Generally, supplies of these fuel types have been readily available to consumers served by the state's electric utilities.

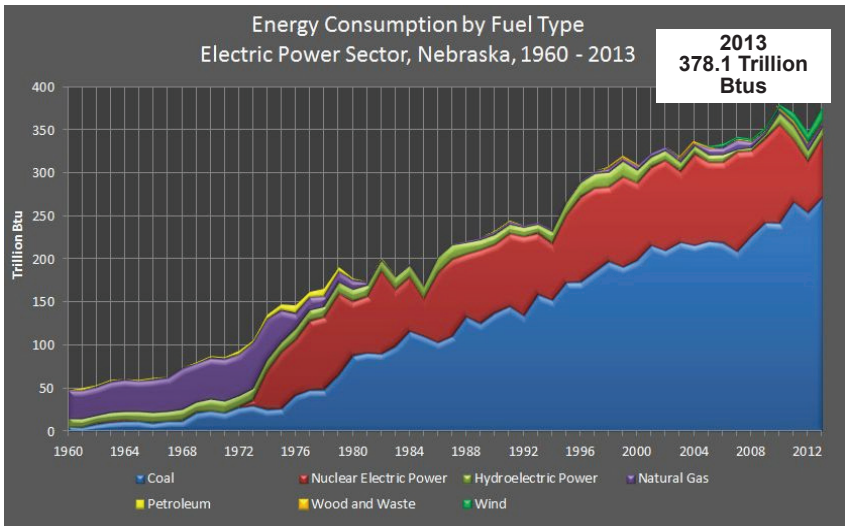
1960-2012. Trends in fuel types used by the state's electric utilities illustrate how the industry has evolved over 53 years. In 1960, 63.8 percent of the electricity generated came from natural gas, with hydropower (20.54 percent) and coal (21.61 percent)



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Electric Utilities

"Over the 53 year period, only 15 years recorded declines in demand."



Sources: State Energy Data Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

supplying most of the balance. An experimental nuclear reactor was located at Hallam and operated between 1963-1964, but generated only marginal amounts of power before being deactivated. Coal used in this sector peaked in 2013 at 272.66. trillion British thermal units, natural gas used peaked in 1973 at 53.11 trillion British thermal units, nuclear power — which began in 1973 — peaked in 2007 at 115.77 trillion British thermal units, hydropower peaked in 1999 at 17.57 trillion British thermal units and wind use peaked in 2013 at 17.191 trillion British thermal units.

Demand

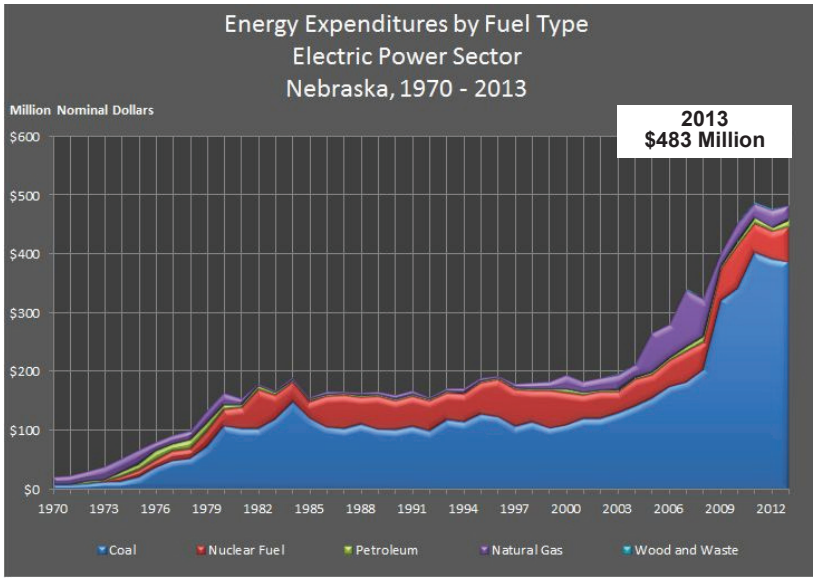
2013. The demand in the state's electric utility sector in 2013 totaled 378.2 trillion British thermal units, an increase of 8.9 percent, or 30.86 trillion British thermal units, over 2012 demand. Among the changes in fuel used to generate electricity in 2013 were increased use of coal, nuclear and wind along with reductions in natural gas and hydro.

Electricity purchases generated by hydropower for use by Nebraska utilities from the Western Area Power Administration in 2014 totaled 2.032 billion megawatt hours at an average price of four cents per kilowatt hour. The total cost of the power purchased in 2014 was $83.41 million. In 2012, the amount of power provided from Western Area Power Administration met 8.1 percent of the electricity demand in the state

1960-2013. In 1960, the state's electric utilities' demand was 50.2 trillion British thermal units. By 2013, the demand in this sector had increased more than seven-fold from 1960 to 378.2 trillion British thermal units.

Over the 53 year period, only 15 years recorded declines in demand. A number of these declines were marginal; however, larger declines in demand paralleled economic cycles as well as favorable climate periods which affected irrigation and air conditioning use.

Electric Utilities



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

Conservation

Energy efficiency efforts in the electric utility sector generally result from technological advances in the generation and transmission of power.

One on-going target of efficiency improvements is reducing electricity transmission line losses. While technological breakthroughs can lessen the problem, other improvements can be made. Local utilities estimate standard line loss at seven percent, but in some cases actual losses can be considerably higher — more than double the seven percent — if preventative maintenance is not performed on a regular basis on utility lines. An example of future technologies being developed: The copper wires used in typical transmission lines lose a percentage of the electricity passing through them because of resistance, which causes the wires to heat up. But "superconductive" materials have no resistance, and if they are used to transmit electricity in the future, very little of the electricity will be lost.

Smart grid technology has garnered a great deal of attention. Smart electrical grids and accompanying communications infrastructures enable end-use efficiency and deployment of this technology in Nebraska is just getting underway.

Consumer behavior, also known as demand side management, can be a source of conservation from which the electric utility sector will benefit since the cheapest kilowatt is the one that doesn't have to be produced. For example, Nebraska utilities have been very proactive in the past several years in encouraging Nebraskans to utilize new lighting technologies, especially compact fluorescents and light emitting diodes. Some electric utilities have provided discount coupons, free light bulbs or financial incentives for larger commercial, industrial or governmental operations.

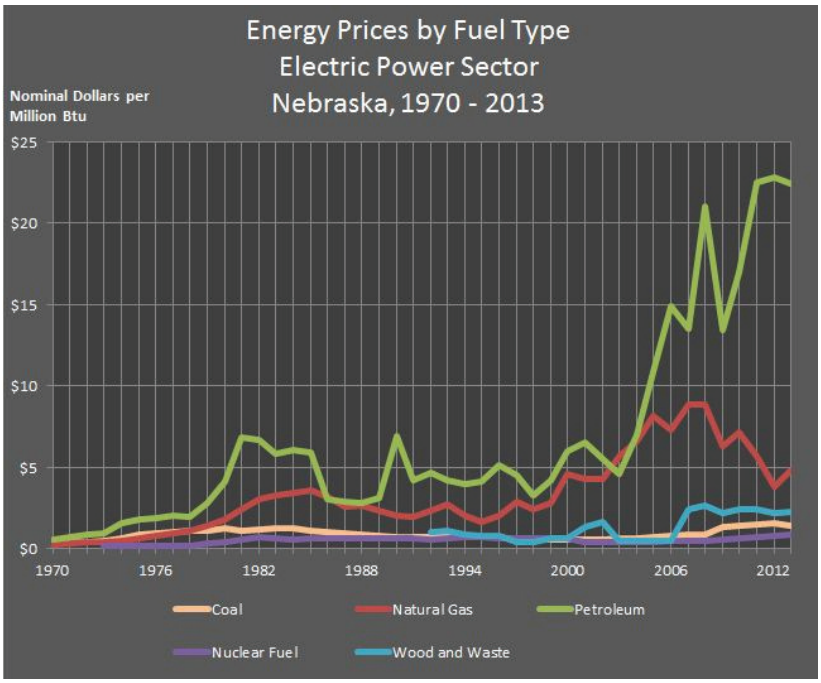
In late 2011, the Nebraska Power Association, with the support of the Nebraska Energy Office and others, issued the *2010 Research & Conservation Report* which documented research, energy efficiency and sustainability efforts of the state's electric utilities and the Energy Office. The *Report* quantified approximately 24 megawatts and 80,000 megawatthours that were reduced because of utility and agency activities and programs in 2010. A copy of the *Report* is at http://www.neo.ne.gov/reports/2010-NPA-Report.pdf .

Energy Need

Nebraska's electric utilities more than met their customers' needs, continuing to export electricity to customers outside the state. Between 1990 and 2008, electricity exports varied from a low of 9.4 percent of generation in 1994 to a high of 23.9 percent in 1999. In 2012, 9.9 percent of the electricity generated in Nebraska was sold for use outside the state's borders, a decrease of 5.2 percent from 2011.

Trends in price as well as efficiency gains — offset by fuel switching by customers — are expected to have

Electric Utilities



Sources: State Energy Price and Expenditure Report. Energy Information Administration, Washington, DC. Nebraska Energy Office, Lincoln, NE.

"Nationally in 2014, the statewide average price for all sectors from all electric utilities in Nebraska was the 14th lowest rate in the country at 8.8 cents a kilowatthour."

an impact on energy use in this sector in the near term. If growth continues in this sector, additional generation will be needed.

2013. In 2013, electric utility sector expenditures totaled $483 million in nominal dollars, a decrease of 1.45 percent from 2012 expenditures.

Nationally in 2014, the statewide average price for all sectors from all electric utilities in Nebraska was the 14th lowest rate in the country at 8.8 cents a kilowatthour. Nationally, the average price for electricity is 19 percent more than it costs in Nebraska. Hawaii at 34 cents pays the highest, while Washington pays the lowest, 7.15 cents.

1970-2013. In 1970, the electric utility sector spent $22.27 million in nominal dollars, less than 4.6 percent of what was spent in 2013, $483 million in nominal dollars. In the 43 years since 1970, coal expenditures increased from $8.5 million nominal dollars to $386.7 million nominal dollars in 2013, natural gas from $12.8 million nominal dollars to $22.8 million nominal dollars in 2013, and nuclear fuel from nothing in 1970 to $60 million nominal dollars in 2013. Minimal expenditures were made for petroleum and wood and waste fuels.

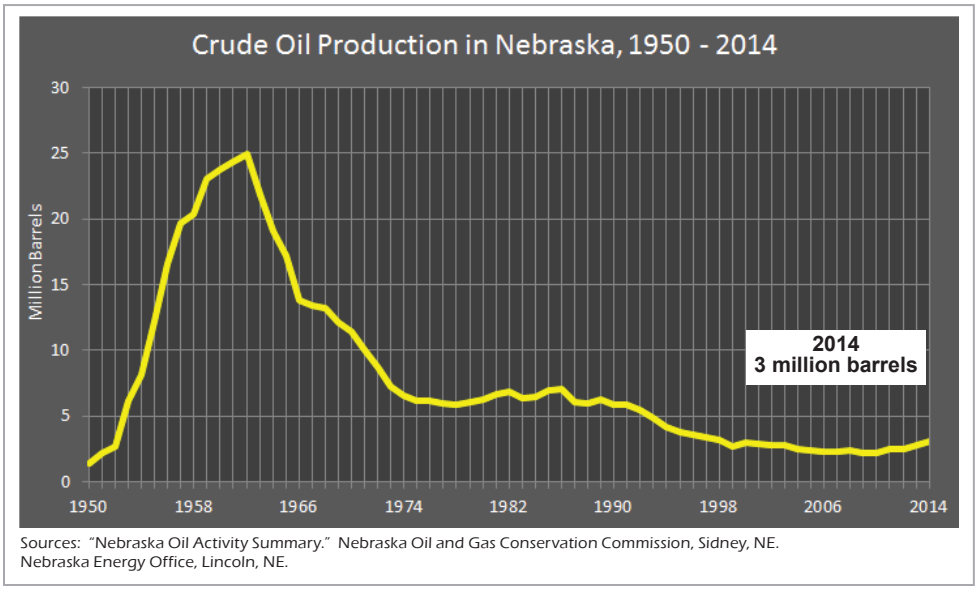
State Energy Resources Assessment

State Energy Resources Assessment

Nebraska is not a state rich in traditional fossil fuel resources. But, the state has respectable solar resources and world-class wind resources.

Oil

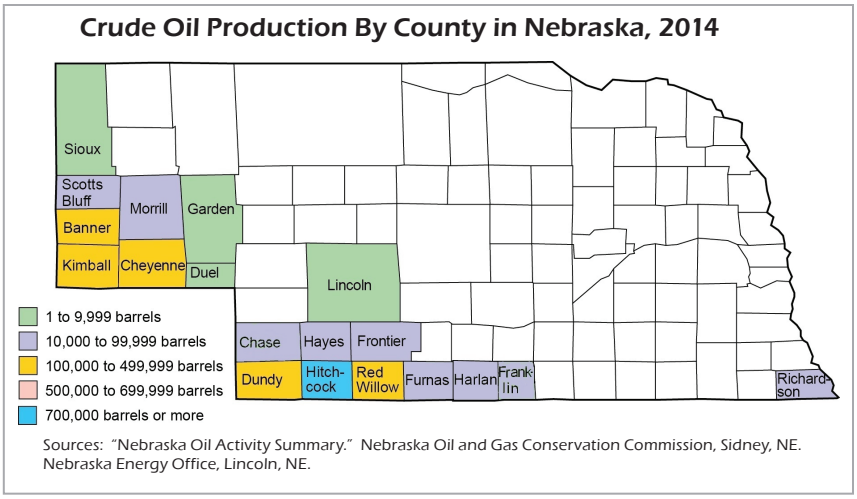
Oil has been produced in the state since 1939. Oil production peaked in 1962 at 24.893 million barrels, and has declined precipitously since that time. In 2014, crude oil production in Nebraska was 3.037 million barrels, an increase of 9.3 percent from 2013 when annual production was 2.778 million, making 2014 the highest level of production since 2003 when production started to decline. Crude oil production began in Nebraska in 1939, but no records were kept prior to 1950. In the 64 year history of reported production, 1962 was the busiest year with over 24.8 million barrels of oil produced.



Sources: "Nebraska Oil Activity Summary." Nebraska Oil and Gas Conservation Commission, Sidney, NE. Nebraska Energy Office, Lincoln, NE.

Nationally, Nebraska ranked 22nd among the states in oil production in October 2015. In 2014, the Energy Information Administration estimated the state's crude oil reserves — an economic calculation — at 14 million barrels, about 1/10th of one percent of the nation's total crude oil reserves.

In 2013, there were 1,288 active oil producing wells in the state. Drilling permits issued for development wells (both oil and natural gas) increased by more than 50 percent from 50 to 102 from 2012 to 2013. Drilling permits for exploratory wells decreased from 90 to 83 in 2012 to 2013.



Sources: "Nebraska Oil Activity Summary." Nebraska Oil and Gas Conservation Commission, Sidney, NE. Nebraska Energy Office, Lincoln, NE.

Production of oil in the state is concentrated in two areas: the southwest, particularly Hitchcock and Dundy counties and in the Panhandle, especially Kimball County. In 2013, these three counties produced nearly 63 percent of the oil mined in the state. The top five producing counties in 2014 (in rank production order): Hitchcock, Dundy, Kimball, Red Willow and Cheyenne. Production in Hitchcock County increased 5 percent from 1,014,251 barrels to 1,066,267 in 2013 to 2014; 5.5 percent in Dundy County from 405,208 barrels to 427,311 in 2013 to 2014 and decreased 10 percent in Kimball County from 467,503 barrels to 419,419 in 2013 to 2014.

State Energy Resources Assessment

In 2012, Nebraska's crude oil production represented about 5.7 percent of the petroleum products used in the state that year.

Natural Gas

Natural gas has been produced in Nebraska since 1950. Natural gas production peaked in the state in 1960 at 28.189 billion cubic feet and has declined since that time. There have been several infrequent, yet minor, increases in production over the years. In 2014, natural gas production was 402 million cubic feet, a decrease of more than 50 percent from 2013.

In 2014, Nebraska's natural gas production represented only .23 percent of the natural gas consumed in the state in that year.

In 2014, Nebraska natural gas production ranked 28th among the 33 producing states, just ahead of Florida.

Beginning in 1977, Nebraska's dry natural reserves have been included with a group of miscellaneous states, including Arizona, Idaho, Illinois, Indiana, Maryland, Missouri, Nevada, Oregon, South Dakota, and Tennessee. In 2014, proven reserves had decreased to 176 billion cubic feet from 179 billion cubic feet in 2013. Proven reserves for this group of miscellaneous states peaked in 2011 at 379 billion cubic feet.

Coal

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

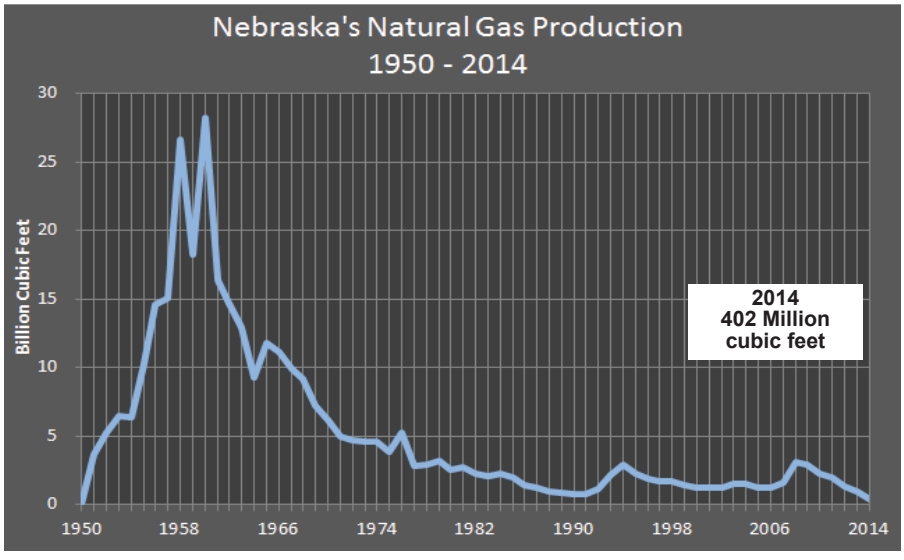
Uranium

Uranium has been mined in the state since 1991 at a site near Crawford, but must be sent outside the state's boundaries for processing.

Alternatives

In Nebraska, there are five viable alternate energy sources available: biomass, geothermal, hydropower, solar and wind.

In 2013, 16.1 percent of the state's energy consumption — 147.11 trillion British thermal units out of 871.89 trillion British thermal units — was met using renewable resources according to the Energy Information Administration. Renewable energy use reached a new peak in 2011 at 159.58 trillion British thermal units.



Sources: "Nebraska Oil Activity Summary." Nebraska Oil and Gas Conservation Commission, Sidney, NE.
Nebraska Energy Office, Lincoln, NE.

Biomass

Biomass includes biodiesel, ethanol, landfill gas, methane and wood and wood waste. Biofuels and biomass accounted for 111.76 trillion British thermal units in 2012 out of 137.20 trillion British thermal units for all renewable energy types, or 85.1 percent.

State Energy Resources Assessment

"The growing biomass energy resource in the Nebraska continues to be ethanol that is produced from corn and grain sorghum."

Biodiesel

Commercial scale biodiesel production began in Nebraska in 2006 and production was estimated to be around 2.4 million gallons in 2008. However, the price of soybeans used for feedstock seriously damaged this budding industry in the state in 2008 and both commercial scale plants in Arlington and Scribner are closed. The biodiesel plant in Beatrice is currently being retrofitted and is expected to begin commercial operation in summer of 2016. It is expected to produce 50 million gallons per year.

Ethanol

The growing biomass energy resource in the Nebraska continues to be ethanol that is produced from corn and grain sorghum. Ethanol production began in Nebraska in 1985 when 8.5 million gallons were produced at the state's first ethanol facility in Hastings. According to the Renewable Fuels Association as of February 2014, Nebraska has the second largest ethanol nameplate capacity (1.9 billion gallons) and the second largest ethanol operating production (1.817 billion gallons) in the nation. Approximately 13percent of the nation's ethanol capacity is in Nebraska's 24 active plants.

Ninety-one percent of Nebraska's ethanol production goes to U.S. domestic markets, five percent is exported to other countries and four percent is used by Nebraskans.

The state's Ethanol Board estimates that 40 percent of Nebraska's corn crop and the equivalent of three-quarters of the state's grain sorghum crop are used in the production of ethanol.

Ethanol consumption in the state comes mainly in the form of E10 blended gasoline — 10 percent ethanol and 90 percent gasoline. Smaller quantities of E85 — 85 percent ethanol and 15 percent gasoline — are also sold. Ethanol-blended fuel consumption in 2014 was 764.97 million gallons, an increase of 21 percent from 2013. Ethanol's share of the fuel market in 2014 increased from 2013 to 87.0 percent in which all fuel sold was an ethanol blend, setting a new record high.

Landfill Gas and Methane

A small, but slowly increasing amount of electricity is being generated from methane at landfills: OPPD's Elk City Station; and wastewater sewage facilities: Lincoln's Teresa Street Treatment Plant and Omaha's Missouri River and Papillion Creek Treatment Plants. The city of Lincoln and Lincoln Electric System partnered at the city of Lincoln's Bluff Road Landfill. The plant began commercial operation in January 2014. Other sources include a commercial processor in Butler County and one livestock anaerobic digester in Colfax County. Energy production from biogas resources has been tracked since 1995 when 1.06 million kilowatt hours was produced. In 2014, reporting Nebraska production facilities produced over 91.49 million kilowatt hours of electricity, an increase of 25.33 percent from 2013.

Geothermal

There are two types of geothermal resources that can be utilized for energy: 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 of the state. The Geo-Heat Center at the Oregon Institute of Technology has identified nine collocated communities in the state. A collocated community is one being within eight kilometers of a geothermal resource with a temperature of at least 50 degrees Celsius. In Nebraska, the nine towns meeting that standard are located in just four counties: Cheyenne — Brownson, Huntsman, Lodgepole, Ordville, Potter and Sidney; Keya Paha – Burton; Kimball — Kimball; and Scottsbluff — Gering. Resources in these areas might be suitable for development, but that prognosis appears unlikely in the near term.

Earth energy can be used directly to provide heat in a variety of applications, such as geothermal heat pumps and appears to offer Nebraskans the most

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economical and practical 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 in cold weather appears strong and is a technology that is being promoted by the state's larger electric utilities.

In 2012, 0.14 percent of the state's total renewable energy consumption — 1.21 trillion British thermal units — came from geothermal resources and a historic high. That was a slight increase over the 1.20 trillion British thermal units in 2011.

"Where solar does make sense economically are in meeting the needs of cattle ranchers in remote regions where photovoltaic systems are less expensive than installing new transmission lines."

Hydropower

The electricity consumed in Nebraska from hydropower resources came from two sources: the 11 dams in or on the border of the state and from purchases of Western Area Power Administration electricity. Usually the amount of electricity produced is relatively constant from year to year, unless affected by drought conditions or a facility is off line. As the state's energy need continues to grow, less and less of the need will be met by the relative constant amount of hydropower produced.

In 2012, 11.96 trillion British thermal units of hydropower were consumed in Nebraska which accounted for 1.38 percent of all renewable energy consumed that year.

Studies of the state's hydropower resources were conducted in 1981 and again in 1997. For the most part the studies concluded that nearly all of the potential hydro resources had been developed, and that even under the most optimistic scenarios, less than 150 MW of additional power could be produced from existing or new hydro resources. It is appears unlikely that any additional conventional hydropower resources will be developed within the foreseeable future. However, there are indications that micro-hydroelectric dams would be feasible in a number of settings across the state.

Solar

According to an assessment by the Energy Information Administration, Nebraska has "good" solar resources, especially in the western part of the state. Nebraska is ranked 13th among the states with great energy potential from solar power, according to the National Renewable Energy Laboratory.

There are two types of solar collectors: concentrating collectors and flat panels. Solar collectors are simply flat panels that can be mounted on a roof or on the ground. Called flat plate collectors, these are typically fixed in a tilted position correlated to the latitude of the location. This allows the collector to best capture the sun. These collectors can use both the direct rays from the sun and reflected light that comes through a cloud or off the ground. Because they use all available sunlight, flat plate collectors are the best choice for many northern states such as Nebraska. For flat plate collectors, Nebraska has good, useful resources throughout the state. For concentrating collectors, Nebraska has useful solar resources, especially in the western region of the state.

Presently, solar technologies are marginally deployed in great part because it is difficult for solar technologies to be cost competitive with the state's low electric rates. Where solar does make sense economically are in meeting the needs of cattle ranchers in remote regions where photovoltaic systems are less expensive than installing new transmission lines.

Nebraska has operational solar panel facilities with a total capacity 52.4 kilowatts at three sites: NPPD Norfolk Operations Center, OPPD Elkhorn Service Center and LES Hyde Observatory.

In 2012, solar energy accounted for 0.05 trillion British thermal units of all renewable energy consumed in the state, the same as in 2011.

Estimated Energy Consumption Reduction

Wind

The U.S. Department of Energy's Wind Powering America program indicates that Nebraska has wind resources consistent with utility-scale production of electricity. Maps of the state's wind resources at different heights are located at http://www.neo.ne.gov/renew/wind.htm as well as a wealth of other wind resources. Other wind energy assessments have suggested the state could produce as much as 7,800 MW of new electricity from wind resources annually. According to data from the National Renewable Energy Laboratory, the state's wind potential is ranked 4th best in the nation by megawatts and 3rd best in the nation by gigawatthours. It is estimated that wind power in Nebraska could meet the state's annual electrical needs over 118 times.

In 2014, nearly 2.8 billion kilowatt hours were generated by utility-scale wind energy in Nebraska. Nebraska has 473 operational turbines with a total capacity of 809.78 megawatts. The average annual output from the turbines is sufficient to provide power to about 250,700 homes for a year. A complete list of sites and generation is available at http://www.neo.ne.gov/statshtml/89.htm .

In 2013, wind energy produced 17.19 trillion British thermal units, 1.97 percent of all energy consumed in Nebraska.

At the end of 2014, the state ranked 18th among all states with 812 megawatts installed wind energy capacity.

Status of Ongoing Studies

No onging studies were performed during the reporting period.

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STATE OF NEBRASKA

The Energy Office logo is inspired by a floor mosaic located just inside the north entrance of the state capitol. The mosaic by Hildreth Meiere is titled, "Genius of Creative Energy" and represents many natural forms of energy.

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