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Renewable Fuel Infrastructure Program accepting applications

Retail gas stations across the state can now apply for grants for the installation of ethanol blender pumps.

The Nebraska Department of Environment and Energy (NDEE) announced July 24 that it is accepting applications for the Renewable Fuels Infrastructure Program (RFIP). This program was created by the state legislature in 2019 to make grants available to retail gas stations on a 50/50 cost share match. Applications are can be found on NDEE's website.

Funds can go toward advanced biofuel blender pumps, fuel storage tanks, necessary infrastructure, marketing and education. The pumps will provide various blends of ethanol between E-10 and E-85 to motorists.

NDEE Director Jim Macy highlighted the benefits this program provides to Nebraskans.

"We encourage Nebraska retailers to take advantage of this program to not only increase access to ethanol blended fuels for motorists in Nebraska, but also create a positive impact on Nebraska's environment," Macy said.

Nebraska's ethanol plants produce around 2 billion gallons of ethanol a year, of which over 95% is shipped to other states or countries. In 2019, Nebraska motorists used an estimated 90 million gallons of ethanol, or approximately 10% of the 922 million gallons of fuel consumed by Nebraskans.

"Typically, sales of mid-level ethanol blend fuels increased 45-55% at Nebraska stations that have installed multi-product ethanol dispenser," Macy said.

The RFIP aims to make ethanol blends available to more Nebraskans, which in turn can enhance air quality, according to Ed Holbrook, a federal aid administrator with NDEE.

Photo by Emily Case, NDEE

The Renewable Fuels Infrastructure Program provides grants so fuel retailers can install ethanol blender pumps and related equipment at gas stations across Nebraska.

"The intent of the RFIP is to increase the availability of clean-burning high blends of ethanol in underserved areas and positively impact Nebraska's air quality," Holbrook said.

The use of ethanol fuels results in fewer greenhouse gases and is biodegradable. According to a 2019 USDA study, using corn-based ethanol reduces greenhouse gas emissions by as much as 40% compared to gasoline.

Holbrook also said the U.S. Department of Agriculture (USDA) has a similar ethanol program; the Higher Blend Fuel Infrastructure Incentive Program, which accepted applications through Aug. 13.

"We are working with the USDA to coordinate efforts in a manner that will make both state and federal dollars be as effective as they can be," Holbrook said.

The Nebraska Environmental Trust awarded funds to NDEE to fund the grant initiative. NDEE will receive a total of $3 million over a three-year Trust grant award; $1.46 million of the award was granted this year.

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Photo by Maywood Public Schools

NDEE has two rebate programs that help schools, businesses, and municipalities reduce diesel emissions—the Nebraska clean Diesel Rebate Program and the School Bus Rebate Program through the Volkswagen Diesel Emissions Mitigation Trust. Maywood Public received a rebate in 2019 and was able to replace an older diesel engine with a bus that runs on propane.

NDEE rebates encourage diesel replacements

by Amanda Woita
NDEE Public Information Officer

Old buses and trucks tend to have higher diesel emissions, but the Nebraska Department of Environment and Energy (NDEE) has two programs aimed at helping reduce these emissions by reimbursing a portion of the costs of newer, cleaner-burning vehicles.

These programs are the Nebraska Clean Diesel Rebate Program and the School Bus Rebate Program.

Randy Smith, an environmental assistance program specialist at NDEE, administers both programs. He said the Nebraska Clean Diesel Rebate Program started with the Diesel Emissions Reduction Act, passed by Congress in 2005. It provides funds to the U.S. Environmental Protection Agency (EPA), which then provides grants and rebates to replace old diesel engines in an effort to reduce diesel emissions. The EPA distributes 30% of those funds to states to run similar programs. Nebraska's Clean Diesel program provides rebates to schools, municipalities, and businesses to replace old diesel engine vehicles with newer diesel vehicles, or ones that use cleaner alternative fuels like compressed natural gas (CNG), propane, or electricity.

Nebraska's School Bus Rebate Program is made possible through the Volkswagen Diesel Emission Mitigation Trust. This program provides rebates specifically for the replacement of older school buses. Smith said NDEE can also use the program to supplement the Clean Diesel funds from the EPA, which allows the state to receive 50% more funding. On Aug. 28, NDEE announced this year's rebate recipients.

Since 2017, NDEE has provided rebates for 20 trucks through the Clean Diesel program and 152 school buses through the VW trust.

Smith said particulate matter and nitrogen oxides (NOx) are the main pollutants when it comes to diesel emissions. Particulate matter is mitigated mostly through the use of filters, so the focus has turned to reducing NOx, which is a harmful pollutant on its own and also a precursor to ozone. According to Smith, older diesel engines emit more pollutants in part because of their age, but also because as EPA's standards have gotten stricter, manufacturers have added controls to newer vehicles to meet those emissions standards.

While the EPA has its own NOx emissions standards (.2 grams/Brake Horsepower Hour), California has instituted optional stricter standards (.02g/bhp-hr). Smith said, while diesel

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School Buses Purchased Using NDEE Rebate Programs (VW and DERA)		
Year	**Propane Buses**	**Total Buses**
2017	1	5
2018	4	40
2019	10	61
2020	6	46
Total	**21**	**152**

Trucks Purchased Using NDEE DERA Rebates		
Year	**CNG Trucks**	**Total Trucks**
2017	2	8
2018	2	7
2019	1	5
Total	**5**	**20**

engines have improved, they cannot meet this California standard, but CNG and propane engines can.

Starting in 2017, the EPA allowed a higher reimbursement percentage for vehicles that met California's strictest NOx standards, according to Smith. This also helps offset the cost of CNG and propane vehicles, which tend to be a little more expensive than diesel engines. Smith added that the state's School Bus Rebate Program follows a similar model.

"Our interest is reduced emissions from these vehicles by providing a higher reimbursement percentage for more expensive vehicles," Smith said.

Kearney Public Schools has applied for funds through the School Bus Rebate program for the last three years, and received funding each time. KPS Transportation Director Becky Reier said she was glad to hear about the program.

She said her district adds diesel exhaust fluid to its school buses. DEF helps break down NOx as an emissions control. However, Reier said this fluid led to more maintenance, and more expense.

Volkswagen Transit Bus Program			
City	**Transit Buses Replaced**	**CNG Buses Added**	**Battery-Electric Buses Added**
Omaha	2	2	0
Lincoln	2	0	2
Total	**4**	**2**	**2**

"I've always wanted to move away from diesel where we can," Reier said. "I was excited to bring propane into the district."

Reier said school districts across the state have been tightening their belts, so having funds available to replace buses and improve emissions is a win-win.

"The program has been wonderful for our district." Reier said.

Air quality is tied to health, Smith said, which is another reason why NDEE wants to encourage the purchase of newer, cleaner vehicles, especially on school buses. Through the School Bus Rebate program, Smith said NOx emissions have been reduced by over 34 tons over the last three years.

"Children are more sensitive to these lung irritants," Smith said. He added that replacing school buses can be one way to reduce their exposure to pollutants.

Reier said the first bus KPS replaced was a large special needs bus. The new propane bus runs quieter compared to a diesel engine, and it pollutes less—which is nice because the bus runs mostly in town.

With the clean diesel program, Smith said NDEE mainly targets refuse trucks. He said emission controls on diesel engines work best at consistent highway speeds. But refuse trucks move slowly, tend to stop and go, and spend a lot of time with the engine idling.

"It's a truck in the worst mode of operation and in an area with a lot of people," Smith said.

Older diesel vehicles will have to be replaced eventually, Smith said, adding that the program's rationale is to encourage the early replacement of these engines with something newer and cleaner that can also protect Nebraska's air quality.

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Tabor retires from NDEE Aug. 28

by Amanda Woita
NDEE Public Information Officer

Tom Tabor, the NDEE's Weatherization Assistance Program and State Energy Program Division Chief, has retired.

Tabor began working for the then-Nebraska Energy Office on May 1, 2013. His last day was Aug. 28. When he first started, Tabor managed the Weatherization Assistance Program and the State Energy Program, which includes the Benchmarking and Renewable Fuels Infrastructure programs. There was also a time when Tabor managed the Dollar and Energy Savings Loan program on an interim basis.

He said he began working for NEO seven years ago because had a passion for environmental and conservation efforts and for helping those in need. The Weatherization Program provides funds so families with low incomes can make their homes more energy efficient, which leads to reduced energy bills.

"The Low-income Weatherization Assistance Program provided a great place to fulfill my personal ambitions in conservation and helping others," Tabor said. "My best reward was always those few times I would get a call from a client… and they tell me that they have a little extra money to spend on other necessities and their home is much more comfortable."

Lynn Chamberlin, a building program specialist; Rodd Opp, an Energy conservation program specialist; Katie Svoboda, a fiscal compliance analyst; and Craig Schieffer, an energy conservation program specialist, all worked closely with Tabor during his time at NEO/NDEE. They said Tabor often went out of his way to address clients' concerns and ensure they understood the program. His compassion was even more evident during the 2019 floods.

Tom's teammates said he was personally involved in on-site Multi-Agency Resource Center event, assisting impacted individuals, and in on-site HVAC inspections in flooded homes to help initiate the repair and replacement of damaged furnaces and water heaters.

During his time with the agency, there were challenges.

Photo by Amanda Woita, NDEE

Tom Tabor led NDEE's Weatherization Assistance Program for more than seven years. He officially retired on Aug. 28, and said working with the weatherization program helped him combine his love of helping other with his passion for environmental conservation.

But Tabor said he likes solving problems.

For example, he said with the passing of the American Recovery and Reinvestment Act, Nebraska's allocated funds for the Weatherization program went from $41 million to just over $380,000. Working with the Weatherization subgrantees, NEO and the state were able to increase annual funding closer to its original amount; $2.5 million came from the U.S. Department of Energy, and $2.8 million came from the Nebraska Department of Health and Human Services' Low-Income Home Energy Assistance Program.

The state-wide floods of 2019 and the current COVID-19 pandemic have also created challenges for the Weatherization Program.

"Working together, I have all the confidence in the word that the subgrantees will rise above these setbacks and will be back to assisting low-income families across the state," Tabor said.

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Tabor's team said he worked diligently with them to understand the programs he managed.

"He worked with the staff and project teams to make sure that everyone understood the tasks and worked together to address concerns and provide the best possible service available to the program clients," they said.

During his time with the agency, Tabor said he is most proud of seeing his team be successful in their jobs. He said they are knowledgeable and have important expertise, which they share through speaking at professional conferences. He said he has heard from the U.S. Department of Energy that Nebraska has one of the best Weatherization Programs in the country.

"I… attribute [that] to our dedicated staff and our network of subgrantees that have worked with our office to improve the program the best we could under the federal regulations," Tabor said.

Tabor will keep busy in his retirement. He describes himself as an avid cyclist and kayaker, and he enjoys camping and hiking in National Forests throughout the U.S. He plans to golf and walk Conservation Reserve Program fields (and maybe get a pheasant or two). In addition to traveling, Tabor said he will also spend time with his 16 grandchildren and one great-grandson and hone his musical skills.

"I used to play a mean ukulele and would like to get back into playing more," Tabor said.

As he leaves the agency, Tabor said he will miss the people and his team the most.

"They have been great to work with and they made my job a lot easier," Tabor said.

Photos by Amanda Woita, NDEE

Tom Tabor's colleagues gathered for a socially-distanced retirement celebration outside the State Capitol Building on Aug. 27. The group also had individually-packaged snacks to mark the occasion.

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NDEE helps clarify energy code updates

by Emily Case
NDEE Public Information Officer

In case 2020 didn't already have enough curveballs, engineers and architects in the state are also in the process of adapting to the 2018 International Energy Conservation Code (IECC), which became the Nebraska Energy Code on July 1.

To help Nebraskans navigate these new rules, the Nebraska Department of Environment and Energy (NDEE) produced a five-part webinar series from April 22-June 3. The free training was part of NDEE's commitment to provide ongoing energy building codes education for state compliance, construction and design industries.

Energy codes are one of a number of building codes. The IECC updates codes every three years, and state or local governments can choose to adopt them. Nebraska used the 2009 IECC before adopting the current energy code.

NDEE Building Program Specialist Lynn Chamberlin, who led four of the five presentations, said they chose topics based on what would be most relevant to stakeholders. Topics and their dates given are listed in the table below.

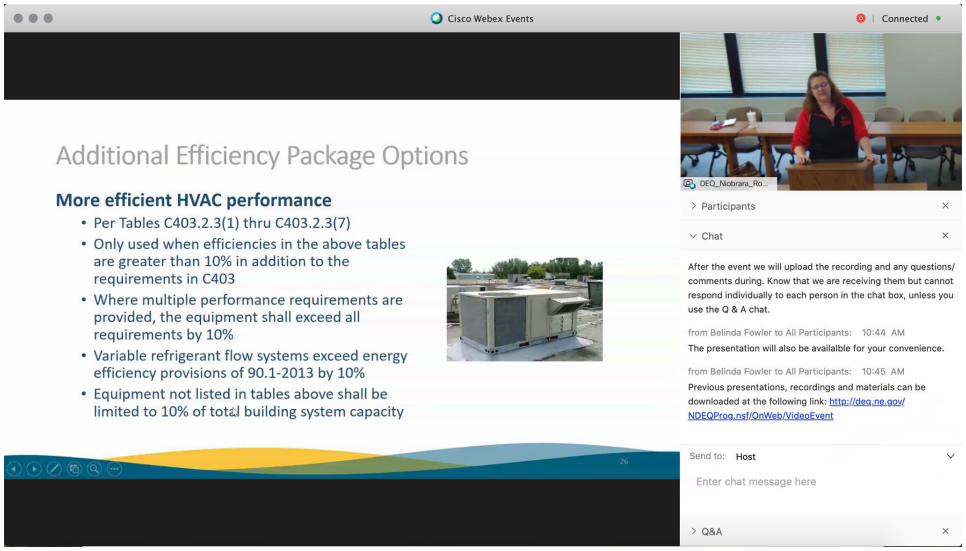

Image by Emily Case

NDEE Building Program Specialist Lynn Chamberlin (upper right-hand corner) presents a webinar about the 2018 International Energy Conservation Code. Chamberlin and NDEE Energy Technical Advisor Bruce Hauschild led the five-part energy code series.

Chamberlin said they hadn't originally planned for NDEE employees to give the presentations — instead, they had tried to get experts from out-of-state to visit and share their knowledge. However, since NDEE teammates started planning in March when the COVID-19 pandemic hit, they had to adapt on the fly, which involved creating webinar-friendly presentations and issuing electronic certificates for attendees. NDEE employees started teleworking at the end of March.

In response to these changes, NDEE Energy Technical Advisor Bruce Hauschild stepped in to provide support for the series and present the commercial mechanical provisions webinar, while NDEE Small Business Environmental Assistance Coordinator Belinda Fowler served as moderator for some sessions.

Working remotely while being required to social distance presented a new set of learning challenges, Fowler said. Moderators both on and off-site successfully worked out the details for jointly moderating the same events at the same time. NDEE held discussions and training remotely to make all of the presentations organized and consistent for stakeholders joining

Topic	**Date**	**Attendance** (562 total)
Residential Provisions	April 22	101
Commercial Building Envelope Provisions	May 6	169
Commercial Lighting Provisions	May 20	106
Energy Codes 101	May 27	73
Commercial Mechanical Provisions	June 3	113

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in for the training. This was a team effort with help and support from the NDEE's IT section, Adam Ward and Gary Morrison, she said.

"After working out the challenges, we wanted to be responsive to stakeholders' needs and requests," Fowler said. "During the first events, stakeholders requested a basic training course, and with Lynn's help we were able to be responsive within a very short time and added Energy Codes 101."

Even so, she said they were surprised by the amount of interest and said they even added the "Energy Codes 101" session after the success of the first few.

"We didn't expect them to be as successful as they were," Fowler said. "Originally we had four set up and then we saw how successful they were being, and we added a fifth." The presentations were well-received with thoughtful questions from attendees, Chamberlin said, with an attendance rate of 80% of those who had originally registered.

"Part of architects' and engineers' job is to follow state law," she said. "They appreciate just knowing how stuff works. They got a lot of good technical questions. … It just helps them to know where they need to go."

The webinars have been archived on the NDEE website, which is helpful as industry professionals "are really putting pen to paper on it," Chamberlin said. The team also put together Q&A documents based on attendees' questions, which can be found at the bottom of the same webpage.

About the program

The NDEE Energy and Assistance Division provides information and assistance to the public and the regulated community. Program support and services include Small Business and Public Assistance, Outreach Planning, Training webinars, Prescribed Fires and Energy Programs, Compliance and/or Permit Assistance Visits. To learn more, visit https://neo.ne.gov/.

About the presenters

Lynn K. Chamberlin, CEM, CLEP
NDEE Building Program Specialist

Land - Energy Weatherization Section

Lynn has been with the NDEE for over 30 years working in building energy efficiency programs and codes for both rehab and new construction work. She holds numerous certifications from national construction industry entities involved in energy efficiency.

Bruce Hauschild, P.E., CEM
NDEE Energy Technical Advisor

Land - Energy Savings Loan and Planning Section

Bruce has been with the State of Nebraska since 2000. He is a Licensed Professional Engineer and holds certificates as a Certified Energy Manager, International Energy Conservation Code Plans Examiner and Inspector, and a Home Energy Rater. He served as the primary contact for the Western Regional Biomass Energy Program, providing review of final reports. His current duties include commercial and residential plan reviews, review of energy audits, energy improvement and renewable energy applications in conjunction with Nebraska's Dollar and Energy Saving Loan program, and technical support for the Energy and Assistance Division.

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Making small changes can add up to big savings with a home energy audit

by Emily Case
NDEE Public Information Officer,
Bruce Hauschild
NDEE Energy Technical Advisor, and
Lynn Chamberlin
NDEE Building Program Specialist

An expensive electric or gas bill might signal that your house isn't using energy efficiently. An inefficient home can use more energy and resources than needed.

If you suspect your house has energy efficiency issues, a home energy audit would be a good place to start, said Bruce Hauschild, Nebraska Department of Environment and Energy (NDEE) Professional Mechanical Engineer. A residential energy auditor should be trained and certified by either the Home Energy Rating System (HERS) or the Building Performance Institute (BPI).

The inspection itself involves various aspects of the house: checking insulation in the walls, floors, and attic by using an infrared camera, assessing the sealing of duct work, determining whether windows have low-e or a gas fill, measuring insulation levels, checking air conditioning size and efficiency, and completing a blower door test.

A blower door test measures how "leaky" the house is, or how much air it lets in or out, Hauschild said. This involves mounting a fan with a pressure gauge, or blower door, into the frame of an exterior door to detect air leaks and find the air infiltration rate of a building.

This test is needed, he said, because houses receive positive pressure from the direction the wind blows from and negative pressure on the lee side, or downstream side of the home. Energy losses from infiltration on a leaky home can be as costly as a lack of insulation.

Photo by Arno Smit on Unsplash

A home energy audit includes checking insulation, assessing the sealing of duct work, completing a blower door test and more.

"If you have a house that leaks a lot, that might use as much energy as one that's not insulated so much; it'll feel cold too," he said. "When temperatures get down those nights below zero and you walk around your house, infiltration spots can feel very cold." An energy auditor can find leak spots in your home using a blower door and infrared camera.

Hauschild also provided some quick ways anyone can improve their home.

1. Make sure you have adequate insulation. Hauschild said to look for attic insulation that is at least 10 in. deep. "Always check for insulation first, that's the fastest way to save energy dollars," he said. "Because insulation is one of the cheapest fixes you can do — and it helps a lot." Shoot for an R-50 to R-60 if adding insulation to your attic and check walls to make certain all cavities are filled. However, be careful because ceiling drywall has weight limits that should never be exceeded. Cellulose and fiberglass are the most common types of attic insulation, and both are good insulation products.

2. Change your furnace filter regularly. Check the type of filter you use to see how often it should be replaced.

3. Invest in energy-efficient lighting. An average household dedicates about 5% of its energy budget to lighting, according to the U.S. Department of Energy. Hauschild recommends using lighting that's around 4,000 degrees Kelvin, which is a fairly neutral light. Lower temperatures of 3,500 Kelvin and below are a more yellow or even red light, and higher temperatures of 5,000 Kelvin and above

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provide a bluer light.

4. When purchasing appliances, look for ENERGY STAR® and their "Most Efficient" rating. ENERGY STAR rated products can be found on the ENERGY STAR website, www.energystar.gov, and look for their page with the "Most Efficient" equipment ratings. ("Most Efficient" is a higher ENERGY STAR rating)

5. Make sure your heating and cooling equipment are working properly. Regular HVAC maintenance provides added benefits of preventing costly breakdowns and extending the life of the systems, according to the Indoor Air Quality Association.

6. Installing a solar system, either photovoltaic modules or a hot water system can be a cost effective improvement. Check local utilities for rebates, and use IRS form 5695 for federal rebates.

7. Use a Certified Energy Auditor, HERS or BPI, to conduct a blower door test to stop infiltration and to find other areas of your home that could use improvements.

Many of these projects can be completed by homeowners, Hauschild said. Utility companies also may have free home audit programs and rebates as well. Check with your local utility.

If you need to undergo a more significant home improvement project, the Dollar and Energy Saving Loan program may help. To qualify, applicants must live in Nebraska, be working on a building in Nebraska and work through a Nebraska lender (incorporated or chartered in Nebraska). For more information, visit https://neo.ne.gov/programs/loans/loans.html#item-02. Minimum requirements can be found on loan application forms.

Photo by Bruce Hauschild

This photo shows insulation levels that were measured in a home inspection. Attic insulation should be at least 10 in deep.

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NDEE updates wind and solar maps

Sources of energy for Nebraska are changing. According to the Nebraska Department of Environment and Energy's 2019 annual energy report, renewable energy in the state is increasing. In 2017, energy production from renewables peaked.

NDEE is keeping up with this changing energy landscape by updating its wind and solar community generation maps. These maps show communities with wind facilities and solar energy generation across the state. As renewable energy changes, these maps will be updated.

See the wind map on the next page. The solar map will be included in a future NEQ, but both the wind and solar maps are available online, and more energy information can be found on our statistics webpage.

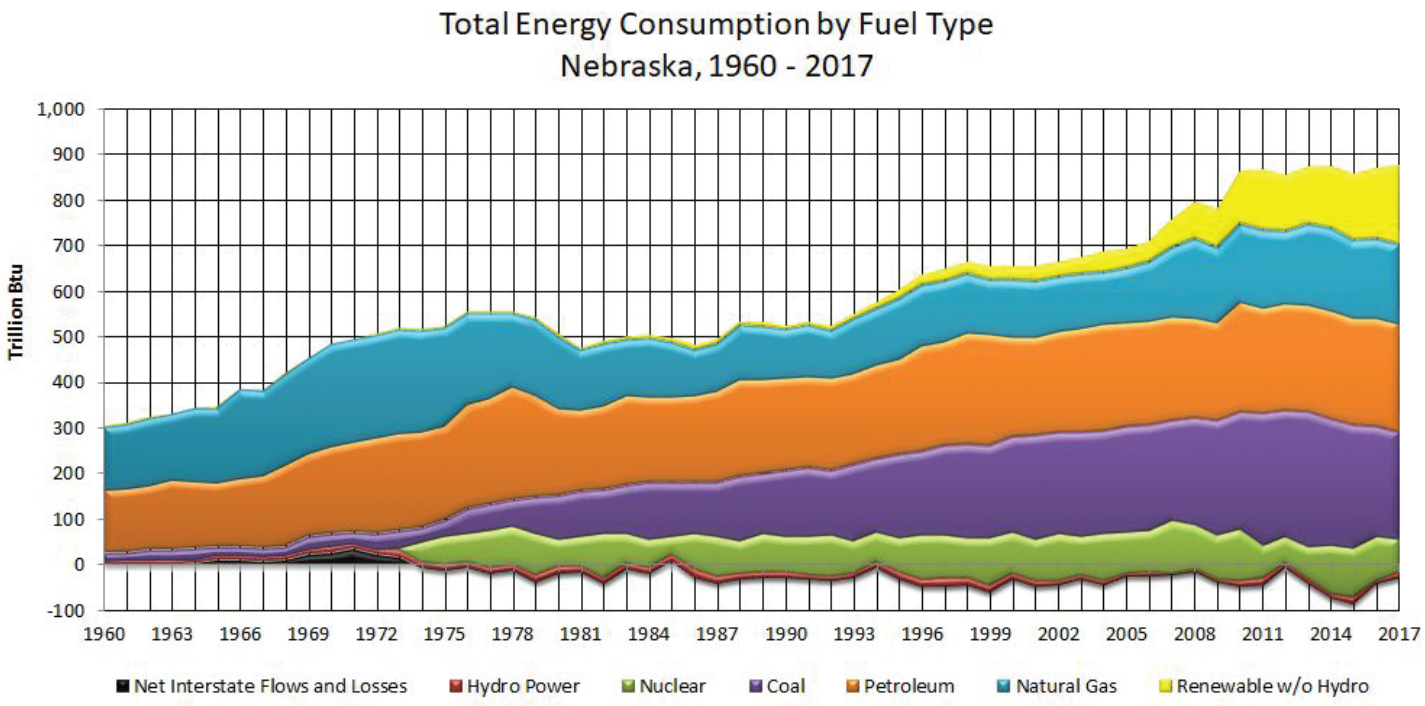

Image by NDEE

This graph shows which fuel types Nebraskans most use for energy. The yellow portion indicates an increase in renewable energy.

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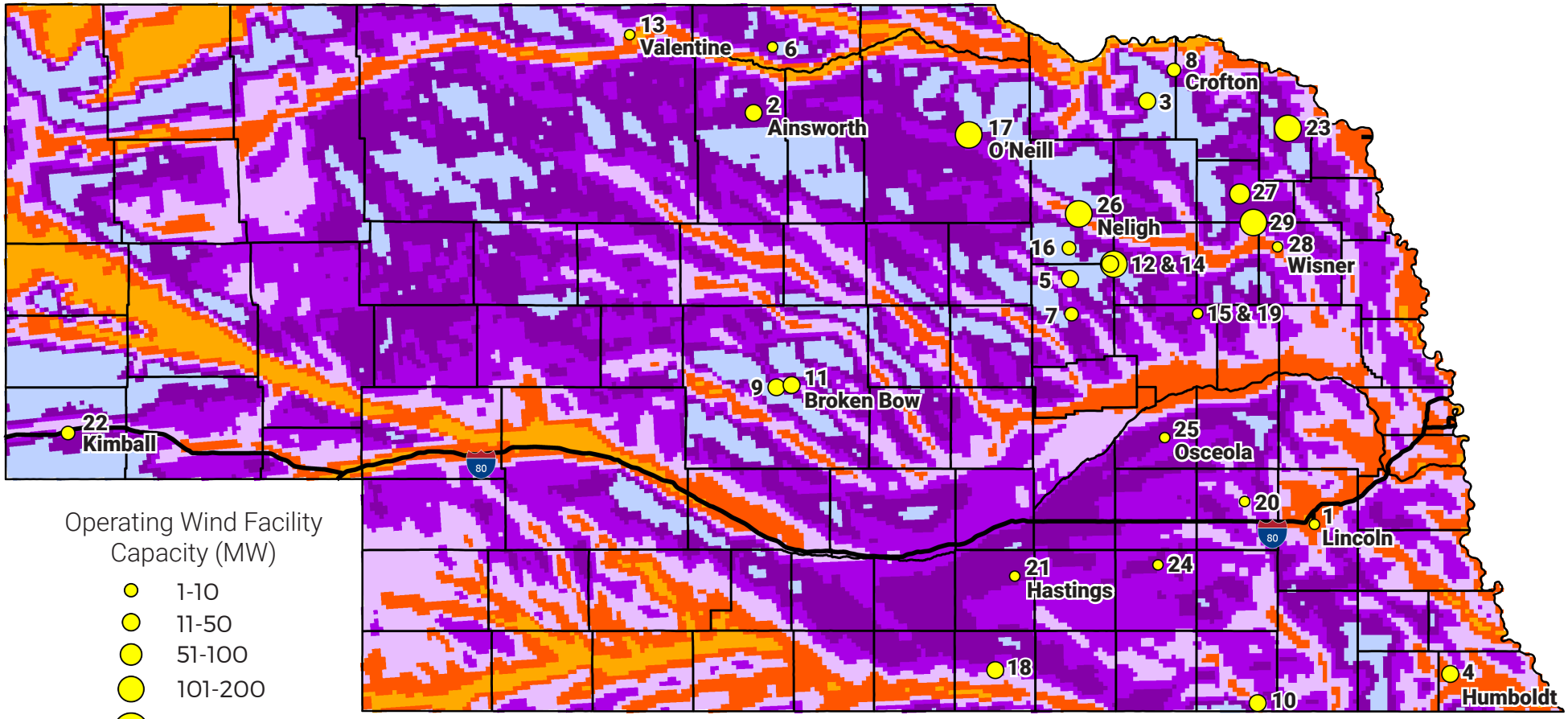
Wind Development in Nebraska

Operating Facilities



Operating Wind Facility Capacity (MW)

- 1-10
- 11-50
- 51-100
- 101-200
- 201-400

Total operational MW: 2,366.26

Wind Speed (m/s)

7.81-8.81 | 7.55-7.80 | 7.28-7.54 | 6.96-7.27 | 6.53-6.95 | 5.80-6.52

Numbers on the map correspond with the table on the next page.
Wind facilities as of August 2020.
Map shows 80-meter wind overlay.

For questions or comments on this map, contact neo.energy@nebraska.gov.
For more information, visit: https://neo.ne.gov/programs/stats/inf/89.htm

Sources: Base map provided by National Renewable Energy Laboratory for U.S. Department of Energy (2017).
Facility locations provided by the Nebraska Department of Environment and Energy (2020).

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Wind Development in Nebraska

	Operating Wind Facilities	Year of Commercial Operation	MW	Turbines	Locations
1	Salt Valley	1998 and 1999	1.32	2	Northeast of Lincoln, Lancaster County
2	Ainsworth Wind Energy	2005	59.4	36	Ainsworth, Brown County
3	Elkhorn Ridge Wind, LLC	2009	81	27	Bloomfield, Knox County
4	Flat Water Wind Farm, LLC	2010	60	40	Near Humboldt and Beatrice, Richardson County
5	Laredo Ridge Wind Farm	2010	80	54	Petersburg, Boone County
6	Springview II	2011	3	2	Springview, Keya Paha County
7	Petersburg, LLC	2011	40.5	27	Boone County
8	Crofton Bluffs Wind Farm	2012	40.6	22	Peoria, Knox County (southwest of Crofton)
9	Broken Bow Wind, LLC	2012	77.6	50	Broken Bow, Custer County
10	Steele Flats Wind	2013	75	44	Steele City and Odell, Jefferson and Gage counties
11	Broken Bow Wind II	2014	75	43	Broken Bow, Custer County
12	Prairie Breeze I	2014	200.6	118	Petersburg, Antelope County
13	Valentine Wind, LLC	2014	1.85	1	Valentine, Cherry County
14	Prairie Breeze II	2015	73.39	41	Adjacent to Prairie Breeze I
15	Creston Ridge, LLC	2015	6.8	4	Creston, Platte County
16	Prairie Breeze III	2016	35.8	20	Elgin, Antelope County (adjacent to I and II)
17	Grande Prairie Wind, LLC	2016	400	200	O'Neill, Holt County
18	Cottonwood Wind Project	2017	89.7	52	Webster County
19	Creston Ridge II Wind Farm	2017	6.9	3	Creston, Platte County
20	Seward Wind Facility	2017	1.7	1	Seward, Seward County
21	Hastings Wind Farm	2017	1.7	1	Hastings, Adams County
22	Kimball Wind Project	2018	30	12	Kimball County
23	Rattlesnake Creek Wind Project, LLC	2018	320	101	Dixon County
24	Perennial Wind Farm	2018	6.9	3	Fairmont, Fillmore County
25	Prairie Wind	2018	2.5	1	Osceola, Polk County
26	Upstream Wind Energy, LLC	2019	202.5	81	Neligh, Antelope County
27	Sholes Wind Energy Center	2019	160	71	Wayne County
28	Cuming County Wind Farm	2019	2.5	1	Wisner, Cuming County
29	Plum Creek Wind	2020	230	82	Wayne County
	Totals		**2,366.26**	**1,140**	

	Retired Wind Facilities	Years of Commercial Operations			
	Springview Wind Energy	1998-2007			
	Valley	2001-2016			
	Kimball Wind Project	2002-2017			

Note: Operating facilities with more than one year listed have multiple turbines that began commercial operation in different years.

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Save money in confined animal operations

From the U.S. Department of Agriculture
Natural Resource Conservation Service

Simple changes in confined animal operations can help farmers and ranchers achieve significant cost and energy savings.

Confined animal operations require a great deal of energy for lighting; heating of barns and brooders; fans for facility ventilation and cooling; pumps for moving water, waste, or milk; electric motors to run feeders; and electricity for cooling milk and eggs. Because confined animal operations must be intensively managed, it is relatively easy to make energy-saving changes to the operation.

All of agriculture, and particularly confined animal production, makes wide use of electric motors. With simple, regular maintenance, producers can save significant amounts of energy and money. Often, if a motor is working, it gets very little thought or attention from the farmer. Just because it is working, however, does not mean that it is working as efficiently as possible.

Certain trouble spots often cause a motor to waste energy, including rusty or corroded moving parts on motor-driven equipment, dry or worn bearings or belt drives that are too loose, too tight or not aligned. Worn pulleys and belts need to be checked and replaced often. Even if a fan belt is tight, it may still need replacing. The belt or the pulley itself might be worn, reducing the speed of the fan and the efficiency with which it runs. A worn belt can easily reduce output by 20% or more.

Considering the current cost of energy, producers might want to think about replacing aging motors. A bank of seven, well-maintained 48-inch fans in a broiler house will cost an average of $13.20 per day to operate at 8 cents per kilowatt hour. These same fans, if poorly maintained, may cost 20% more, or $15.84 per day to operate. Over a year, this difference for fan maintenance can amount to nearly $1,000/broiler house.

Photo from the Environmental Protection Agency

In swine operations, electric motors may be used to pump water for drinking and for the manure flushing system, move feed from the feed bulk tank to the feeder line, and run the powerful exhaust fans. Worn or inefficient motors, belts, or fans can add significantly to the cost of operations.

High-efficiency motors can reduce energy consumption by 3-8% and might be substituted for other motors. Because of their high cost, high-efficiency motors might only make sense for high horsepower motors operating at least 2,500 hours per year.

The swine and poultry industries rely very heavily on fans and ventilation systems to remove gases from the tightly built production buildings, and maintain proper temperatures for the animals.

To help mitigate energy use, the broiler industry has largely adopted a system called “tunnel ventilation” where large banks of fans at one end of the house draw large amounts of air at relatively high speed over the birds. This air provides air conditioning by a “wind-chill” effect. This usually is coupled with an evaporative cooling system, which further reduces broiler house temperatures.

Dirty fans and shutters can reduce air-moving capacity of the fan by well over 30%, reducing the cooling effect and using more energy. Regular cleaning will maintain

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the efficiency of the fan, and guarantee that energy dollars are being used efficiently.

A number of commercial air-to-air heat exchanger systems are available for confined animal operations that transfer warmth from exhaust air to incoming air, resulting in large savings in heating costs. These systems are particularly applicable to swine nursery operations, and work has shown that these systems could save up to 40% of the energy needed for broiler brooding. Research has been done in swine and poultry operations, using "earth tubes" to utilize geothermal resources to heat and cool incoming air.

Dairy operations may benefit from adjustable speed drives in vacuum milking systems as a means of saving energy. Vacuum pumps run the milking machines that attach to the cow's udder, then pump the milk from the milking parlor to the holding tank. Vacuum pumps often are oversized and run at constant high speed to meet the maximum need of the operation. If less than maximum is needed, the excess is wasted. With an adjustable, computer-driven speed drive on the vacuum pump motor, the capacity of the pump is matched to the actual need for vacuum. The pump will run more efficiently, reducing energy needs and cost.

Dairy operations need to cool milk rapidly from 102° F (the temperature at which it leaves the cow) to around 34° F in the holding tank. Using heat exchangers to transfer this heat to cold water removes the heat from the milk and raises the temperature of the water, allowing the warmed water to be used for other things.

The warmed water can be used to wash down cattle and milking parlors, or it can be heated further to a point where it can be used for high temperature cleaning of milking equipment. On a 500-cow dairy, transfer of heat from milk to water saves the equivalent of 215,000 British thermal units of energy that normally would be provided by purchased electricity. The economic advantages of installing heat exchangers in a milking operation can exceed $3,600 (at 8 cents/kilowatt [kW]) in energy savings annually.

All confined animal operations rely heavily on electric lighting, often to increase the production of milk, eggs and other commodities. Dairy cows given 16 hours of light continuously each day will increase milk production from 5 to 16%, increase feed intake by about 6%, and maintain reproductive performance, compared to cows receiving 13.5 hours or less of light . Lights also physiologically stimulate egg production in chickens and turkeys.

Changing electric lighting from incandescent lights to fluorescent or to high pressure sodium lamps can provide all the lighting that farm animals need, both at a reduced cost of operation and with a large increase in energy conservation. Switching from incandescent to U-tube fluorescent lights can save energy needed for lighting by 75%. In a 40,000-bird-broiler operation, for example, this equates to a savings of nearly 18,000 kilowatt-hours per year. At a typical electric rate of 8 cents/kW, this becomes a savings of over $1,400 per year per broiler house.

Operators of confined livestock operations can be good stewards of the environment while saving on production costs by adopting these and other available methods of energy conservation.

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Winds of fortune

A conversation with a wind energy college program instructor

by Emily Case
NDEE Public Information Officer

Northeast Community College, which has its main campus located in Norfolk, Nebraska, established its wind energy program in 2009. It remains a unique educational opportunity in the state, with the Hastings campus at Central Community College the only other place to offer a similar program, Energy Technology.

John Liewer
Northeast Community College Wind Energy Technology Instructor

The coursework aims to propel students into high-skill, high-wage and high-demand jobs — with many students landing positions before they even finish the program, said wind energy technology instructor John Liewer. According to the Bureau of Labor Statistics, the number of wind technicians in the country is expected to increase from 7,000 to 11,300 between 2019 and 2029.

Liewer recently sat down with the NDEE to talk about the program and how it's evolved in his time there. This conversation has been lightly edited for clarity.

NDEE: How long have you been an instructor here and what made you interested in wind energy?
JL: I started in 2012. I've taught some classes for some of the other programs, I was an electrician before teaching. I didn't really get into wind energy until 2012.

I'd been with the company I was with for 15 years, I wasn't really looking for a change but I was ready for a change. This opportunity came up, my wife pointed it out to me and I laughed at her. "Eh, they don't want me." She read the requirements and I thought well, I guess I meet the requirements. So I decided to go for it. It's been a good change, I've enjoyed it.

I've always liked wind turbines, I never really had a strong opinion for or against them, I didn't realize how much opinion there was against until getting into the program. I feel like it sounds cliche, but I'm more in it for the students.

NDEE: How have you seen the program grow since you started teaching?
JL: A lot, actually. We've made a lot of changes in the curriculum. We have an advisory board so we take a lot of their recommendations and ideas, implement them in the classes. But the amount of industry support we get has grown a lot in the last eight years.

My first year teaching, there weren't any local jobs so they had to go elsewhere to find jobs; in the last three years if not four, the students have had jobs before they leave the program and most of them are local. Right now even if we did have full classes we still wouldn't meet the demand. We have seven freshmen that should be coming back as sophomores and we've got 17 signed up for the fall.

NDEE: What kinds of jobs are available in the area?
JL: We've got a brand-new site just to the north of us, Plum Creek. There are a handful of brand-new jobs at Sholes Wind Energy Center, Rattlesnake Creek Wind Project, Thunderhead Wind Project.

There are five completely new sites within the last two to three years, so that's made a huge impact on the job demand for our students. Mostly wind farms are the big draw right now for site tech positions, but we also have a lot of students becoming traveling technicians.
NDEE: What coursework does the program entail?

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JL: Their freshman year is pretty basic. Getting students in, a lot of students that have never messed with tools or used tools. A lot have never used tools before. On the first day, I talk to them about responsibility — teamwork is very important in our industry, nobody ever works alone, mainly safety reasons. It's important to work with classmates. I preach to them the importance of finishing school and earning that degree. A lot of times a summer internship will lead to a job.

Photo from Northeast Community College

Northeast Community College's wind energy program began in 2009. The program teaches students the skills they need to be wind technicians, and many students complete the program with jobs already lined up.

NDEE: What do you see as Northeast's role in the field of wind energy?

JL: It goes to our mission statement: dedicated to success in the students in the region it serves. That's our mission, to support the region through the workforce, and so our program is helping local kids stay local.

And when I first started teaching, I was surprised at how many of my students wanted to stay local. I can remember everybody saying when I grow up, "I can't wait to get out of this town and never come back." When I had my first class of students and asked them where they want to go, many said, "I kind of want to stay here." The overwhelming majority of them felt that way.

NDEE: How do you think the field will change in the future?

JL: I think it's going to continue to grow. It may slow down eventually, but it's still going to continue to grow and everything we have out there is not going to go away. It's here to stay for sure. Technology is improving by leaps and bounds every year — more and more electronics and controls — so they're getting more sophisticated and they take a lot more skilled techs to take care of them.

Whenever I talk to people, I try to make sure that they know the good outweighs the bad. That nothing we have is perfect, there's downsides to anything. The good with renewable outweighs the bad, especially for small communities. They've been pushing that since I graduated high school. Keeping young people at home. This gives them an opportunity to do that.

NDEE: Do you have any final thoughts?

JL: Any student who's got an electrical or mechanical kind of inquisitive nature or aptitude about them, it's worth looking into. We do a lot of stuff a mechanic does, we do some stuff electricians do, it's a mix of all the trades. We get to do it 250 feet in the air.

I was always afraid of heights too. I did not like heights but as I grew older and forced myself into it, I felt safe if I had fall protection and the right environment. My first climb was a test for me and I felt safe and I was able to do it. It gets better.

To see a video of NECC's wind turbine getting a new blade, click here

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Five home energy hogs to avoid

Reprinted with permission from the Rural Electric Nebraskan
by Pat Keegan

Q: Our family has been trying to reduce our monthly expenses. The other day, my sister-in-law and I compared our electric bills. I was surprised to find out her energy costs were significantly lower than mine, even though our homes are similar in size and built around the same time. What could be causing my bill to be so much higher?

A: You are certainly not alone in these trying times as you search for ways to cut costs, and your energy use might provide some potential opportunities for savings. Even though you noted the similarities between your home and your sister-in-law's home, you may have a hidden energy hog causing your bills to be higher. Here are five energy hogs that may be increasing your energy use.

Photo by Blaz Erzetic on Unsplash

Heating or cooling uninsulated areas, like a garage or workshop, can add to your energy bills.

A refrigerator or freezer in the garage

That second fridge or freezer may be costing more than you think. If the model was produced prior to 1990, it's likely using twice as much energy (or more!) than a newer EnergyStar-rated model. If it's located in the garage, it may run constantly in the summer, which could lead to higher electric bills.

Cooling or heating an uninsulated area

Cooling or heating an uninsulated workshop or garage can be expensive. To give you an example, during a past energy audit I conducted, I found that the homeowner heated an uninsulated shed to keep several half-empty buckets of paint from freezing. So, he was paying more to keep his paint warm than the paint was even worth.

Pet owners have been known to heat and cool an uninsulated garage to keep pets comfortable, not realizing that this might be costing more than heating their actual home. If you really want to heat or cool these types of spaces, they need to be well insulated and heated/cooled efficiently, perhaps with a ductless mini-split system.

Hot tub

The average operating cost of a hot tub is $250 per year. But that amount may be higher if your hot tub is an older, less efficient model, or if you live in a colder climate.

A smaller hot tub with better insulation, a cover and a pump that runs on a lower voltage will use less energy than other models. In the end, getting a "good deal" on a used hot tub may cost more in energy bills in the long run.

Swimming pool

If you have a swimming pool, consider installing a smaller, more efficient pump and reducing how often it runs. You can also look at installing a larger filter and maximizing the flow of water through the pipes by making them larger and reducing how sharply the corners turn. These measures could cut your electric use for the pool

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pump by as much as 75%. Consult with a pool installation specialist to find the most efficient setup that will still keep your pool clean.

Pumps

If you live on an acreage or on a farm, you probably have several pumps, including irrigation, well, septic and sump. If you're like most of us, you use those pumps until they break down.

Consider replacing the oldest and most-used pumps over time with new, more efficient ones that are sized correctly for their task. Also, make sure you're eliminating leaks in the water lines, which make your pumps work harder and longer.

If one of these five energy hogs doesn't explain the difference in energy use between your home and your sister-in-law's, there are many other possibilities. I recommend conducting an energy audit, which should give you the answers you seek.

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