Nebraska Energy Quarterly

NEBRASKA
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DEPT. OF ENVIRONMENT AND ENERGY

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*Photo by Emily Case, NDEE*

**The Nebraska Department of Environment and Energy closed out 2020 by moving into a new building in the Fallbrook area of Lincoln. During both the move and the pandemic, NDEE staff continued to serve Nebraskans.**

# NDEE's year in review

***by Amanda Woita***
***Public Information Officer***

While 2020 has been a challenging year, the Nebraska Department of Environment and Energy has continued to provide its services to Nebraska residents and has made some big changes going into 2021.

The COVID-19 pandemic has changed how many people and businesses go about their daily routines. Despite this, NDEE staff were able to continue conducting business, even when temporarily working from home. This includes providing loans and funds through the Dollar and Energy Saving Loans (DESL) program and the Weatherization Assistance Program.

**DESL Program**

Each year, the DESL program helps hundreds of Nebraska residents, businesses, school districts and municipalities make their homes and buildings more energy efficient and helps them reduce energy bills. This is done through low-cost financing for energy efficient equipment and projects. These loans can be used to replace inefficient lighting, install highly rated energy efficient heating and cooling systems, or install a solar project for a home, place of business or entire community.

In fiscal year 2020, NDEE participated in a total of 389 loans in the DESL program, according to Division Chief Aaron Miller. The total cost of all energy efficiency improvements and renewable energy projects that were financed was

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over $9.95 million, with NDEE's investment being over $7.03 million.

Of the 389 total DESL projects, 351 involved residential energy efficiency measures for a total project cost of $4,992,667. Over FY2020, these projects are estimated to have saved 143,345 kilowatt hours of electricity and 65,780 therms of natural gas and have reduced carbon emission by over 9,034 tons.

Additionally, the DESL program loans helped finance 38 Photo Voltaic (PV) solar electric systems for a total cost of $2,385,729, with the total capacity of the systems combined being 1,143 kilowatts.

**Weatherization Assistance Program**

The Weatherization Assistance Program is federally funded and is designed to weatherize homes for those with limited incomes – this helps them save energy and money. NDEE is responsible for inspecting homes that are weatherized and monitoring sub-grantees, which consist of community action agencies and one non-profit agency. The sub-grantees are responsible for the home weatherization improvements.

In FY2020, the Weatherization program invested more than $1.6 million in federal funds. These improvements created more than $110,000 in savings for electricity and $530,000 in savings for natural gas. It is also estimated that weatherizing these homes reduced air emission pollutants by more than 8.5 million pounds of carbon dioxide.

The most common improvements in homes are:

- Adding insulation
- Replacing and repairing furnaces
- Reducing air leakage
- Installing high efficiency lighting
- Insulating water heater tanks and pipes
- Repairing cracked windows

**Moving Forward**

The start of 2021 comes with significant changes for NDEE. The agency has moved into a new building and has re-organized its internal structure.

NDEE has been at its main downtown location for nearly three decades, but over the last few years, its staff have been split among three locations, with the Energy and Assistance Division staff working separately from the rest of the agency.

With the agency's move to its Fallbrook location in early December, the NDEE team is finally all together. NDEE Director Jim Macy said this will improve communication and collaboration among sections and create more unity among teammates.

"We are excited to have our team working under the same roof," Macy said. "Being in the same location will help streamline our processes, which will improve our efforts to help our customers."

This move also marks the initiation of NDEE's new internal structure. Previously, its divisions were split among different media – air, energy, land and water, in addition to management services. Now, the divisions will be organized by the type of work they are performing. The new divisions are:

- Inspection and Compliance Division
- Planning and Aid Division
- Permitting and Engineering Division
- Drinking Water Division
- Monitoring and Remediation Division
- Management Services Division

What was formerly the Energy and Assistance Division will now be housed under the Planning and Aid Division, which is responsible for distributing funds for grants and loans.

This reorganization is another way to improve collaboration, Macy said, especially because many permitted facilities are required to follow regulations for multiple media. The new internal structure allows inspectors or permit writers across media to work more closely together with their counterparts when assisting the same facility.

"By joining efforts across media, we will be able to make compliance easy for our regulated community," Macy said.

Despite the difficulties caused by the pandemic, NDEE staff are proud of what they accomplished in 2020 and their continued efforts to improve energy efficiency in Nebraska homes. With the agency's new building and new organization, it is an opportunity for agency teammates to move forward together.

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# Electricity storage and Nebraska's future

***by Andrew Hug***
***Environmental Assistance Coordinator***

Storing coal is easy—pile it up. Storing gas and petroleum is relatively easy—pour them into tanks. Storing electricity in bulk—now that is a challenge worthy of engineers.

Those engineers have stepped up and produced tremendous breakthroughs in the past 10 years, so much so that large-scale electricity storage is now both a technological and economical option.

While there are many methods of storing electricity (see sidebar), the two common technologies utilities use are both batteries—flow batteries and electrochemical cells such as lithium ion batteries. The kilowatt and kilowatt hours a flow battery can provide can be scaled simply by increasing the size of the tanks and the surface area of the electrodes, while the same scalability in lithium ion batteries is a function of the number of cells on site.

The cost of battery storage dropped 70% from 2015 to 2018 according to the Energy Information Administration (EIA), and the National Renewable Energy Laboratory (NREL) predicts prices will continue to drop rapidly through 2025 and then decline more slowly through 2050. Storage deployments broke records yet again in the third quarter of 2020 with 476 MW deployed, a 240% increase over the previous record set just three months earlier. Industry analyst Dan Finn-Foley at Wood Mackenzie expects the new record to fall soon "given the scale of storage systems anticipated for 2021."

In 2018, few newly proposed wind or solar farms included any storage. There were more in 2019 and it started to become routine in 2020. Electricity company Southern California Edison contracted for 770 megawatts of grid battery projects in April 2020 and expects to activate them by August 2021. Even back in 2018, solar plus storage started being competitive in some markets. Arizona Public Service, an investor-owned utility, selected solar plus storage over a natural gas peaking plant under competitive bidding, and the prices for storage have continued to drop since then. Wood Mackenzie, an energy consultancy, expects the U.S. storage market to grow sevenfold from 2019 to 2021 .

One of the objections to wind and solar power is their intermittency—sometimes they don't supply enough power to meet demand and sometimes they can supply too much. Batteries can provide power when wind and solar farms cannot. These technologies address

## Electricity storage systems

Other ways electricity can be stored include:

**Pumped hydro:** water is pumped uphill to a storage reservoir using excess electricity so it can be released when the turbines need it.

**Compressed air:** air is pumped into tanks or mines and when electricity is needed, the process is reversed and the compressor motor becomes a generator.

**Stacked blocks:** concrete blocks are raised against gravity to store energy in them and when lowered, release that energy.

**Hydrogen:** excess electricity powers hydrolyzers that separate hydrogen from oxygen in water so the hydrogen can be burned later.

**Heat:** excess electricity (or the sun's rays directly) is used to heat masses such as water, salt solutions or rocks, and that heat is later used to drive a turbine.

**Ice created using excess electricity or off-peak electricity:** used to provide air conditioning in summer.

**Flywheels:** excess electricity is stored in the motion of the heavy wheel which can drive a turbine when needed.

**Flow batteries:** liquid catholyte and anolyte solutions are stored in separate tanks, then pumped to a stack with electrodes separated by a membrane which permits ion exchange and thus electricity.

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those issues, along with with grid integration software that anticipates and matches up supply and demand over large geographic areas. At present, most wind and solar farms have to curtail or otherwise waste generation opportunities because demand does not always sync with a blowing wind or shining sun. With storage, those hours—now usually wasted—can charge a bank of batteries and add value to the wind or solar farm's capital investment.

Perhaps most importantly, the batteries help provide two additional important grid functions. The first is stabilization by providing knowable and quantified supplies in reserve that can be matched up second to second with shallow fluctuations in supply and demand. That slightly alters grid frequency, much as coal plants have done. The second is peaking power for when there are spikes in demand, like on a hot late afternoon in summer, much as natural gas peaking plants have done.

Batteries are especially valuable for peaking power because they can be instantly dispatched while other sources take time to ramp up, and because what were once wasted potential electrons can now be sold as price premium peaking power. As an added bonus, batteries can be deployed to a site in a matter of months, whereas it takes years to construct a natural gas power plant.

Batteries at present are generally capable of providing electricity for about four hours, but six- and eight-hour batteries are available, and often "shaving the peak" off peak demand can be accomplished in four hours. Wood Mackenzie reported in 2018 that batteries had begun to beat out natural gas peaking plants. They also provide the added advantage that they can be placed directly inside a city center, which reduces transmission costs and line losses without adding to urban air pollution.

One of the advantages to wind and solar power specific to Nebraska is that it offers the state an additional energy market. And if the heating and transportation sectors electrify in the next decade or two, as many experts expect, Nebraska could supply those markets, as well.

Wind farms occupy vast areas of land but utilize only a small percentage of that land even when bettery storage is included. A turbine might need 50 to 100 acres of space, but the pad itself and the road to it usually occupy an acre or less. Utility-scale solar farms occupy large acreages, however, increasing work in agrivoltaics is producing ways to continue agricul-tural production both around and under solar panels. Nebraska's landowners, largely farmers and ranchers are in a position to supply that electrical demand while continuing to raise food and fiber.

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# Know what to do around downed power lines

*Reprinted with permission from Nebraska Magazine*

Old Man Winter can create some pretty severe storms, which can interfere with power distribution or even bring down lines.

What is the most important thing to remember about a downed power line?

DO NOT GO NEAR IT. For any reason.

After a storm has caused damage in or alongside a roadway, be alert and slow down. Do not attempt to drive over downed lines or through water or over snow or debris that could be covering downed lines. Driving over a line can pull more lines or related equipment down.

If you see a downed line, pull over and report the location to 911.

Here is some additional information about downed lines, which can occur after a severe storm or an accident involving a power pole.

**Q:** *Can I tell if a downed line is energized by looking?*

**A:** No, there is no way to tell. Always assume a downed line (or any line) is live, even if it is not buzzing or sparking.

**Q:** *What should I do if I am in an accident involving a power line or other electrical equipment?*

**A:** DO NOT get out of your car or truck. It is always safer to remain inside a vehicle, which acts as an insulator and keeps you out of the path of stray electricity. Call 911 and tell the dispatcher a downed line or other electrical equipment is involved. Power company personnel will be dispatched to the scene to de-energize the power.

**Q:** *Is there any reason I should get out of the vehicle?*

*Photo by Amanda Woita, NDEE*

**Severe weather or accidents can bring down power lines. It's important to know what to do when encountering downed lines to avoid injury or electrocution.**

**A:** Yes, but only when your vehicle is on fire or you see smoke. If that is the case, make a clean jump from the vehicle without touching it (cross your arms closely to your chest), and then hop with feet together as far as you can—preferably 50 or more feet away.

**Q:** *What happens to the electrical current when a line is down?*

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**A:** Once a power line is in contact with a car or truck, the ground or other objects, it energizes the area. The electrical current spreads to the vehicle and ground and it ripples out.

Each "ring" of the ripple represents a different voltage. Stepping from one voltage to the next can cause your body to become a path of electricity and electrocute you. That is why you should hop or shuffle once you make a clean jump from the vehicle. Always keep your feet together – think of hopping like a bunny or shuffling like a penguin.

**Q:** *What else can I do?*

**A:** Put your window down and yell to others not to approach the scene. They could be shocked or electrocuted if they walk or run over to the energized area or touch anything that is energized.

**Q:** *What if I can't tell what type of line is down?*

**A:** It doesn't matter—stay in your vehicle and wait for the utility personnel to arrive.

**Q:** *Why am I safe in my vehicle?*

**A:** Because you are not a path to ground for electricity while in the vehicle. But if you step out of the vehicle, you will create a path for the electricity to get to ground.

# NMPP weighing interest in possible AMI service for utilities

*Reprinted with permission from*
*Nebraska Municipal Power Pool*

The Nebraska Municipal Power Pool Board of Directors discussed a possible new Advanced Metering Infrastructure (AMI) service for member utilities during their board meeting held in September.

AMI is an integrated system of utility meters that enables two-way communication over a fixed network between a local utility and metering end-points. It allows for enhanced meter data collection, better management of outages, service calls, system maintenance, expanded billing options and improved overall customer experience. Many utilities today are moving from the older monthly read meter systems to an AMI system.

After some NMPP member utilities requested some type of AMI service, NMPP staff began researching the idea of joint-purchasing AMI equipment and a shared Meter Data Management system. Currently NMPP is gauging interest among member utilities to see if it would be a viable service to go forward—the more utilities that participate in the service, the lower the cost for all participating utilities. An AMI vendor has been identified, but enough program commitments need to be secured before proceeding.

Utilities could choose to have a third party install the AMI hardware or install the meters and data routers themselves. All common costs of the service, not including the meters, would be shared by participating members. Once the system is installed, NMPP would handle the ongoing administration and monitoring of each utility's AMI system.

The potential service aims to assist NMPP member utilities, especially the smaller ones, that would have difficulty implementing an AMI system on their own. If your utility is considering an AMI system, it might be worth considering this potential NMPP service. This would likely be a less expensive option than going alone and NMPP staff would assist you.

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

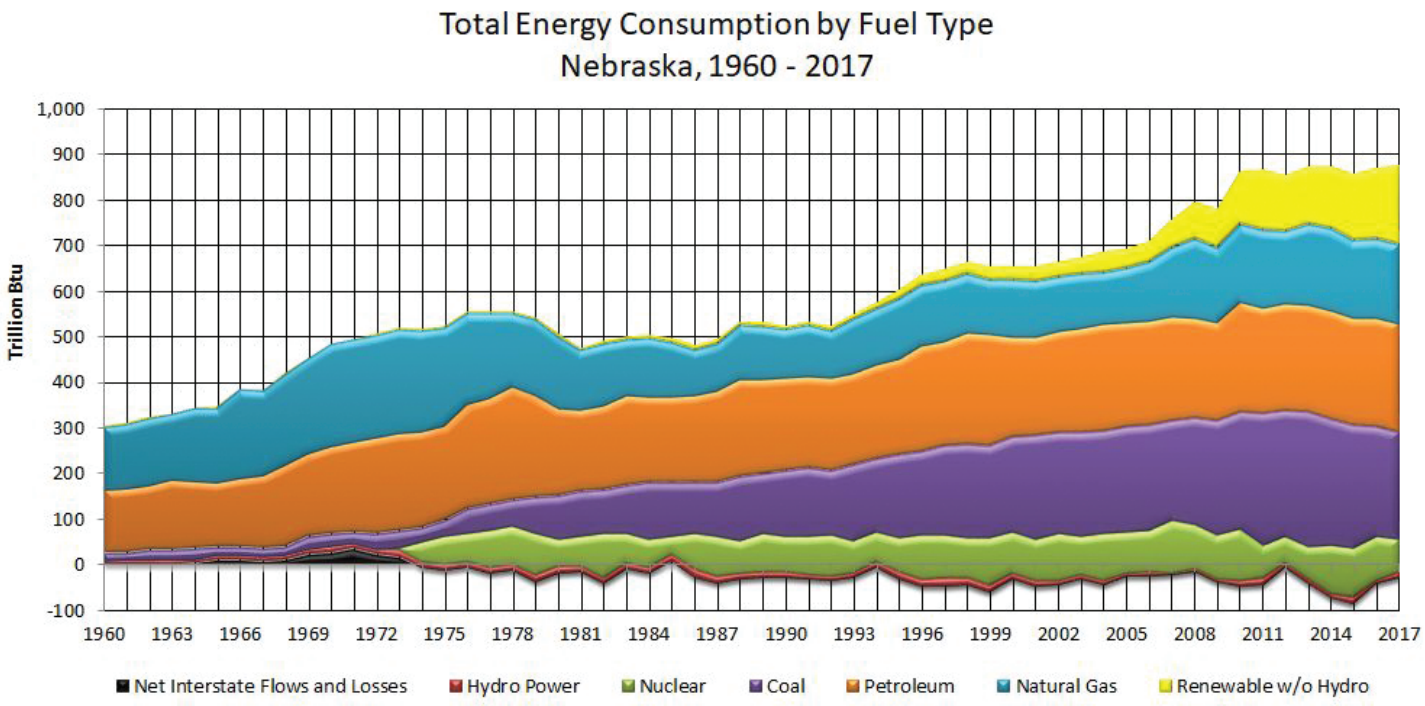


*Image by NDEE*

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

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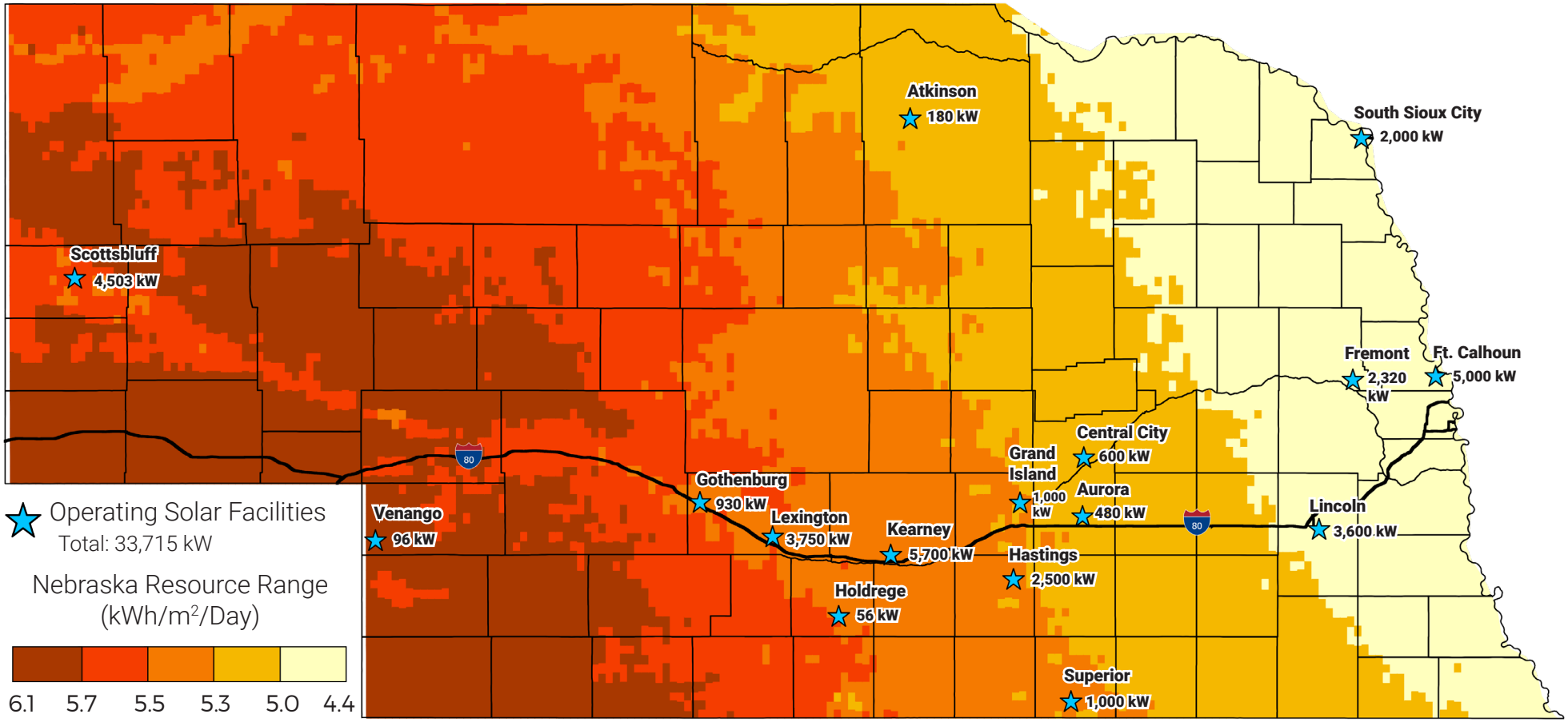
# Nebraska Community Solar Power Generation




Solar facilities as of August 2020.
All solar facilities are in AC power.

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For questions or comments on this map, contact neo.energy@nebraska.gov.
For more information, visit: https://neo.ne.gov/programs/stats/inf/198.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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# Nebraska Community Solar Power Generation

| Operating Solar Projects | Year of Commercial Operation | Total kW (AC Power) |
|---|---|---|
| Lincoln | 2016 | 3,600 |
| Aurora | 2017 | 480 |
| Central City | 2017 | 600 |
| Holdrege | 2017 | 56 |
| Kearney | 2017 | 5,700 |
| Lexington | 2017 | 3,750 |
| Scottsbluff | 2017 and 2020 | 4,503 |
| South Sioux City | 2017 | 2,000 |
| Venango | 2017 | 96 |
| Fremont | 2018 | 2,320 |
| Grand Island | 2018 | 1,000 |
| Superior | 2018 | 1,000 |
| Atkinson | 2019 | 180 |
| Ft. Calhoun | 2019 | 5,000 |
| Gothenburg | 2019 | 930 |
| Hastings | 2019 | 2,500 |
| **Total** | | **33,715** |

Note: Projects with more than one year listed have multiple facilities that began operations in different years.

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# Conservation practices that save: windbreaks/shelterbelts

*Information from the USDA Natural Resource Conservation Service*

Heating and cooling account for more than half of a household's energy use, according to the Energy Information Administration.

There are steps homeowners can take, such as weatherizing their homes. And those who live in rural areas can also protect their homes from cool weather by using windbreaks.

*Photo by Amanda Woita, NDEE*

**A windbreak saves energy and adds comfort and livability to homes in open country. For homeowners in rural areas, well-designed windbreaks can cut home heating costs by 10 to 25%.**

Windbreaks, or shelterbelts, are barriers used to reduce wind speed and usually consist of trees and shrubs, or a combination of the two. For the greatest protection, the windbreak needs to be oriented perpendicular to the troublesome winds.

Remember that an individual's savings depend on local site and climatic conditions, the building's construction quality, an individual's living habits and the design and condition of the windbreak.

The reduction in wind speed behind a windbreak modifies the environmental conditions in this sheltered zone. The sheltered zone extends downwind as far as 10 to 15 times the height of the windbreak. The greatest wind reduction occurs between two to five times the height of the windbreak downwind. For maximum wind protection, the windbreak needs to be dense and tall.

Home heating savings are not the only energy benefit from windbreaks. Windbreaks are effective in controlling drifting snow. By strategically locating windbreaks upwind of roads and highways, blowing snow can be reduced, resulting in less snow accumulation and ice development on roads. This results in less fuel being used to remove snow from highways.

This windbreak application is also known as a living snow fence. In a state like Minnesota, where the state spends an average of $100 million per year in snow removal, this can be a significant savings. Minnesota performed a cost-benefit analysis of living snow fences and found that for every dollar spent on a living snow fence, there was a $17 return. This included not only the savings in fuel but also less economic disruption resulting from closed roads. The living snow fences also can save lives by improving driving conditions during the winter.

Windbreaks also:

- Protect livestock and increase feed efficiency, weight

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gains and survival of newborns and improve animal health, ultimately increasing profits
- Reduce wind erosion
- Increase crop yields by 5 to 20% and increase crop quality
- Reduce pesticide drift
- Improve irrigation efficiency
- Filter dust and other air pollutants
- Provide wildlife travel corridors and habitat
- Store carbon and
- Reduce noise.

## In the Classroom

# Get kids interested in saving energy

*by Maria Kanevsky*
*Reprinted with permission from Nebraska Magazine*

Getting kids interested in saving energy can seem tough at first, but it doesn't have to be. Saving energy can be crucial for keeping electricity bills low, and getting kiddos engaged now will help them form energy-saving habits for the future. Believe it or not, there are fun ways to teach kids how to be energy efficient that will actually get them excited about saving energy

*Photo by Alexander Dummer on Unsplash*

**In addition to promoting good habits, teaching children how to save energy can also lower energy bills.**

**Create a reward system.**
One simple method is a star chart. You can use the chart to keep track of stickers and reward your child for every 10 stickers that they earn for doing some activity that saves energy.

Stickers could be earned every time your child remembers to turn off the light a room after they exit, unplugging devices (like phone chargers) that they're not using, or showering in less than five minutes. Rewards can be small things that get your child excited, like a piece of candy or a small toy.

These actions taken by your kids will add up over time and help save energy around the home.

**Turn the learning experience into a game.**
Games create a fun, interactive option for kids to become engaged with learning more about saving energy. One example is to create an "energy treasure hunt" around the home, where the family searches for devices or appliances that use the most electricity. After finding these items, you can discuss with your kids a few ways for those devices to use less energy.

You could also have them search for other proactive efficiency measures, like weather stripping, LED bulbs and air filters.

Another game to play with your kids is "I Spy" for any energy-saving technologies in stores while out running errands. Encouraging your kids to find a wide variety of devices around stores can keep them even more engaged.

Teach them about the EnergyStar logo, which identifies the most energy efficient devices and appliances. The more interested you are in finding those technologies, the more interested your kids will be, too.

**Discuss lifestyle changes as a family or as an individual, but also make the changes fun.**
This could be getting the family together to play a board game instead of watching television. You could also suggest reading a book together instead of using electronic devices. Encourage them to play outdoors

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with friends instead of playing video games indoors. Incorporating energy-saving practices into everyday life is the best way to ensure the habit has a lasting impact.

Got teens? If your kids are a little older and the suggestions noted previously don't work, try getting them involved in simple efficiency projects around the home. There are several DIY tasks that teens can help with, like caulking and weather stripping around windows and doors, or replacing the HVAC filter.

Teaching your kids to save energy can be easier when you make it fun. Each of us, including our kids, can do our part to save energy.

# Energy Tips

## Don't let cold winds heat up your energy bill

*By Laura King-Homan*
*Reprinted with permission from OPPDTheWire.com*

Winter energy efficiency tips are not only related to your home's heating system, they have more to do with your home itself.

Fall and winter are great times to prepare your home for the cold weather. OPPD has a library of videos to help with projects to increase your energy efficiency. The utility offers additional information on its energy efficiency page on its website.

This video, featuring OPPD Energy Advisor Eric BenSalah, shows how addressing leaks and poor insulation can significantly lower your heating costs. The following strategies can save energy and money while keeping you comfortable as the cold winds blow outside. Most of the tips are free or inexpensive, requiring only a little time.

**Take advantage of heat from the winter sun**

- Leave blinds and/or shades open in direct sunlight to warm the room.
- Close them at night to prevent heat loss through the windows.

**Cover drafty windows**

- Seal any leaky windows or doors with foal or felt weatherstripping. Using a thermal gun is a more expensive option, or you can use an anemometer for a more budget-friendly solution. You can also simply feel around the frames to determine if and where there are leaks.
- Tight-fitting, insulated drapes or shades on windows that feel drafty are a useful layer once you weatherize.

**Adjust the temperature**

- When you are at home and awake, set the thermostat as low as comfortable.
- When asleep or out of the house in the winter, lower the thermostat temperature between one and four degrees. Each degree of adjustment can save you 1-5% in energy use.

**HVAC systems**

- It is recommended that your furnace have an inspection by a licensed HVAC company. Any cracks in your heat exchanger can release harmful gases when the heat is running.
- Check or replace your furnace filter at least once per month.

**Reduce heat lost from fireplaces**

- When not in use, be sure to close the damper on your fireplace. Keeping the damper open can be like an open window during winter. Warm air goes up the chimney.
- Have your chimney inspected and cleaned by a professional on a regular basis.

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