Nebraska Energy Quarterly

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NDEE Releases Energy Annual Report

The 2019 Energy Annual Report is now available on the Nebraska Department of Environment and Energy's website.

This report fulfills obligations set by Neb. Rev. Stat. §81-1607, which requires NDEE to submit an annual report that identifies emerging trends in energy supply, demand and conservation within the agricultural, commercial, residential, industrial and transportation sectors, along with any other sector that is useful.

Also included in this report is a year-in-review for our program areas: the Weatherization Assistance Program, State Energy Program, Dollar and Energy Saving Loans Program, State Heating Oil and Propane Program and other special projects.

Questions or comments on this report may be submitted to neo.energy@nebraska.gov.

Image from NDEE

The cover of the 2019 Annual State Energy Report.

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EV Charging Station Rebates Awarded

The Nebraska Department of Environment and Energy (NDEE) has awarded rebates totaling over $1.8 million for new Electric Vehicle (EV) charging stations that will be installed over the next two years for public use at 35 locations in 18 Nebraska counties.

The new charging sites will include grocery and convenience stores, publicly-owned community locations, Lincoln high schools, and the University of Nebraska-Lincoln campuses. Most of the new stations will include a Direct Current (DCFC) Fast Charger and a slower Level 2 (240V AC) Charger. A DCFC can provide an EV with 60 to 90 miles of driving range in 30 minutes. Level 2 chargers provide about 25 miles of driving range per hour of charging. Some of the new workplace, campus and hotel charging sites, where EVs are expected to be parked for at least several hours, will have only Level 2 chargers.

The funding for this program comes from Nebraska's portion of the trust fund set up in 2017 as partial settlement of Volkswagen's diesel vehicle emission violations. The Trust provides states with funds for actions to reduce nitrogen oxide (NOx) emissions from diesel vehicles and equipment. Governor Pete Ricketts has designated NDEE as the lead agency to administer these funds.

Photo by John Cameron on Unsplash

NDEE has awarded more than $1.8 million in rebates for Electric Vehicle charging stations across the state.

NDEE's initial Volkswagen Trust plan called for using 10%, or approximately $1.2 million, of the available funds to provide rebates to encourage the deployment of EV charging stations across the state. During the application period for the Electric Vehicle Charging Rebate Program that closed Nov. 15, 2019, the agency received 53 applications requesting over $3.8 million in project funding. In view of the strong demand, NDEE increased the funding to the full 15% allowed for this purpose under the Volkswagen Trust agreement. NDEE chose applicants to achieve a wide geographic spread of charging sites to encourage use of EVs within many communities and facilitate EV travel between communities.

The charging station rebates will partially reimburse recipients for the costs of the purchase and installation of the charging equipment, required upgrades in electrical service and 5-year equipment warranties and networking costs. Charging stations that include the more expensive DCFC equipment will be reimbursed for up to 80% of these costs, while Level 2 charging projects will be reimbursed at 50%. After the chargers begin operating, the rebate recipients will provide NDEE with charger usage data for up to 5 years.

A list of the EV Charging Rebate recipients is shown on page 4.

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EV Charging Rebate Recipient	City	Charger Type
2627 Lodging, Inc. — Fairfield Inn	Scottsbluff	Level 2 Dual
B&R Stores — Russ's Market 33rd and Highway 2	Lincoln	DCFC + Level 2 Dual
B&R Stores — Russ's Market	Hastings	DCFC + Level 2 Dual
B&R Stores — Russ's Market Express	Waverly	DCFC + Level 2 Dual
B&R Stores — Super Saver Columbus	Columbus	DCFC + Level 2 Dual
B&R Stores — Super Saver Grand Island	Grand Island	DCFC + Level 2 Dual
B&R Stores — Super Saver Fallbrook	Lincoln	DCFC + Level 2 Dual
Cambridge Hotel Group — Cobblestone Inn	Cambridge	Level 2 Dual
Charge Express — Downtown Geneva	Geneva	DCFC + Level 2 Dual
City of Aurora	Aurora	DCFC + Level 2 Dual
City of South Sioux City — HyVee	South Sioux City	DCFC + Level 2
H.I.S. Auto Care LLC	Lincoln	Lvel 2 Dual
High West Energy — Potter Service Center	Potter	DCFC + Level 2
Lincon Public Schools	Lincoln	Seven Level 2
Loup River PPD — Columbus Holiday Inn	Columbus	Level 2 Dual
Metropolitan Community College	Omaha	DCFC*
Nebraska City Utilitites	Nebraska City	DCFC*
Nebraska Innovation Campus	Lincoln	DCFC + Level 2 Dual
NPPD Service Center	Scottsbluff	Level 2 Dual
NPPD — Lichti Brothers Truck Stop	York	DCFC + Level 2 Dual
NPPD — Downtown Norfolk	Norfolk	DCFC + Level 2 Dual
Casey's General Store — Blair	Blair	DCFC + Level 2 Dual
City of La Vista — Cabela's parking lot	La Vista	DCFC + Level 2 Dual
City of Omaha I-480 parking lot	Omaha	DCFC + Level 2 Dual
Casey's General Store — North Bend	North Bend	DCFC + Level 2 Dual
Casey's General Store — Syracuse	Syracuse	DCFC + Level 2 Dual
Polk County Rural Public Power District	Stromsburg	Level 2
University of Nebraska-Lincoln	Lincoln	Three Level 2 Dual
Total Awarded		

DCFC = Direct Current Fast Charger
Level 2 Dual = dual-port Level 2 charger serving two parking spaces
NPPD = Nebraska Public Power District
*Level 2 Charger is already present at site or will be provided using other funding

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How Many Homes Can be Powered by Solar Energy?

As new solar facilities are being developed in Nebraska, NDEE has been asked to translate the scale of these projects into a more tangible way of understanding them. The question raised is "How many homes could be powered by a Megawatt (MW) of solar electricity?"

To start, NDEE uses the answer that has been provided by the U.S. Energy Information Administration, which says that 1 MW of solar electricity provides enough power for 160 homes.

Although that would seem to be a simple answer to a simple question, there are actually many complex variables to consider, said Bruce Hauschild, an energy technology advisor with NDEE.

Those factors include:

- What is the size, location and efficiency of the "average" home?
- When saying "powered by," what factors are being considered (does the home use all appliances and electric heating and cooling systems)?
- Is the megawatt designation referring to stationary solar panels or solar commercial single tracking or full tracking panels?

Defining the average home's electric use

According to the EIA, the average annual electricity consumption for a U.S. residential utility customer was 10,399 kilowatt-hours (kWh) in 2017. Louisiana had the highest annual electricity consumption at 14,242 kWh per residential customer, and Hawaii had the lowest at 6,074 kWh per residential customer.

Defining power used in homes

Another variable to consider is what is meant by "powered." Hauschild said this can be interpreted as only a home's electric consumption, or a home's total power usage.

According to the EIA's 2015 Residential Energy Consumption Survey, average site energy consumption is listed as 94.3 million British Thermal Units (Btu) per household at end use in the Midwest. Converting this to kilowatt-hours (kWh), the average Midwest household's total power usage is 27,638 kWh annually.

Photo by Tom Rumble on Unsplash

Figuring how many homes can be powered by solar energy depends on several factors.

While the average household uses 27,638 kWh/year in total power consumption, the EIA states the average home's electric consumption is 10,399 kWh/year.

Measuring solar energy systems' capabilities

The National Renewable Energy Laboratory's (NREL) website allows users to measure estimated solar power potential. This search function allows users to search a location and types of solar power generation to see how much electricity can be generated in a year.

Hauschild entered the following criteria in NREL's solar power tool:

- Location – Lincoln
- Solar Panels – Standard
  - o Stationary
  - o Facing south
- Other inputs – Standard

With that information, NREL's PV calculator estimated 1,440,706 kWh can be generated in a year with a 1 MW (1,000 kW) system.

If the criteria is changed to a commercial system with single-axis tracking, 1,660,031 kWh can be generated in a year. With a full tracking system, it is predicted that 2,027,081 kWh can be generated.

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Combining the factors

Using the average home's electricity consumption (10,399 kWh/year), the average commercial single-axis tracking solar system (1,660,031 kWh/year), Hauschild said 160 homes can use solar power for only their electric use.

However, if the solar panels change to a full tracking system, 200 homes can replace their electric consumption with solar power.

To take that further, if one uses the average home's total energy use (27,638 kWh/year), a MW of standard, non-tracking solar power can only power 50 homes, Hauschild said.

"As you can see, there are many ways this question can be answered," Hauschild said.

Hauschild said in researching this question, he ran across a reference stating 1,000 homes can be powered per MW of solar. Energy use varies across the United States – an average home in Louisiana consumes almost twice as much electricity as the average home in Hawaii – and across the globe.

"If you think internationally, electric energy use in homes in other countries might be as low as 1,000 kWh per year," Hauschild said. "In a country like that, 1 MW of solar could replace the electric use in 1,000 homes."

Photo by Mariana Proenca on Unsplash

Factors like average power use, the solar energy system capabilities and more can determine how many homes can be powered with solar energy.

Hauschild said those interested in using solar energy can use their own utility bills to see how much solar power they might need. If energy use is high, homeowners can consider improvements to increase their energy efficiency like adding insulation, stopping air leaks, upgrading to LED lighting, and possibly upgrading your heating and cooling system to lower the amount of energy you use. This would also lower the amount of solar power you would need to power your home.

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MEAN sets carbon neutral goal

The Municipal Energy Agency of Nebraska (MEAN) Board of Directors approved a resolution laying out a vision to a carbon neutral power resource portfolio by 2050 at its board meeting on Jan. 23 in Kearney.

Formed in 1981, MEAN provides wholesale electric supply and energy-related services to its 69 member and participating communities in Colorado, Iowa, Nebraska and Wyoming.

The resolution authorizes MEAN's staff to collaboratively work with the MEAN Power Supply Committee to construct policies around resource planning, portfolio optimization and emissions reduction to support future actions to achieve the 2050 carbon neutral goal.

The formation of the plan will culminate in MEAN's 2022 Integrated Resource Plan, which details MEAN's future resource needs and performs evaluations to determine the preferred resource plan. Bob Poehling, MEAN executive director/CEO, said this will be a significant and challenging goal

"MEAN is a member-driven organization and there is a desire from member communities to further build upon our clean energy portfolio and environmental stewardship," Poehling said. "MEAN's member communities will work together to navigate how to achieve this goal while still maintaining a reliable and competitively priced wholesale energy supply."

MEAN has a history of working to fulfill renewable energy needs for each member community, including constructing and owning the first utility-scale wind project in Nebraska near Kimball.

Recent carbon-free efforts include:

• Contracting to purchase the energy (30 megawatts) of the recently expanded Kimball Wind Project, which has three times more energy capacity than the original project.

• Successfully working with the communities of Aspen and Glenwood Springs in Colorado to achieve their local 100% renewable energy goal.

• Expanding the opportunity for larger renewable projects located in MEAN Participant communities through its Renewable Distributed Generation Policy.

Photo by Gonz DLL on Unsplash

The MEAN Board of Directors has set a goal to be carbon neutral by 2050.

• Extending a current 20-year contract for additional wind energy from the Wessington Springs, S.D. Wind Center.

Today, MEAN's resource capacity portfolio consists of 50% non-carbon resources from projects around the region, including member federal hydro allocations from the Western Area Power Administration. MEAN will have opportunities in the coming years to transition toward carbon neutrality as power purchase agreement contracts expire and capital debt is paid on its shared ownership of power resources with other utilities.

Achieving MEAN's 2050 vision will require industry advancements and technological innovations, particularly those that add stability to the grid and offset the intermittent production of renewable energy such as from wind and solar resources. Potential solutions are not yet viable on a utility scale or economically feasible, and emerging technologies must still be developed.

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EIA Website Shows State Rankings

Did you know the Energy Information Administration (EIA) maintains an overview of states' energy profiles? It can be found on their website and includes maps and state rankings.

Viewers can compare Nebraska's energy consumption, production, and energy prices among the other states. The EIA also provides breakdowns of the state's consumption by source and sector, what type of energy it produces the most of and more. Here are some examples of information on the EIA's website.

Quick Facts

- Nebraska produces about 13% of the nation's fuel ethanol and ranks second in the nation, after Iowa, in ethanol production and capacity.
- Nebraska is among the top 10 states in per capita total energy consumption in part because of its energy-intensive industrial sector, led by agriculture and food processing, and because of the state's hot summers and harsh winters.
- Nebraska has the third-highest number of industrial electricity customers of any state, and a significant share of Nebraska's industrial consumption is seasonal demand from farms where electricity is used to run irrigation systems.

Graphs that show Nebraska's energy consumption by source, consumption by sector, energy production and electricity generation can be found on the EIA state profile website.

Nebraska ranks...

7th In total energy consumption per capita

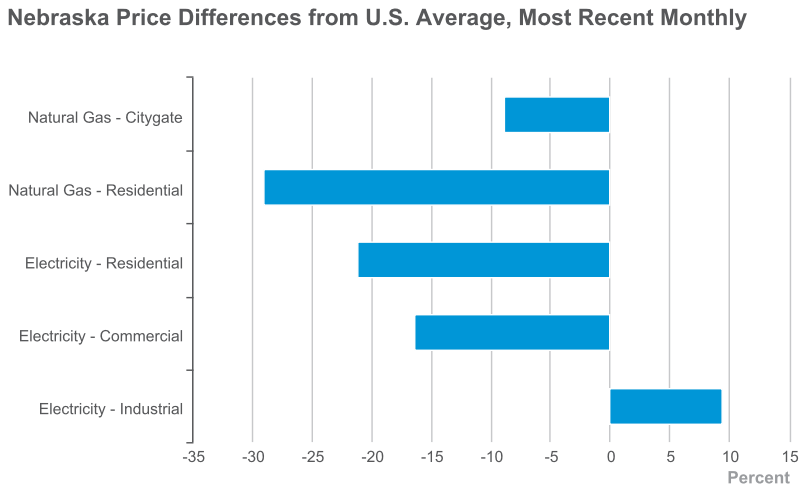
That's 457 million British Thermal Units (Btu) per capita

43rd In both natural gas and electricity prices

On average, Nebraskans spend $6.66/thousand cubic feet for natural gas and 10 cents/kilowatt hour for electricity

37th In carbon dioxide emissions

Nebraska's total carbon dioxide emissions is 48 million metric tons. Texas has the highest CO2 emissions at 707 million metric tons



Source: Energy Information Administration, Petroleum Marketing Monthly; Natural Gas Monthly; Electric Power Monthly

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Rebates fund engine replacements

The Nebraska Department of Environment and Energy awarded more than $950,000 through its 2019 Clean Diesel Rebate Program, which distributes funding from the U.S. Environmental Protection Agency to reduce diesel emissions.

This program provides partial reimbursement for diesel truck replacements and agricultural irrigation pump diesel engine replacements. More information and details on eligibility for these program can be found on NDEE's website.

Through the Diesel Truck Replacement Program, NDEE can provide funding to replace older diesel refuse trucks and medium- to heavy-duty local diesel freight, delivery and maintenance trucks. In 2019, NDEE awarded $579,497 in rebates for the replacement of eight diesel trucks.

Through the Agricultural Irrigation Pump Diesel Engine Replacement program, NDEE can provide funds to assist farmers with replacing irrigation pump diesel engines with an electric motor or by connecting a submersible pump directly to the electric grid. In 2019, NDEE awarded $372,345 in rebates for the replacement of 21 diesel irrigation engines.

A list of rebate awardees for both programs can be found online. NDEE's website also contains information for awardees on the next steps for carrying out their projects for the truck and irrigation programs.

NDEE established the Clean Diesel Program in 2008 to distribute funding from the EPA to reduce diesel emissions. This funding was authorized by congress through the Diesel Emissions Reduction Act (DERA), which provides annual funding for states to establish grant, rebate and loan programs that reduce diesel emissions.

Since its inception, NDEE's Clean Diesel Program has:

- Awarded $2,977,318 to 115 recipients,
- Funded early replacement of 27 school buses with new, cleaner-burning buses,
- Funded early replacement of 12 diesel refuse trucks with new cleaner-burning trucks,
- Funded replacement of 48 diesel irrigation engines with all-electric equipment,
- Retrofit pollution control devices on 334 diesel engines,
- Installed idle-reducing auxiliary power units on 39 long-haul trucks,
- Reduced nitrogen oxide emissions by 788 tons,
- Reduced diesel particulate emissions by 34 tons,
- Reduced hydrocarbon emissions by 49 tons, and
- Reduced carbon monoxide emissions by 154 tons.

Photo by Peter Gonzalez on Unsplash

NDEE has awarded more than $950,000 through its 2019 Clean Diesel Rebate Program, which helps fund the replacement of older diesel trucks and diesel irrigation engines.

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OPPD's Marshmallow Challenge tests students' engineering skills

Their mission was to build a tower as tall as they can. But the only materials they could use were dry spaghetti, string, tape, and a marshmallow to top it off.

All fifth grade classrooms in Omaha Public Power District's service territory were invited to take part in OPPD's Marshmallow Challenge. The contest coincided with National Engineering Week, Feb. 16-22.

OPPD's Society of Engineers sponsors the challenge, which finished its seventh year. The goal is to promote problem-solving, teamwork and innovation. The contest is part of OPPD's ongoing commitment to Science Technology Engineering and Math (STEM) education.

OPPD announced three winners, with the three highest structures, Feb. 21. They received some OPPD swag, as well as a classroom visit from one of OPPD's employees who talked about careers in engineering.

There was also be special recognition for the team that shows the most creative use of their materials, even if their structure is not among the highest.

Educators interested in joining our Marshmallow Challenge email list should let us know at marshmallow-challenge@oppd.com.

Marshmallow Challenge Winners

Winners are listed by school and team name

1st Place — St. Margaret Mary
SMM Team #1

2nd Place — Hickory Hill Elementary
Doggos

3rd Place — Brownell Talbot
LAMM

Most Creative — Jameson
Students at Jameson tried to build a framework to develop stability and get the height requirement, instead of using a typical triangular base.

Courtesy photo

SMM Team #1 from St. Margaret Mary won first place in OPPD's Marshmallow Challenge. See more pictures below.

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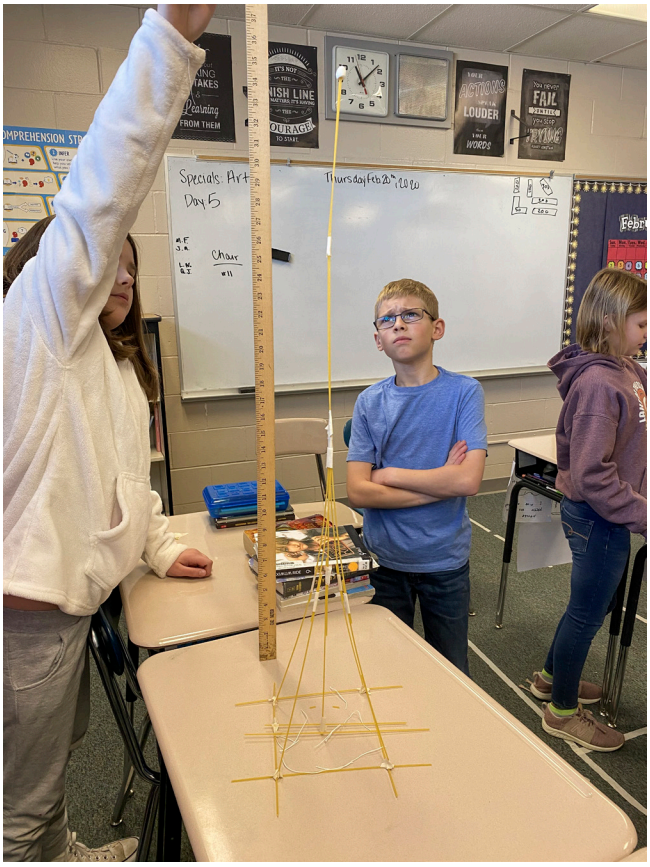
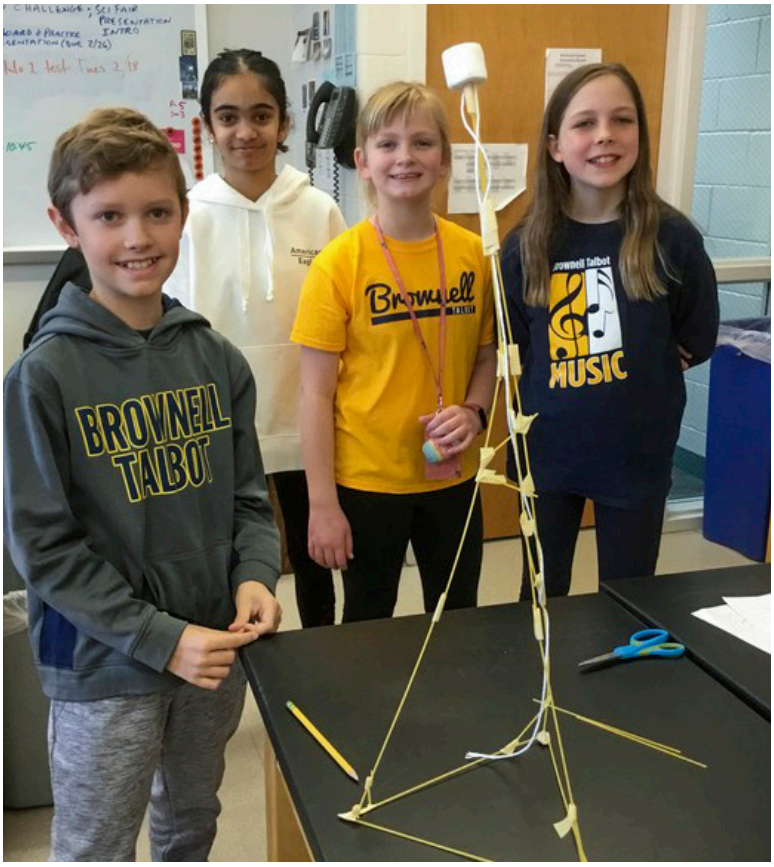


Courtesy photo

Hickory Hills Elementary's team Doggos won second place in the Marshmallow Challenge.



Courtesy photo

Third place in the Marshmallow Challenge went to team LAMM from Brownell Talbot.

Energy Tips

Examine potential cost savings with smart lighting

Reprinted with permission from the Rural Electric Nebraskan
By Pat Keegan

It seems like every device is getting smarter these days. Since smart home lighting is so new, many of us could use a little introduction.

At its heart, smart lighting covers a range of bulbs, controls and lighting systems that are programmable through an app on a mobile device, computer or smart speaker. Smart lighting can do more than just turn on and off at the right time. Some smart lighting systems can dim at various times. Some can be connected to a sensor or motion detector so that a light goes on when a door is opened, or someone enters a room. Some smart lighting systems can change color so you can set up a holiday light show indoors or outdoors. It can also be practical, providing lighting that matches sunlight during the day and is more relaxing in the evening. You may even be able to play music directly from the bulb!

In most cases, you control smart lighting through your home Wi-Fi. You can communicate to individual smart bulbs or to a hub that, in turn, controls individual bulbs. In some cases, you can use Bluetooth® on your phone to control smart lighting, but you'll need to be within range of the bulb or hub. Smart lighting can also be used outdoors, but the range of your control device could limit this approach.

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If the smart bulbs are the type that connect through a hub or connect directly to your Wi-Fi network, you should be able to control them via smart speakers like Google Home, Amazon Echo or Apple HomePod, and remotely through the internet or smartphone. While a hub-based system is more expensive, it allows lights to be grouped by floor or room, and also uses less bandwidth on your network than running many separate bulbs. Some hub kits also allow you to use regular bulbs instead of requiring more expensive smart bulbs, which could save you money.

Photo by Stephan Frank on Unsplash

Smart home lighting devices allow you to control light bulbs through the internet or a smart phone. This level of control could save you a few dollars on your electric bill.

Will smart lighting save energy? That depends on how you light your home and control your lighting now, and on how you would control the smart lighting you install. If you use smart lighting to turn lights off when they aren't needed, like when rooms are empty or no one's home, or to reduce the wattage, you will save energy.

How much energy can you save? Lighting accounts for about 6% of electricity use in the average home, which means your total cost for all the lighting in your home might only be $100 per year. If you have some high wattage bulbs that are on for long periods of time every day, your lighting use could be significantly higher than average.

Investments in smart lighting are not likely to pay back as quickly as some energy efficiency measures that control heating or air conditioning. Smart bulbs are more expensive than typical LED bulbs, ranging from $15 to $80, and a hub can cost of up to $125, so it could take a long time to make your money back. Chances are, you're better off investing in smart lighting for the features than the energy savings.

One alternative to smart lighting is smart wall outlets or wall switches. For example, you can plug a lamp with a standard bulb into a smart wall outlet, or you can have several lights wired to one smart switch. The downside to smart switches and outlets is that installation could be more challenging, and you may not have as many options and features that come with smart lighting.

Another strategy for smart lighting that has been around for a long time and is reasonably priced is to use occupancy sensors, motion sensors or timers as control devices.

The wide number of options and costs makes it difficult to select the best smart lighting for your situation. We suggest you do the research to make sure it's worth your time and money to make the change.

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