

TYPES OF RENEWABLE ENERGY

ethanol, biodiesel, wind, solar, **anaerobic digestion**, organic waste biomass, **hydropower**, landfill gas

WHAT IS RENEWABLE ENERGY:

Renewable energy, also known as clean energy, is becoming more available across America. Renewable energy uses resources that can be regenerated, such as harnessing the wind, the sun, or crops that can be replanted, such as corn. The energy can power our homes, schools, and vehicles in place of energy derived from non-renewable fuels, sometimes referred to as fossil fuels. This industry is expected to continue to grow in the future. There are many opportunities for countries to invent, manufacture, and export clean energy technologies. Illinois is ranked second in the Midwest for installed renewable energy capacity, fifth in the nation for installed wind power capacity, third in the nation for ethanol production capacity, and fourth for biodiesel production capacity.

• Illinois renewable energy capacity includes:

- 3,667 megawatts (mW) of wind power
- 40 mW from hydropower
- 53 mW from solar photovoltaics
- 149 mW from biomass and waste

TIMELINE/HISTORY:

600 B.C. — Ancient Greeks discovered static electricity.

950 B.C. — The first windmills were used in Persia to grind corn into cornmeal.

1200s — Windmills were adapted to provide irrigation to farms.

1700s — Ben Franklin discovered that static electricity and lightning were the same thing.

1882 — The world's first hydroelectric power station was built in Appleton, Wisconsin.

1885 — Coal replaced wood as the most important supply of energy to generate power.

1902 — First solar power plant in Illinois was built in Olney.

1908 — Henry Ford produced the Model T car that was designed to run on biodiesel.

1935 — Average gasoline price was \$0.19 per gallon.

1941 — Henry Ford built a soybean car.

1970s — Oil crisis that led people to turn to domestic fuel sources.

1975 — Illinois Environmental Council was founded by grassroots environmentalists.

1979 — Illinois Solar Energy Association was founded.

1992 — Congress passed the Energy Policy Act.

1999 — Illinois Renewable Energy Association was formed to assist Illinois residents to become aware of the need for renewable energy.

VOCABULARY:

AUTONOMY — independence or freedom, as of the will or one's actions

BIODIESEL — biofuel intended for use in diesel engines

BIOFUEL — fuel derived from biomass

BIOMASS — organic matter that can be converted to fuel and is a potential energy source

E-85 — a renewable fuel made of up to 85% ethanol and 15% gasoline

ENERGY — a supply or source of power, for example wind energy

ETHANOL — renewable fuel made from corn or other plant materials

HEAT — a type of energy that is felt as a temperature

HYDROPOWER OR HYDROELECTRIC — generation of electricity using flowing water that powers a generator

MEGAWATT (MW) — a unit of power, equal to one million watts

POWER — the rate in which energy is used

WATT — a method of measuring power or energy

2000 — Average gasoline price was \$1.51 per gallon.

2003 — First wind farm in Illinois was installed in Mendota Hills, Lee County.

2005 — The Energy Policy Act created Renewable Fuels Standard to ensure all fuel sold in the United States contains set percentages of renewable fuels.

2011 — Average gasoline price was \$3.53 per gallon.

2019 — Average gasoline price was \$2.60 per gallon.

2019 — Average E-85 price was \$2.28 per gallon.

CLEAN ENERGY LAWS

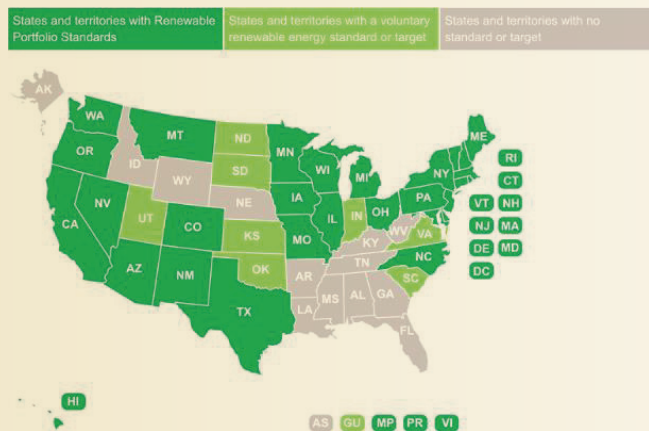
Stimulate job creation with new investments in energy efficiency, renewables, and energy innovation

Enhance Illinois' position as a leader in the clean energy economy, attracting investment and new companies to Illinois

Preserve Illinois' low energy rates for residents and businesses

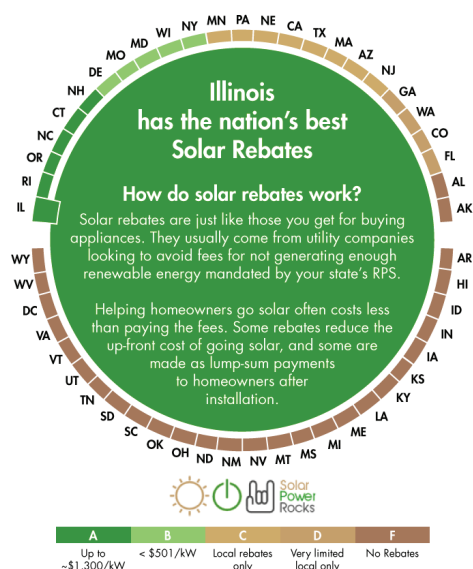
FUTURE ENERGY JOBS ACT

The Future Energy Jobs Act (FEJA) helps to make sure that Illinois builds new clean energy resources. This law came into effect during the summer of 2017. It will also open opportunities to people in low-income communities. More than \$750 million will be invested in low-income programs through the FEJA. FEJA will provide specific programs that will deliver consumer savings, economic development, and job training and creation for ex-offenders and former foster children.



ILLINOIS RENEWABLE PORTFOLIO STANDARD (RPS)

The Illinois' Renewable Portfolio Standard (RPS) requires specified electric utilities and suppliers to get a certain percentage of electricity from renewable sources. According to this law, renewable sources must make up 25% of overall electric sales by 2025, with wind energy accounting for 75% and solar accounting for 6%. For more information on RPS visit www.ncsl.org/research/energy/renewable-portfolio-standards.aspx



SOLAR REBATE PROGRAM

The Solar Rebate Program is a self-funded program that provides rebates for solar and wind energy systems that began in 2005. The \$10,000 cash rebate is awarded on a first-come first-serve basis until the program is out of funds. The program is funded through the Renewable Energy Resources and Coal Technology Development Assistance Charge and does not impact the state budget.

FUN FACTS:

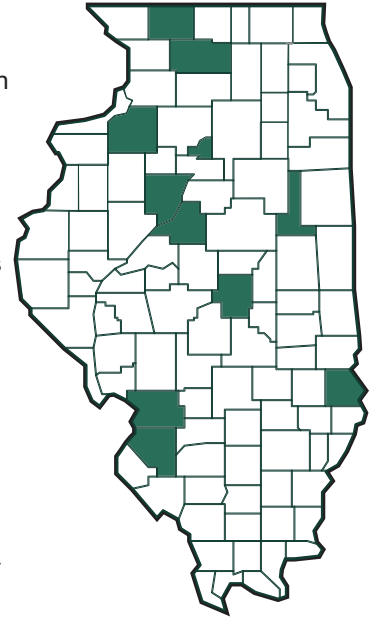
Farmers are **leaders** in developing **climate-smart solutions**.

Illinois is one of the **top ethanol** and **biodiesel** states in the **nation**.

The American Lung Association supports the use of **ethanol** and **biodiesel**.

ETHANOL:

Ethanol is a high-performance fuel made from corn. Illinois farmers plant more than 12 million acres of corn a year, which produces more than 2 billion bushels of corn that can be processed into several different types of products. One of those products is “green fuel” or “homegrown fuel” which is known as ethanol. Illinois is one of the top ethanol-producing states in the nation, and about 27% of the corn produced in Illinois is used to produce ethanol. One bushel of corn produces about 2.8 gallons of ethanol. Illinois can produce enough ethanol to displace 35% of the state’s petroleum usage. Ethanol makes up 10% of the United States gasoline supply. When used in place of gasoline, ethanol emits 30% - 50% fewer greenhouse gas emissions. Through the production of ethanol in Illinois, more than 4,000 full time jobs have been created.



locations of ethanol plants

BIODIESEL:

Biodiesel is a renewable fuel made from soybeans. It is the fastest growing alternative diesel fuel in the United States. Illinois ranks number one in U.S. soybean production and is one of the largest biodiesel-producing states. Biodiesel reduces harmful greenhouse gases while also delivering high-quality performance you can trust all year long. Biodiesel has many benefits, such as reliable engine performance, economical operation, and is an all-weather fuel. Biodiesel leads to sustainable fleet operation for multiple users like school bus companies. Biodiesel leads to clearer and healthier air, results in a smaller carbon footprint, is American made, and provides jobs for Illinois.

WIND ENERGY:

Illinois is ranked sixth in the nation for installed wind capacity and is the sixth state to exceed 5,000 mW of operating wind in 2019. Energy is collected when the wind turns the blades of the windmill. The energy can be used for generating electricity, charging batteries, pumping water, grinding grain, and many more things. Illinois ranks fourth in the nation in wind industry employment with more than 7,000 wind jobs.

SOLAR ENERGY:

Illinois is ranked 21st nationally in solar energy production. Solar energy is created from collecting sunlight on special panels that convert the sun’s heat into useable energy. These special panels can be placed on rooftops or in wide open areas to collect the sunlight. There are enough solar panels to power 31,686 homes in Illinois. There are 395 solar companies operating in Illinois, providing 5,512 solar jobs. Many corporations in Illinois have gone to solar energy, such as IKEA, Walmart, and Target.



CAREERS

wind turbine technician, solar installer, clean car engineer, sustainable builder, **sustainability professional**, engineer, contractor, environmental consultant, wind-farm developer

SPOTLIGHT ON CAREERS

ENGINEER

Engineers solve problems and develop technologies. There are many different branches within engineering. In renewable energy, engineers play a huge role in the implementation of new technology. These engineers specialize in mechanical, electrical, and environmental engineering. Engineers design hydroelectric dams, solar cells, and wind turbines.

ENVIRONMENTAL CONSULTANT

An **environmental consultant** works with more than renewable energy. This position affects all aspects of a company's efforts to become environmentally friendly. Companies trying to reduce their environmental impact will hire these consultants to help reduce the damage they are doing to the environment.

SCIENCE AT HOME: GET A RISE OUT OF YEAST

Yeast is a fungus, which is a living organism, and is related to mushrooms! There are many kinds of yeasts around us that can be found on our skin, the skin of fruits and veggies, and there are even yeasts we use to make products like ethanol! The yeast we are most familiar with is known as baking yeast. We use this yeast for baking bread! Just like most of us humans, yeast loves sugar. When yeast meets sugar, a gas called carbon dioxide is produced, which creates little air bubbles that get trapped in bread. The heat from baking causes the yeast to die, but the air bubbles continue to enlarge and expand during baking.

Materials Needed:

- (1) 20 oz. bottle
- Balloon
- Pencil and paper
- ½ teaspoon measuring spoon
- 1 teaspoon measuring spoon
- Sugar
- Water
- Active yeast

Directions:

1. On a piece of paper, write what you think will happen to the balloon once you add the sugar and water to the yeast inside the two-liter bottle.
2. Mix a teaspoon of sugar and a half teaspoon of yeast in a two-liter bottle. Add two or three inches of water and shake the mixture.
3. Stretch a balloon over the top of the bottle.
4. Now wait a few minutes and watch what happens! On your piece of paper, record your observations!
5. Why did this happen? Using the "background information" above, along with your observations, write a paragraph in your own words explaining why this happened.

Want to try more experiments?

- What will happen to the balloon if you leave it on the bottle for 30 minutes?
- Would the yeast work faster if you used hot water? What about ice water?
- What will happen if you use more sugar?
- What if you use no sugar?

LINKS

<https://ilenviro.org/about/>
https://www.illinoisrenew.org/about_us

THE
IAA
FOUNDATION
www.iaafoundation.org



Illinois
AGRICULTURE
in the ClassroomSM
www.agintheclassroom.org