Clue 1
This practice is banned in some communities (none in Maine)

Clue 2
Takes advantage of evaporation

Clue 3
Can significantly reduce electricity use in the home

.....

Clue 1
Uses electrical energy to produce light and heat

Clue 2
Lacks Edison's hallmark "filament"

Clue 3
Provides as much light as a 100-Watt incandescent bulb

Clothespin's energy connections

A "solar" clothes dryer uses the Sun's radiant energy. Wet clothes on the line become dry as the water leaves them. This happens because the Sun evaporates the water off the clothes. Evaporation is the process by which water is converted from its liquid form to its vapor form and is transferred from land and water masses to the atmosphere. The rate of evaporation depends upon:

- Wind speed: the higher the wind speed, the more evaporation
- Temperature: the higher the temperature, the more evaporation
- Humidity: the lower the humidity, the more evaporation

It is not uncommon for families to dry their clothes on a clothesline. People may not connect this idea to evaporation and the energy associated with this process, or they may have a number of misconceptions about where the water goes when it evaporates. Some may believe that the water simply "disappears" or goes directly to the clouds. Water is in the surrounding air in an invisible form called water vapor.

According to the United States Department of Energy's Energy Information Administration statistics from 2001, about 5.8% percent of residential electricity use goes towards the clothes dryer. Using a clothesline as opposed to an electric or gas dryer is an energy-saving measure.

What other energy connections can you think of?

Efficient light bulb's energy connection

Several connections can be made between energy and energy-efficient light bulbs. Energy efficient bulbs, such as compact fluorescent light bulbs (CFLs), use less energy to do the same "job." A 25-watt CFL gives off the same light output (lumens) as the 100-watt incandescent bulb using less energy. The 100-watt incandescent bulb produces much more heat and has a shorter bulb life.

One way to think about energy efficiency is to examine the way energy gets used in a particular device. Is energy being used the way it was intended to be used (to achieve the "desired" effects) of the device? In the case of a light bulb, light is the desired effect. In incandescent bulbs, heat is given off in addition to light; heat is not a "desired" effect. It may be tempting to refer to the energy that is given off as heat or other undesired forms as energy that is "lost" but the *Law of Conservation of Energy* (*First Law of Thermodynamics*) states that energy is cannot be created or destroyed.

What other energy connections can you think of?

Clue 1

Despite being the most abundant fossil fuel produced in the United States, Maine has none of this naturally occurring resource.

Clue 2

This substance is made up of thermally altered and highly compressed plant material that grew millions of years ago.

Clue 3

Nearly half of the electricity in the United States comes from burning this nonrenewable energy source.

.....

Clue 1

The amount of energy available in this substance is typically measured with a calorimeter.

Clue 2

A source of building material and fuel for an organism.

Clue 3

Although generally made up of high concentrations of carbohydrates along with proteins and fats, these substances often contain water, vitamins, minerals, caffeine, and spices that are non caloric and therefore do not provide living things with energy.

Coal's energy connections

Coal is a combustible black or brownish-black sedimentary rock composed mostly of carbon and hydrocarbons. It is the most abundant fossil fuel produced in the United States. Nearly half of the electricity generated in America comes from burning coal. When coal is burned, energy is released. This energy, stored in the sugars assembled by plants that lived hundreds of millions of years ago when the earth was partly covered with swampy forests, is chemical energy. For millions of years, layers of dead plants accumulated at the bottom of the swamps and were covered by layers of water and dirt, halting decomposition, and trapping the energy of the dead plants. Heat and pressure from the upper layers compressed the plant remains into coal. The energy stored in these ancient plants is released when the coal is burned. Coal is a nonrenewable energy source (a fossil fuel) because it takes millions of years to form. Maine has no coal burning power plants or coal mines.

What other energy connections can you think of?

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Energy drink or bar's energy connection

Food contains chemical energy. The arrangement of atoms or molecules in foods determines how much energy they store. The amount of energy available in different foods is measured using a calorimeter.

Scientifically, foods are substances containing carbohydrates, proteins, and/or fats and serve as both an energy source and building material for an organism. Foods labeled as energy bars typically contain a high concentration of carbohydrates, along with proteins and fats, to give the body fuel it needs to function. During digestion, chemical reactions occur that release the energy stored in the food. Most energy drinks make people feel energized because they offer a quick source of easily and quickly digested food and/or often contain other chemicals such as caffeine, that stimulate the central nervous system. This period of high energy is often followed by a sudden period of exhaustion. Energy is not a substance, but food labels using the words "energy" or "power" sometimes make people think it is, or that "energy bars" or "energy drinks" somehow possess a special "energy" quality. In fact, scientifically all food is an energy source. Water, vitamins, minerals, caffeine, and spices have no calories and while some of these may be substances needed by living things and are ingested by organisms, they do not provide living things with energy.

What other energy connections can you think of?

Clue 1
It may seem counterintuitive to think that this substance has energy.

Clue 2
Contains chemicals that when combined, undergo a chemical reaction

Clue 3
The chemical reaction that occurs is endothermic (absorbs heat).

.....

Clue 1
Encases the components of a simple circuit

Clue 2
Requires a chemical energy source to work

Clue 3
Modern versions may have LED bulbs in place of incandescent ones

Instant cold pack's energy connections

Typically first aid kits are stocked with "instant" cold packs for quick and convenient treatment of an injury. The packs are made of chemicals (ammonium nitrate and water) that, when mixed together, become "cold." The two chemicals are initially in separate compartments in the pack. When the cold pack is needed, the inner compartment in the pack is broken allowing the chemicals to mix. The chemical reaction that takes place is endothermic (absorbs heat).

Associating things that are "cold" with energy seems counterintuitive! However, all matter has thermal energy – the collective energies of molecular motion. Atoms and molecules make up all substances, and these atoms and molecules are always moving. The higher the temperature, the faster the atoms and molecules that make up the substance are moving and thus the more thermal energy. The amount of thermal energy a substance has takes into account the amount of matter in a substance. The greater the amount of matter, the more thermal energy a substance has. This is why an iceberg contains more thermal energy than a cup of boiling water.

What other energy connections can you think of?

Battery-power flashlight's energy connection

As in many other electrical devices, flashlights house the components of simple circuits. A circuit is an unbroken path or closed loop which allows electrical energy to flow. The flashlight's components include a pathway for electric current. In a flashlight, the electric current goes through the metal wire (attached to a switch), through the metal spring, through the batteries, through the base of the light bulb, across the filament of the light bulb (if the bulb is an incandescent type), and through the side of the bulb. Without this complete pathway the flashlight will not light.

Batteries are an energy source. Inside the battery are chemicals that react, acting like a "pump" to move electrical charges through the circuit. The electrical charges are already present in the wires and bulb. The battery, when connected properly, gets the charges moving. Many people think that batteries (and generators) send out a substance that gets "used up" but this is not true. When batteries "die" they do not "run out of electricity" but rather the battery's chemical reaction fails to fuel the movement of the electrical charge.

There are of course many other types of flashlights such as mechanically powered flashlights, those that have LED (light emitting diodes) rather than incandescent bulbs and/or those that use rechargeable batteries.

What other energy connections can you think of?

Clue 1
Used to make fuels such as ethanol for vehicles

Clue 2
Converts carbon dioxide into sugar using energy directly from the sun

Clue 3
Is an inextricable part of the American diet

.....

Clue 1
Anyone can use these for a nominal fee; they help us get from point A to point B.

Clue 2
Fueled by gasoline, diesel, natural gas or propane

Clue 3
Use of these systems reduces congestion, land use, and automobile emissions and helps to conserve energy resources.

Corn's energy connections

Corn or maize is the most widely grown crop in the Americas. In fact, as revealed in *The Omnivore's Dilemma: A Natural History of Four Meals* by Michael Pollan, corn is an inextricable part of the American diet. A myriad of foods are made from or contain corn and corn is prevalent in livestock feeds. In recent years corn has been used to make fuels such as ethanol for vehicles and as an ingredient in some plastics. Corn is a plant (a grass) and like most plants, corn is photosynthetic. It is through the process of photosynthesis that carbon dioxide is converted into sugar using energy directly from the sun.

What other energy connections can you think of?

Public transportation's energy connection

All forms of transportation require an energy source. Currently, the most common modes of transportation rely on fossil fuels as their energy source. Gasoline, diesel, natural gas, and propane are all fossil fuels that are commonly used for public buses. Ferries and other marine vessels are typically fueled by diesel. These fossil fuels are formed similarly to coal, one key difference being that coal comes primarily from trees and large ferns that lived millions of years ago while petroleum products derived from crude oil, such as gasoline, diesel and jet fuel, and heating oil, generally come from the fossil remains of microscopic animal and plant-like marine organisms (plankton). Crude oil formed as layers of decaying remains built up and became compacted by intense heat and pressure. Once removed from the ground, crude oil is sent to a refinery where it is separated into petroleum products, including gasoline and diesel. Over millions of years, as crude oil forms, pockets of "natural" gas get trapped. Propane is derived from natural gas as it is being processed. Natural gas is a mix of many gases and propane is chemically pure. Some modern trains, including subway trains, are powered by diesel while others are powered by electricity supplied by overhead wires or additional rails. Nearly half of the United States' electricity is generated by burning coal.

There are a number of benefits of using public transportation, such as reducing the number of automobiles on the roads, which reduces emissions and helps conserve energy sources.

What other energy connections can you think of?

Clue 1
Designed to slow heat transfers

Clue 2
Utilizes reflective materials to slow the movement of heat by minimizing infrared radiation

Clue 3
Can be used over and over again to help keep food hot… or cold

.....

Clue 1
Contains a circuit

Clue 2
Use photovoltaic (PV) cells to convert sunlight directly into electricity

Clue 3
Won’t help you do your math homework after dark!

Insulated bag's energy connections

Many products designed to keep things hot or cold (thermoses, travel mugs, home insulation, space or emergency blankets) utilize reflective materials. A key piece to remember is that "heat" moves – "cold" does not. Materials and substances warm up or cool down because of heat transfers. Foil insulation slows the movement of heat by reflecting infrared radiation. In the case of a silver-lined thermos bottle, the silver lining inside keeps the food hot by reflecting the hot food's infrared radiation back to itself. For the same reason, the most effective way to use an emergency or space blanket is to keep the silver side towards the body.

In addition to the insulating properties of reusable bags, unlike plastic bags, reusable bags are generally not petroleum based. Energy is used to produce and distribute both types, and the reusable feature saves energy.

What other energy connections can you think of?

Solar calculator's energy connection

Calculators are one example of a growing number of solar powered devices available to consumers. Solar powered calculators use solar or photovoltaic (PV) cells, which convert sunlight directly into electricity. When light strikes a cell, a certain portion of that light is absorbed by a specially treated material (semiconductor). This material allows the free flow of electrons (electricity). This free flow of electrons, an electric current, can be drawn off and used to power a calculator. There are many online and print resources that provide more detailed information about how solar cells work and the history of the development of solar cells. More and more homes and businesses have solar cell components.

Many people own or have used a solar powered calculator or some other solar powered device. Many people think that it is the sun or the heat from the indoor lighting rather than its light itself that is being absorbed by the cells. It is light and not heat that is absorbed by a PV cell. How could you test this?

What other energy connections can you think of?

Clue 1
These entertaining devices date back to the 15th century.

Clue 2
Rely on “human power”

Clue 3
Frequently use the energy in compressed or stretched materials (e.g. rubber bands or springs) to make them work.

.....

Clue 1
Do not produce heat

Clue 2
Are fashionable insulators

Clue 3
Traditionally made from many natural fibers including animal fur and wool, today can be made from human-made materials such as Thisulate, Goretex or Kevlar.

Wind up toy's energy connections

A number of simple toys and devices- slingshots, bows and arrows, wind-up toys, watches, balloons, music boxes, and bungee cords use the energy of deformed (compressed or stretched) materials. Elastic energy is the energy stored when elastic materials are stretched or compressed. Materials that have elastic properties (such as rubber bands or springs) can be "reshaped" but naturally revert to their original shape when the force causing the deformation is removed. Many wind-up toys contain a spring that becomes compressed or tightened as it is turned by a key. After release, the spring reverts back to its original, decompressed position often turning a series of gears that make the toy "go" and/or produce other interesting effects such as sound or light.

Energy is readily associated with things that are in motion or are mechanical devices. Such low tech devices are often said to be "human powered." Taking this one step further, a person's energy can be traced back to the food they ate and ultimately the sun.

What other energy connections can you think of?

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Mitten's energy connection

Maine people are undoubtedly familiar with mittens and know something about why one wears mittens outside in the colder months. We all know mittens help keep your hands warm but did you ever stop to think about why they work?

Many people incorrectly believe that insulating objects produce their own heat. Some people often think of heat as an intrinsic property of a material or object. In other words, they think of materials as being inherently hot or cold or as containing a certain amount of "hotness" or "coldness." Heat is a form of energy - not a substance - yet it is often described as one. The mitten is not in and of itself "warm." The mitten does not give off heat. The mitten is not a heat source and it does not have a higher starting temperature than its surroundings. The person wearing the mitten gives off heat. The fiber that the mitten is made from has insulating properties that are effective in slowing the transfer of heat energy so the mitten "holds in" the body's warmth thus making the person feel warmer.

What other energy connections can you think of?

Clue 1
Its container is a petroleum based product.

Clue 2
Is used in its liquid and gaseous states in the process of generating electricity

Clue 3
Its dihydrogen monoxide components can be used to fuel cars.

.....

Clue 1
This simple child's toy is a close cousin to sails, whirligigs, and turbines.

Clue 2
Requires air flowing from a high pressure area to a low pressure area to work

Clue 3
"Captures" energy from this renewable energy resource

Bottle of water's energy connections

Numerous connections can be made between a bottle of water and energy. Water is directly involved in the generation of electricity via hydroelectric dams. Water is also a key component in nearly all other types of electrical generation methods, as fuels are burned to produce steam to spin turbines. The movement of water through the water cycle and energy's role in water's change of state, especially in the context of weather, is another critical connection between water and energy.

Living things need water, but not as an energy source like food. Instead, water a key factor in the many chemical processes necessary for sustaining life. Providing clean, safe drinking water for people requires energy.

Water has always played a tremendous role in transportation. A present-day connection is the development of hydrogen powered cars– vehicles specially designed with fuel cell technologies that work by converting hydrogen and oxygen into water, and in the process it produces electricity.

Then there is bottled water! Plastic bottles not only require energy to be manufactured and distributed but plastics are petroleum products – derivatives of nonrenewable fossil fuels. Think of all of the energy that could be saved by using reusable water bottles instead of plastic ones.

What other energy connections can you think of?

.....

Pinwheel's energy connection

The connection my friend is blowing in the wind…

Wind is caused by air flowing from high pressure area to low pressure area. As the sun heats up a certain area of land, the air around that land absorbs some of that heat. The hotter air above the land begins to rise very quickly. This happens because a given volume of hotter air is lighter than an equal volume of cooler air. When that lighter hot air suddenly rises, cooler air flows in. That air rushing in is wind. If an object such as a pinwheel or a wind turbine blade is put in the path of that wind, the wind will push on it, transferring some of its own energy of motion to the blade. This is in essence how a wind turbine, pinwheel, or boat sail "captures" energy from the wind.

More and more people are working on technologies that can harness wind in order to generate electricity. Maine has several large-scale wind projects across the state. As with any energy source there are pros and cons of wind power.

What other energy connections can you think of?

Clue 1
Established nationally in 1974

Clue 2
Contributes to increased efficiency

Clue 3
Fuels is required to get autos moving at this or any speed

.....

Clue 1

Clue 2

Clue 3

Speed limit sign's energy connections

In 1974 a 55 mile per hour speed limit was put into law as a provision of the Emergency Highway Conservation Energy Act. The law, called the National Maximum Speed Law prohibited speed limits higher than 55 mph part of a nationwide effort to reduce oil consumption. The law was amended in 1987 to allow 65 mph speed limits on certain roadways and in the 1990's the law was repealed putting the decision at the state level.
55 mph was designated top speed because it was thought to be the most efficient speed for saving fuel. As it turned out, the energy saved was minimal (about 1%) or about the same amount a driver could achieve by maintaining proper air pressure in their tires. The 55 mph speed limit did save lives the first year the law was in effect. While there is some discrepancy in most efficient speed limit, many sources indicate it is between 55-65 mph.

Many students associate movement with energy. They may also make the connection that vehicles that travel on roadways are fueled by an energy source (gasoline, diesel, electricity, etc.).

What other energy connections can you think of?

.....

X's energy connection

What other energy connections can you think of?