

RENEWABLE ENERGY IN ACTION! Resource Guide



Galiano
Conservancy
ASSOCIATION

CELEBRATING

1989

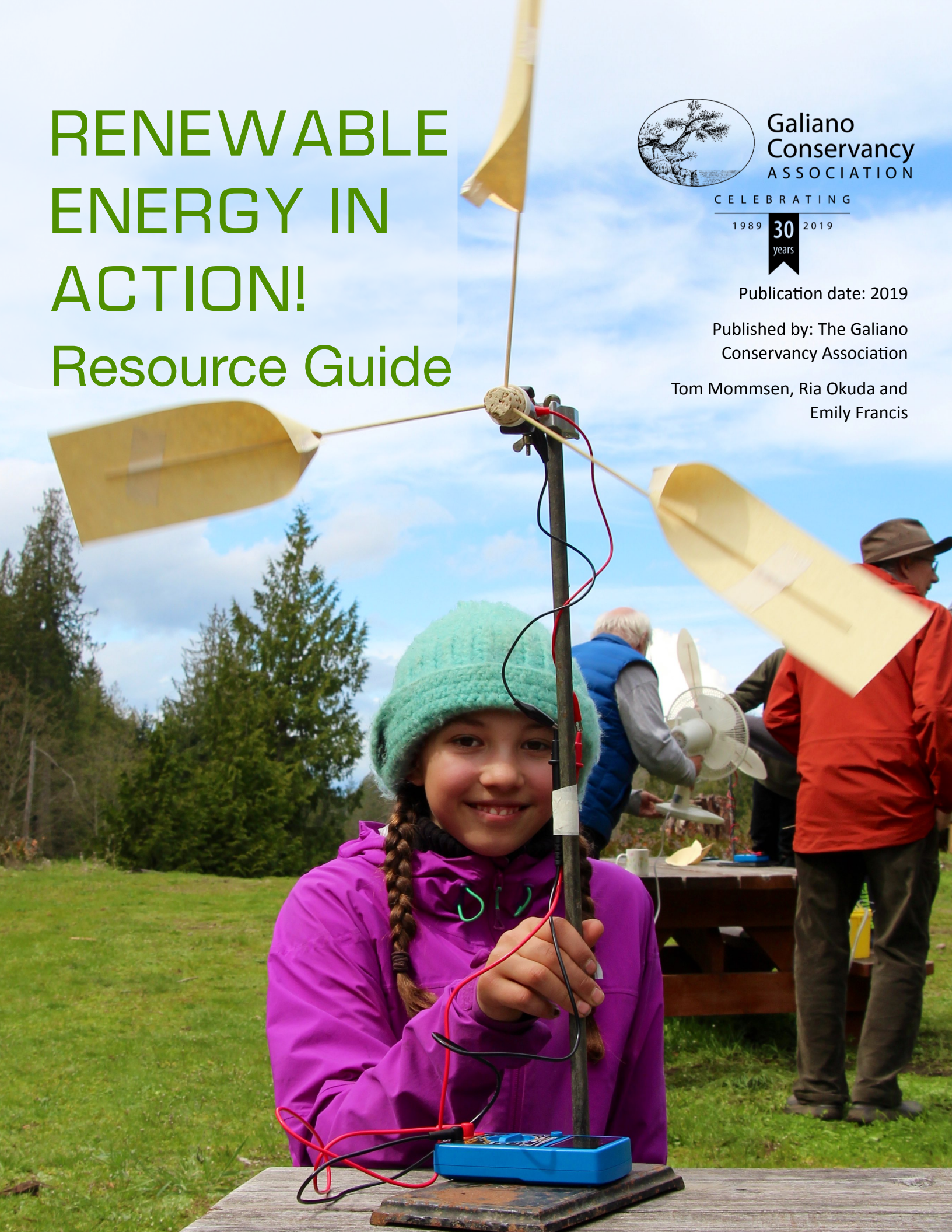
30
years

2019

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RENEWABLE VS. NON-RENEWABLE

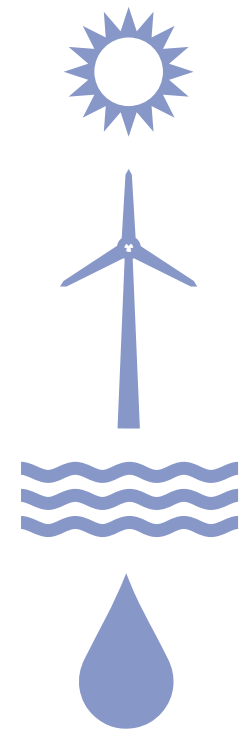


As consumers of energy, we require a large input of energy to go about our daily life. We mainly use it for electricity, heat and transportation. We can receive our energy from **non-renewable** and **renewable** sources. More commonly and historically we use non-renewable sources of energy such as coal, petroleum, natural gas, propane and uranium. These non-renewable sources of energy are being depleted and are not able to regenerate in a foreseeable timeline. They also contribute to the global production of greenhouse gases that accumulate in the earth's atmosphere, which in turn leads to global warming and climate change. Global carbon dioxide concentrations have increased from about 280 ppm in preindustrial times to 414 ppm in April 2019 (a 48% increase). The overwhelming portion of this increase is due to human activity, i.e. burning of fossil fuels. Agriculture (livestock, rice) and other human activities (draining wetlands, hydro-reservoirs, gas exploration, fracking, etc.) also produce methane, a greenhouse gas that is 80 times more powerful than carbon dioxide.

Renewable energy comes from resources that are continuously replenished by nature. They will not run out as long as our sun is shining. **Sustainable** sources of energy are those that meet the needs of people now and in the future without detriment to the source or the environment.

As the global demand for energy increases and the effects of greenhouse gases are changing our global climate systems, the need to replace fossil fuels like coal, gasoline and gas with renewable and sustainable energy sources is extremely important and urgent.

THE MAIN SOURCES
OF RENEWABLE ENERGY
ARE SOLAR, WIND,
WAVES AND WATER.



THE SUN



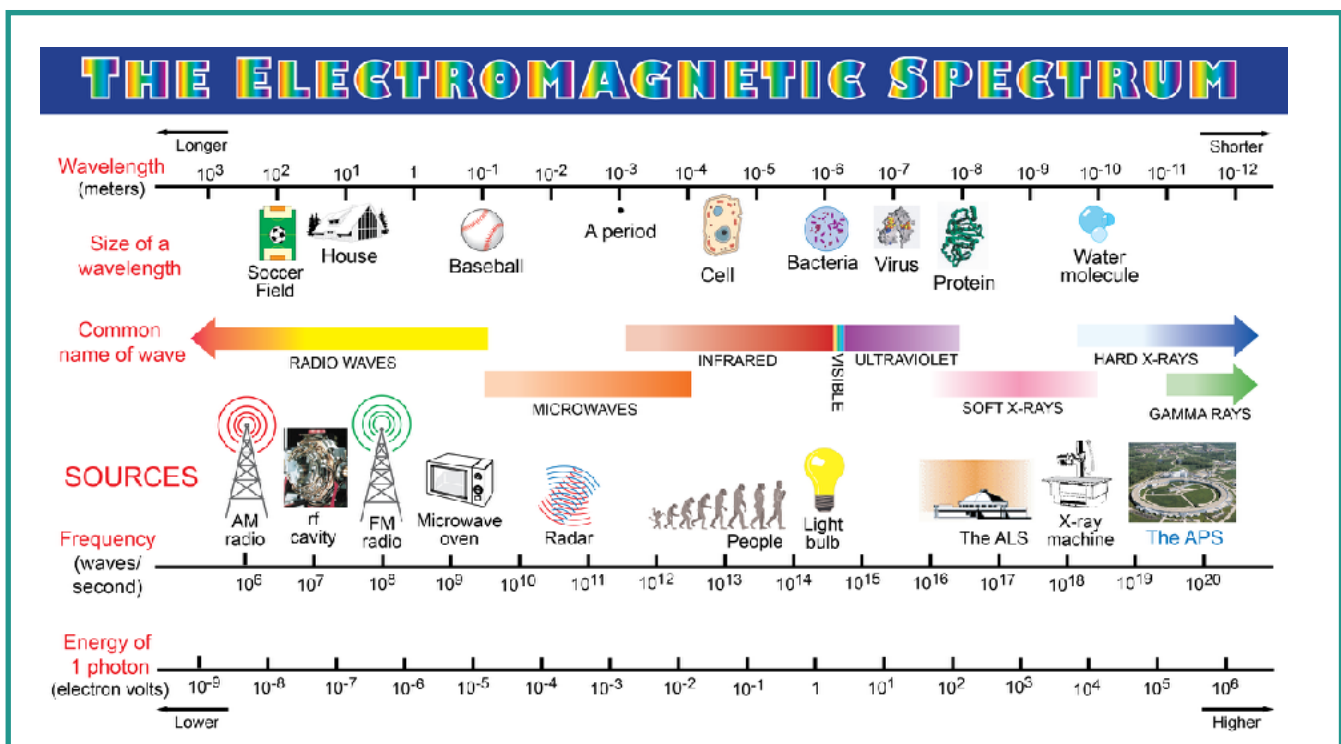
SOLAR ENERGY IS THE MOST ABUNDANT RENEWABLE ENERGY SOURCE.

We are constantly receiving energy from the sun. In less than two hours, the sun delivers all energy used by people in a year!

The sun emits a variety of electromagnetic or radiant energies. This energy can travel through space in the form of a wave. The electromagnetic spectrum (pictured below) describes all forms of light energy and their associated wavelengths.

Solar technologies harvest radiant energies emitted by the sun to produce electricity, thermal energy (heat) or both.

Photovoltaic (PV) panels use visible light to directly generate electricity. **Concentrated Solar Power (CSP)** plants convert light energy into thermal energy to produce electricity. CSP uses big mirrors to focus light onto a small point. This small point gets very hot and generates steam to drive a turbine (Stirling engine), which in turn produces electricity. **Thermal Collectors** capture incoming solar radiation as thermal energy which can be used to heat buildings or water.



WIND



The mechanical energy from wind – air in motion - has long been captured by humans; first by sails and later by windmills used for pumping water or grinding grain and more recently by specific wind turbines that generate electricity. For wind turbines to work efficiently to generate electricity, bigger is better—taller towers will be exposed to more constant wind than closer to the earth’s surface. The newest developments are giant off-shore floating wind turbines that may produce in a single turn as much electricity as needed to run a house for a day.

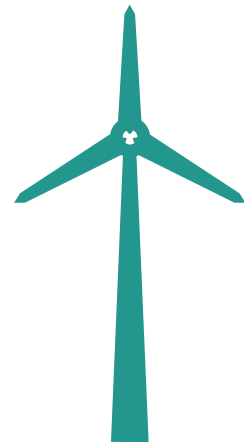


Photo: Zhunisali, creative commons



Photo: Murdock, creative commons



Photo: Leaflet, creative commons

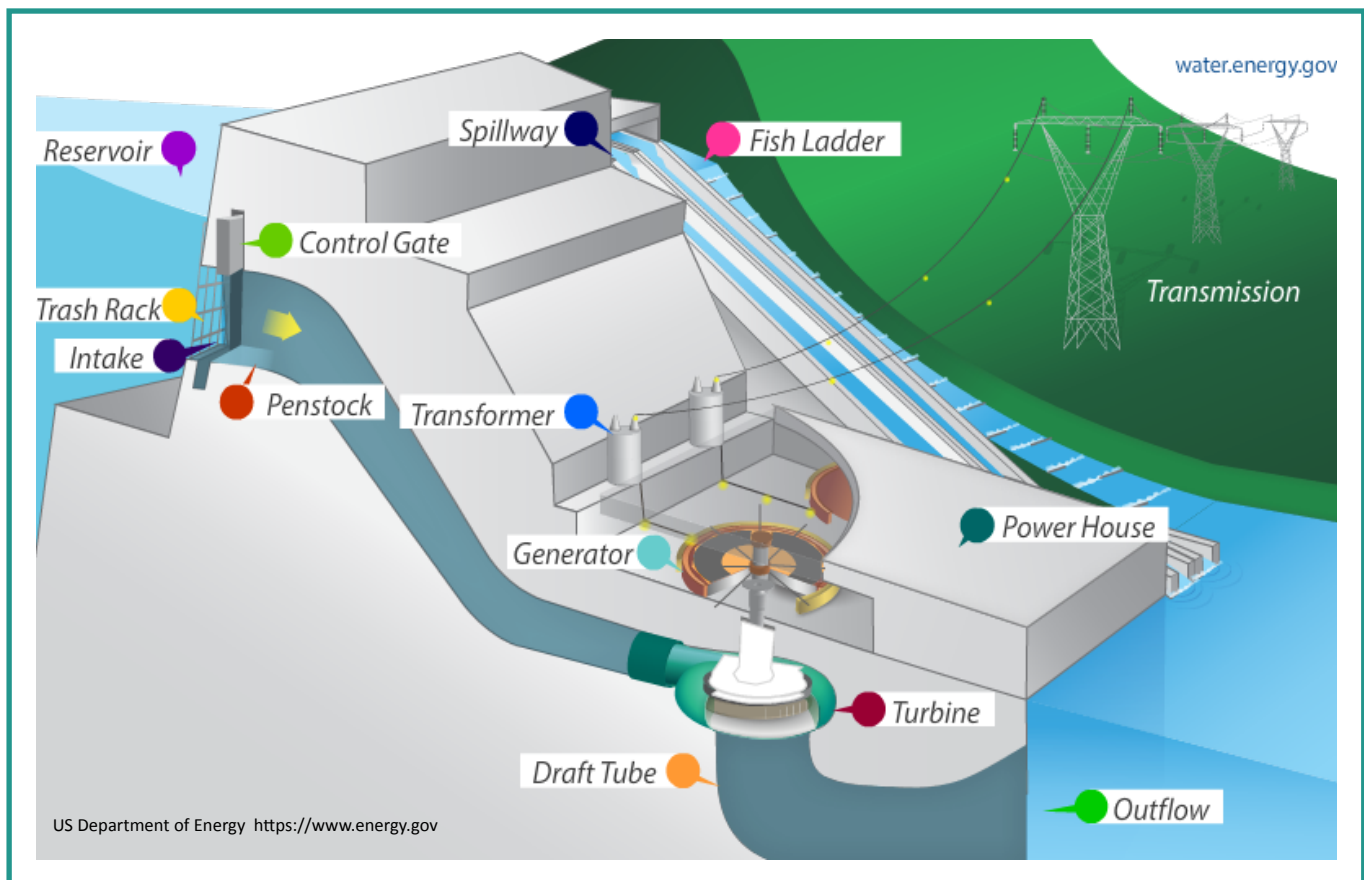
WATER



Hydro power is created from the movement of water through a turbine. Large dams hold vast amounts of potential energy in the form of stored water. As water is sent through turbines, the potential energy is converted to mechanical energy. The mechanical energy from the rotating turbine is then converted to electrical energy via a generator.

Although hydro power is considered renewable and is a reliable electricity source for many people, large and small scale dams can impact river ecosystems and their surrounding environments. Large-scale hydro dams can also produce vast amounts of methane—a greenhouse gas 80 times more powerful than carbon dioxide in terms of global warming potential.

BRITISH
COLUMBIA
RECEIVES ALMOST
90% OF ITS
ELECTRICITY
FROM HYDRO
DAMS.



DEFINITIONS



Potential energy is stored energy and the energy of position.

Kinetic energy is the motion of waves, electrons, atoms, molecules, substances, and objects.

Global warming: An increase in the near-surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is today most often used to refer to the warming observed as a result of increased anthropogenic emissions of greenhouse gases.

Climate change: A term used to refer to all forms of climatic inconsistency, but especially to significant change from one prevailing climatic condition to another. In some cases, "climate change" has been used synonymously with the term "global warming".

Greenhouse gases: Those gases, such as water vapour, carbon dioxide, methane, nitrous oxide and hydrofluorocarbons (HFCs), that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.

Carbon dioxide (CO₂): A colourless, odourless, non-poisonous gas that is a normal part of Earth's atmosphere. Carbon dioxide is a product of fossil-fuel combustion as well as other processes. It is considered a greenhouse gas as it traps heat (infrared energy) radiated by the Earth into the atmosphere and thereby contributes to the potential for global warming. The global warming potential (GWP) of other greenhouse gases is measured in relation to that of carbon dioxide, which by international scientific convention is assigned a value of one. Also see [Global warming potential \(GWP\)](#) and [Greenhouse gases](#).

Methane: Methane (CH₄): A colourless, flammable, odourless hydrocarbon gas which is the major component of natural gas. It is also an important source of hydrogen in various industrial processes. Methane is a powerful greenhouse gas.

Voltage: the amount of pressure applied to make electrons move, strength of the current in a circuit. Units = volts (V).

Current: electrons flowing between two points with a difference in voltage. Units = amperes or amps (A).

Resistance: slowing the flow of electrons. Units = ohms (Ω).

Power: the amount of electric current flowing based on voltage applied, amount of electricity required to start or operate a load. Units =watts (W) in a DC system $W=V*A$.

Interested in learning more about the Galiano Conservancy or want to book one of our programs?

Contact us!

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and Ria Okuda Environmental Educator

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RESOURCES



Instructions for a Bicycle Blender

<https://foodshare.net/program/blender/>

What is energy? -

https://www.eia.gov/energyexplained/index.php?page=about_home and

Laws of energy

https://www.eia.gov/energyexplained/index.php?page=about_laws_of_energy

Canada Energy Facts 2016 : Energy Generation by type- (Natural Resources Canada)

<https://www.nrcan.gc.ca/energy/facts/electricity/20068>

Canada Energy Fact Book 2016-2017

https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/pdf/EnergyFactBook_2016_17_En.pdf

Stats – Energy & Canada's Economy 2017

<https://www.nrcan.gc.ca/energy/facts/energy-economy/20062#L7>

Canada Renewable Energy Production

<https://www.nrcan.gc.ca/energy/facts/renewable-energy/20069#L1>

Galiano Conservancy Renewable Energy Program

<https://galianoconservancy.ca/product/renewable-energy/>

Giant wind turbine

<https://www.weforum.org/agenda/2018/03/giant-offshore-turbine-wind-energy-haliade-x/>

Energy Literacy

www.energy.gov https://www.energy.gov/sites/prod/files/2017/07/f35/Energy_Literacy.pdf

Energy Workbooks and Teacher guides

<https://www.solardecathlon.gov/education-curriculum.html>

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