

*Newsletter No.5*

*May 2022*



TOGETHER NOW FOR THE FUTURE  
OF OUR PLANET

2019-I-CZ01-KA229-061142\_1

# Renewable Energy

*Fedor Nikitin*  
*Kseniia Palka-Kuznetsova*

THIS IS THE  
ONLY HOME  
WE HAVE



Funded by the  
Erasmus+ Programme  
of the European Union

# What is renewable energy

Renewable energy is energy that is collected from renewable resources that are naturally replenished on a human timescale. It includes sources such as sunlight, wind, rain, tides, waves, and geothermal heat. Although most renewable energy sources are sustainable, some are not.



## The Advantages of Renewable Energy Resources

**A FUEL SUPPLY THAT NEVER RUNS OUT** - Unlike the mining of coal, oil, and natural gas which require extensive networks of heavy machinery, processing stations, pipelines, and transportation, renewables convert natural resources directly into electricity. And while many fossil fuels are becoming harder and more expensive to source, renewable energy never runs out and is easily found.



**ZERO CARBON EMISSIONS** - Perhaps the most significant benefit of renewable energy is that there are no greenhouse gasses or other pollutants created during the process. Considering coal power plants create around 2.2 pounds of CO<sub>2</sub> for every kilowatt-hour of electricity whilst solar panels and wind turbines create none at all.

**BERKELEY LAB**  
**Getting to Net-Zero Carbon Emissions by 2050**  
8 actions needed by 2030

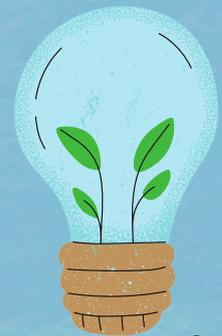
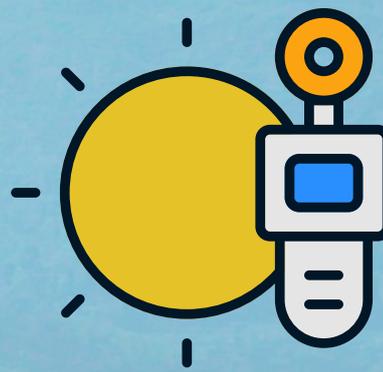
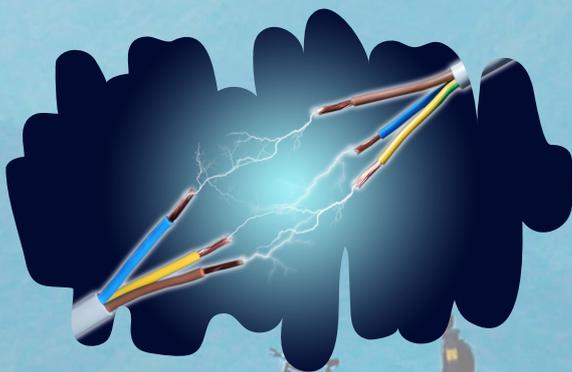
<b>1</b> Increase solar and wind capacity 3.5 times, to 500 gigawatts	<b>4</b> Increase zero-emission vehicle sales share to 50%	<b>6</b> All new buildings and appliances meet strict energy efficiency goals
<b>2</b> Eliminate most electricity generation from coal	<b>5</b> Increase sales share of building heat pumps to 50%	<b>7</b> R&D for carbon capture, sequestration, and carbon-neutral fuels
<b>3</b> Maintain current natural gas generating capacity for reliability	<b>8</b> Build electricity transmission and pipelines for carbon dioxide and hydrogen gas.	

An infographic grid with 8 numbered boxes, each containing an illustration and a text description of an action needed by 2030 to reach net-zero carbon emissions by 2050. The actions are: 1. Increase solar and wind capacity 3.5 times, to 500 gigawatts; 2. Eliminate most electricity generation from coal; 3. Maintain current natural gas generating capacity for reliability; 4. Increase zero-emission vehicle sales share to 50%; 5. Increase sales share of building heat pumps to 50%; 6. All new buildings and appliances meet strict energy efficiency goals; 7. R&D for carbon capture, sequestration, and carbon-neutral fuels; 8. Build electricity transmission and pipelines for carbon dioxide and hydrogen gas.

**CLEANER AIR AND WATER** - Burning fossil fuels to generate electricity does far more than warm the climate; it also contaminates the air we breathe and the water we drink. But in addition, they also emit mercury, lead, sulfur dioxide, and dangerous metals which can cause a lot of health problems ranging from breathing difficulties to premature death. Fossil fuel electricity can also contaminate waterways, both from air pollution that falls to the ground during rain, and waste materials created during the production process. Whilst on the other hand, renewable energy creates no pollution, waste, or contamination risks to air and water.



**A CHEAPER FORM OF ELECTRICITY** - With the rapid growth of renewable energy over the last ten years, solar and wind power are now the cheapest sources of electricity in many parts of the world. In the United Arab Emirates - an area well-known for its abundant land and sunny weather - a new sun farm recently secured the world's lowest price of solar energy at just 1.35c per kilowatt-hour.



**RENEWABLE ENERGY CREATES NEW JOBS** - With an increasing focus on global warming and many governments setting ambitious carbon-reduction goals, one of the surprising renewable energy advantages is that it has quickly become a major source of new job growth.



# The Disadvantages of Renewable Energy



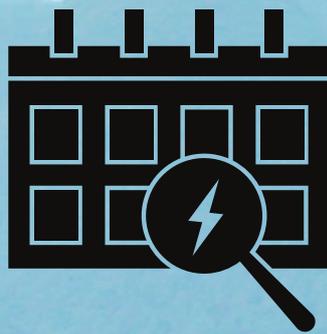
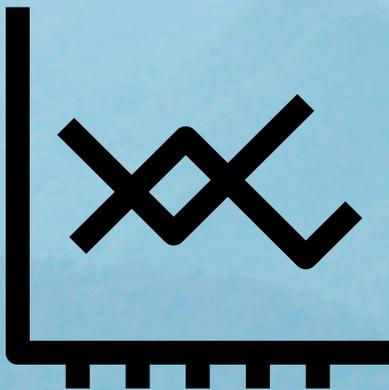
**HIGHER CAPITAL COSTS** - While renewable energy systems need no fuel and can deliver substantial long-term savings, their up-front costs can still be prohibitive. For example, installing a solar system on your home may cost \$10,000 - \$20,000, and despite your desire to power your house with renewable energy, the price tag may push it out of reach.

## Cost of capital:

This is the true cost of securing the funds that the business uses to pay for its assets. Some funds are from debt (less interest to the creditors, so it's a lower cost of capital to the firm). Some are from



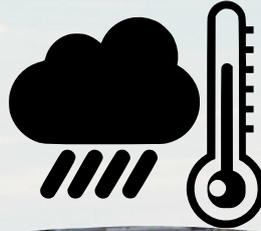
**ELECTRICITY PRODUCTION CAN BE UNRELIABLE** - renewable energy systems rely on natural resources such as sunlight, wind, and water, and therefore, their electricity generation can be as unpredictable as the weather. Solar panels lose efficiency on cloudy days, wind turbines aren't effective in calm weather, and hydropower systems need consistent snow and rainfall to maintain reliable production. At the same time, when renewable systems produce too much energy, they risk overloading the grid and causing major problems for network operators.



**ENERGY STORAGE IS A CHALLENGE** - Due to the intermittent nature of renewables, they need forms of energy storage to capture and release electricity in a consistent and controlled way. Utility-scale batteries have gained significant momentum in recent years, such as the world's largest system that recently came online in California. However, despite falling costs, storage technology is still relatively expensive and there are some lingering issues regarding its reliability and lifespan.



**IT'S IMPACTED BY ENVIRONMENTAL CONDITIONS** - The efficiency of renewable energy systems also depends on their location and surrounding environment. For example, wind turbines are only effective in large, open areas with strong and consistent wind, which limits their viability to specific regions. And while solar panels generate some electricity even on cloudy days, they are most productive in locations with consistently bright and sunny climates.



**RENEWABLES STILL HAVE A CARBON FOOTPRINT –**

While solar panels and wind turbines produce no carbon emissions as they make energy their manufacturing, transport, and installation still creates a carbon footprint. Renewable energy components are typically made in large factories that consume high amounts of electricity, in addition to the diesel and gasoline vehicles needed for their transport and installation.



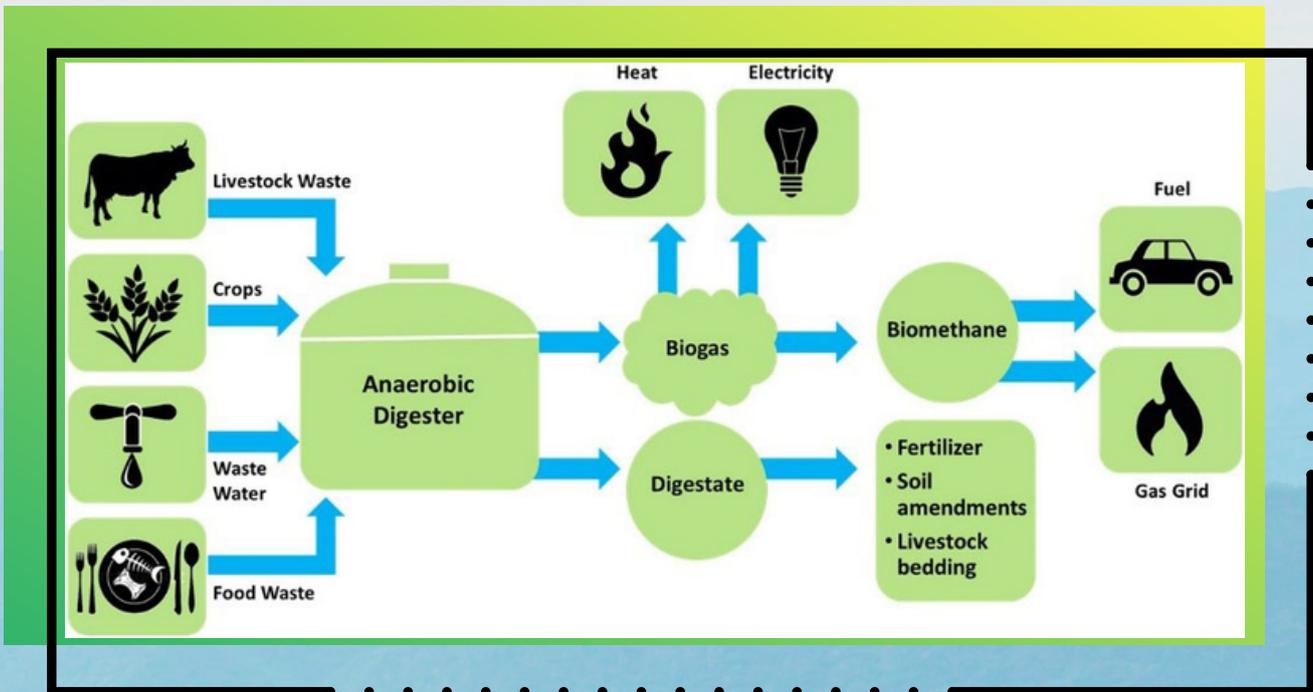
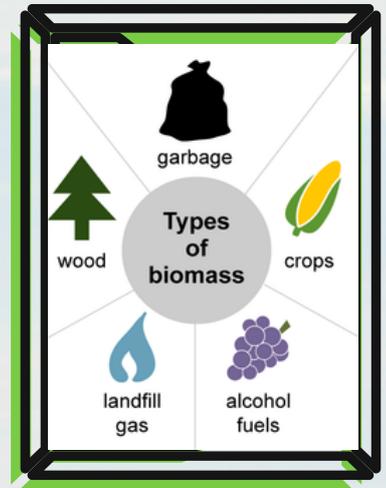
# 10 TYPES OF RENEWABLE ENERGY



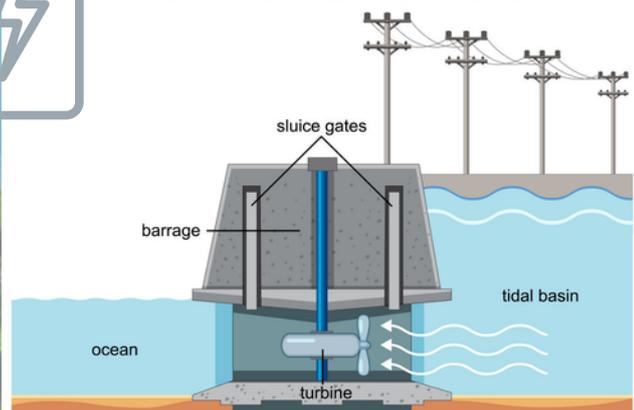
**Biomass** - This is an organic matter for thousands of years, such as wood which is still our largest biomass energy resource even today. Other sources of biomass can be used including plants, residues from agriculture or forestry and the organic components.



**Biogas** - This is a mixture of methane, carbon dioxide, hydrogen and hydrogen sulphite, the major constituents being methane. Biogas is produced by anaerobic degradation of animal and plant wastes in the presence of water. This is a non-polluting, clean and low-cost fuel which is very useful for rural areas.



## Tidal Power Station

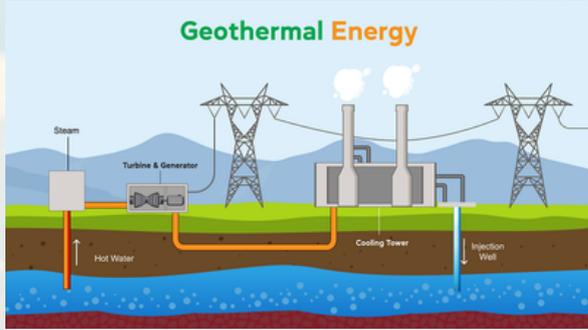
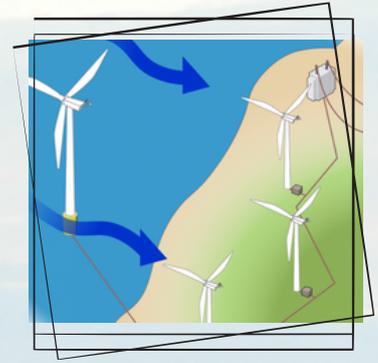


**Tidal energy** - Tidal energy can be generated in two ways, tidal stream generators or by barrage generation. The power created through tidal generators is generally environmentally friendly and causes less impact on established ecosystems. It is similar to the wind energy. Tidal energy is the only form of energy that derives directly from the motions of the Earth-Moon system.





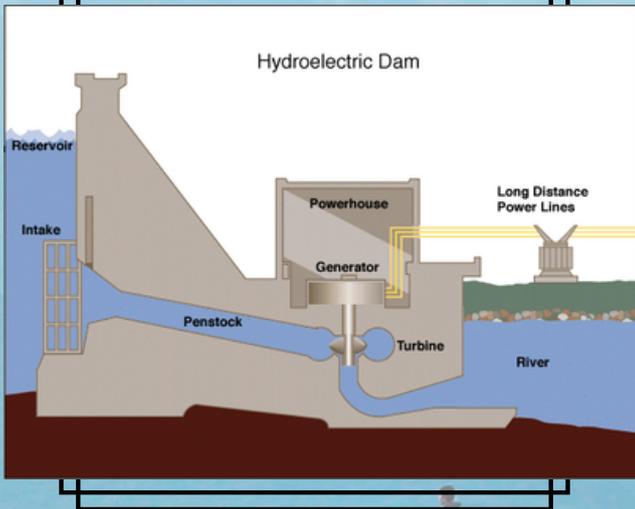
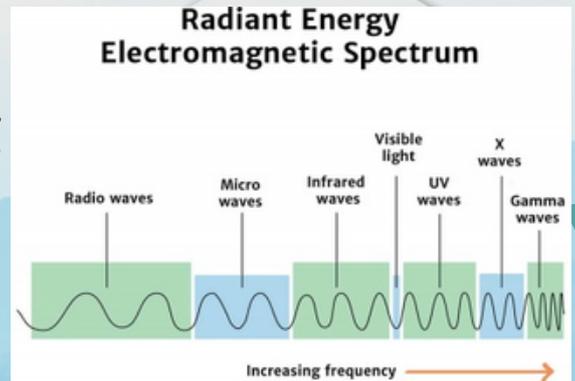
**Wind energy** - Wind energy is a conversion of wind energy by wind turbines into a useful form, such as electricity or mechanical energy. Wind farms are installed on agricultural land, grazing areas or on small platforms in the sea, they have one of the lowest environmental impacts of all energy sources. The principal application of wind power today is the generation of electricity.



**Geothermal Energy** - Geothermal energy is the heat from Earth. It's clean and sustainable. Resources of geothermal energy range from the shallow ground to hot water and hot rock found a few miles beneath the Earth's surface. The steam or hot water comes out of the cracks in the Earth and when it doesn't find any way to come out, holes are drilled with pipes in it to gush the hot water out due to high pressure which turn the turbines of a generator to produce electricity.



**Radian energy** – This is energy that is transferred by electromagnetic radiation, such as light, X-rays, gamma rays, and thermal radiation, which are described in terms of either discrete packets of energy, called photons, or continuous electromagnetic waves. Nikola Tesla built one of the earliest wireless telephones to be based on radiant energy.

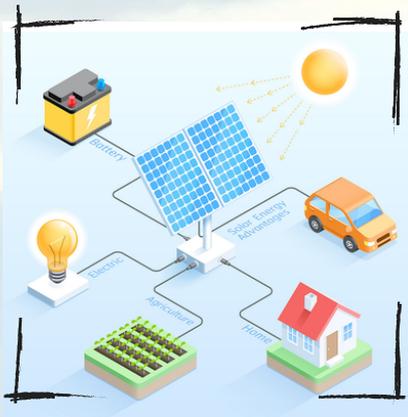


**Hydroelectricity** - This is the most widely used form of renewable energy. The gravitation force of falling water which spins turbines is the key point in hydroelectricity generation. Small scale hydro or micro- hydro power has been an increasingly popular alternative energy source, especially in remote areas where other power sources are not viable. But hydroelectricity has a few major environmental problems like water logging and siltation, which causes loss of biodiversity of fish population and other aquatic animals.



**Compressed natural gas** - Compressed natural gas is a substitute for gasoline, diesel or propane fuel. It is cleaner and safer to use as it diffuses easily into the surroundings if leaked. However, burning it does release a few greenhouse gases in the air. Compressed natural gas is used in traditional gasoline internal combustion engine cars that have been converted into bi-fuel vehicles.

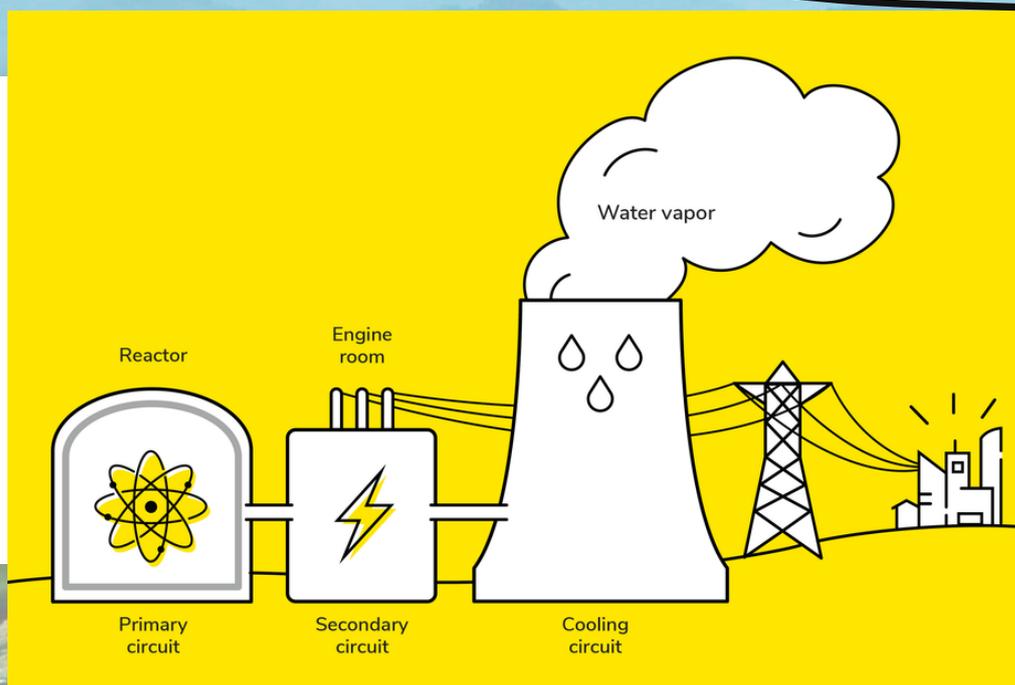




**Solar energy** - The sun offers an ideal energy source, unlimited in supply, which does not add to the earth's total heat burden and does not produce air and water pollutants. Although it has its problems such as the fact it is expensive and the major fact that it is not always sunny and in some countries the sunlight is not as long as in other countries.

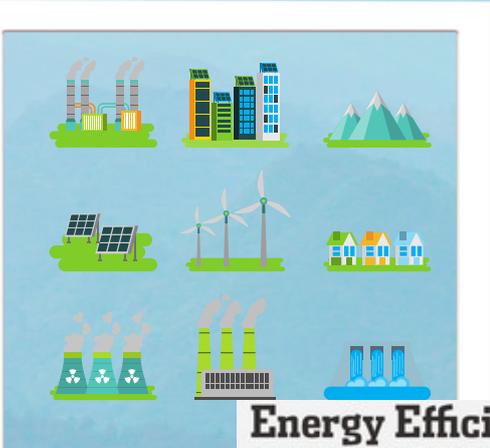


**Nuclear energy** - Proponents of nuclear energy contend that nuclear power is a sustainable energy source that reduces carbon emissions and increases energy security by decreasing dependence on foreign oil. Nuclear fission is used to extract energy from atomic nuclei via controlled nuclear reactions. Utility scale reactors are used to produce steam which is then converted into mechanical work for the purpose of generating electricity or propulsion. Obviously has risks as it works on radioactive and dangerous components such as plutonium and uranium.



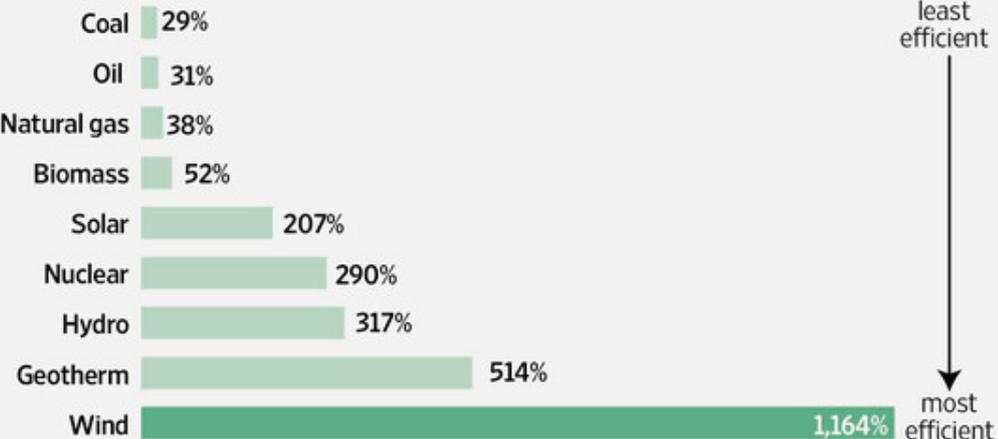
# Statistics

Wind is the most efficient fuel for electricity, it creates 1164% of its original energy inputs when converted into electricity. The annual share of U.S. electricity generation from renewable energy sources will rise from 20% in 2021, to 22% in 2022. The production and use of renewable energy are rising, and almost 30% of the electricity consumed on the planet comes from renewable energies. Norway is the largest clean energy producer, as 98.4% of its energy production comes from renewable sources. Energy generated from renewable energy sources currently represents about 12% of the Czech Republic's energy mix. Around 35% of overall energy production is nuclear with the remaining 53% coming from fossil fuels – statistic from 2020 In an interesting chain of events Brussels has given the green light for the EU to burn more coal over the next decade as it tries to end the use of Russian gas and oil. Coal is the most carbon-intensive fuel but the European Commission said the EU would use 5 per cent more than previously expected over the next five to 10 years as the bloc tries to replace Russian energy imports.



## Energy Efficiency

Percentage of energy input retained when converting fuel to electricity



Source: Energy Points

The Wall Street Journal

# Sources



- [https://en.wikipedia.org/wiki/Renewable\\_energy#:~:text=Renewable%20energy%20is%20energy%20that,are%20sustainable%2C%20some%20are%20not.](https://en.wikipedia.org/wiki/Renewable_energy#:~:text=Renewable%20energy%20is%20energy%20that,are%20sustainable%2C%20some%20are%20not.)
- <https://atomberg.com/top-10-renewable-energy-sources/>
- <https://www.eia.gov/energyexplained/what-is-energy/sources-of-energy.php>
- <https://afry.com/en/area/renewable-energy>
- <https://news.energysage.com/advantages-and-disadvantages-of-renewable-energy/>

