



Renewable (Sustainable, clean) energy

Vs

Non-renewable (unclean fossil fuel) energy

Part one

Renewable (Sustainable, clean) energy

Renewable Energy Sources



Bioenergy
Ocean



Geothermal
Solar



Hydropower
Wind



What Is Renewable Energy? – Definition, history, Types, Benefits

Renewable energies are booming as innovations cut costs and deliver on the promise of a [clean energy](#) future. American [solar](#) and [wind](#) generation breaks records and is integrated into the national power grid without compromising reliability.

This means that renewables are increasingly displacing “dirty” [fossil fuels](#) in the electricity sector, offering the benefit of lower CO2 emissions and other [types of pollution](#). But not all energy sources marketed as “renewable” are environmentally friendly. Here’s what you should know about the different types of renewable energy sources and how you can take advantage of these new technologies in your home.

What Is Renewable Energy?

Renewable energy, often referred to as clean energy, is derived from renewable resources that are naturally replenished constantly in the human timeframe. It includes sources such as sunlight, wind, rain, tides, waves, and geothermal heat.

Renewable energy contrasts with [fossil fuels](#), which are used up much faster than they are replenished. Although most renewable energy sources are sustainable, some are not. For example, some biomass sources are considered unsustainable at current exploitation rates.

Renewable energy sources often provide energy in four key areas: power generation, air, and water heating/cooling, transportation, and rural (off-grid) energy services. About 20% of the world's energy consumption by humanity comes from renewable sources, including nearly 30% of electricity.

About 8% of energy consumption is traditional biomass, but this figure is declining. More than 4% of the energy consumption is used for thermal energy from modern renewable energies, such as [solar water heating](#), and more than 6% for electricity.

History

Prior to the development of coal in the mid 19th century, nearly all energy used was renewable. The oldest known use of renewable energy, in the form of traditional [biomass](#) to [fuel fires](#), dates from more than a million years ago. The use of biomass for fire did not become commonplace until many hundreds of thousands of years later.^[47] Probably the second oldest usage of renewable energy is harnessing the wind in order to drive ships over water. This practice can be traced back some 7000 years, to ships in the Persian Gulf and on the Nile.^[48] From [hot springs](#), geothermal energy has been used for bathing since [Paleolithic](#) times and for space heating since ancient Roman times.^[49] Moving into the time of recorded history, the primary sources of traditional renewable energy were human [labor](#), [animal power](#), [water power](#), wind, in grain crushing [windmills](#), and [firewood](#), a traditional biomass.

In the 1860s and 1870s, there were already fears that civilization would run out of fossil fuels and the need was felt for a better source. In 1873 [Augustin Mouchot](#) wrote:

The time will arrive when the industry of Europe will cease to find those natural resources, so necessary for it. Petroleum springs and coal mines are not inexhaustible but are rapidly diminishing in many places. Will man, then, return to the power of water and wind? Or will he emigrate where the most powerful source of heat sends its rays to all? History will show what will come.^[50]

In 1885, [Werner von Siemens](#), commenting on the discovery of the [photovoltaic effect](#) in the solid state, wrote:

In conclusion, I would say that however great the scientific importance of this discovery may be, its practical value will be no less obvious when we reflect that the supply of solar energy is both without limit and without cost, and that it will continue to pour down upon us for countless ages after all the coal deposits of the earth have been exhausted and forgotten.^[51]

[Max Weber](#) mentioned the end of fossil fuel in the concluding paragraphs of his [Die protestantische Ethik und der Geist des Kapitalismus](#) (The Protestant Ethic and the Spirit of Capitalism), published in 1905.^[52] Development of solar engines continued until the outbreak of World War I. The importance of solar energy was recognized in a 1911 [Scientific American](#) article: "in the far distant future, [natural fuels](#) having been exhausted [solar power] will remain as the only means of existence of the human race".^[53]

The theory of [peak oil](#) was published in 1956.^[54] In the 1970s environmentalists promoted the development of renewable energy both as a replacement for the eventual [depletion of oil](#), as well as for an escape from dependence on oil, and the first electricity-generating [wind turbines](#) appeared. Solar had long been used for heating and cooling, but solar panels were too costly to build solar farms until 1980.^[55]

Since the 21st century, many parts of the world have transitioned to sources of renewable energy from [fossil fuels](#).

The Global Trend Towards Renewable Resources

Renewable resources have become a focal point of the environmental movement, both politically and economically. Energy obtained from renewable resources puts much less strain on the limited supply of fossil fuels, which are nonrenewable resources. The problem with using renewable resources on a large scale is that they are costly and, in most cases, more research is needed for their use to be cost-effective.

Beyond their limited supply, energy sources such as fossil fuels damage the environment when burned and contribute to global warming. The first major international accord to curb carbon dioxide emissions and global warming was the [Kyoto Protocol](#), signed in 1997.² More recently, global powers met in Paris in 2015 to pledge emissions reductions and focus on higher reliance on renewable resources for energy.³

There are many incentives designed to encourage the use of alternative energy. For example, energy taxes place a surcharge on fossil fuels so that the prices of renewable resources are more competitive and people will be more inclined to use renewable energy. [Green funds](#), investment vehicles such as mutual funds, support eco-friendly and sustainable companies by investing in them and helping to promote environmental awareness.

These incentives seem to be having an effect. According to the U.S. Energy Information Administration (EIA), In 2020, renewable energy provided approximately 11.6 quadrillion British thermal units (Btu). (One quadrillion is 1 followed by 15 zeros.) This amount of energy represented 12% of total U.S. energy consumption.⁴ The electric power sector consumed around 56% of U.S. renewable energy in 2020, and approximately 20% of U.S. electricity generation was from renewable energy sources.⁵

State and federal governments have encouraged more biofuel consumption by imposing requirements and incentives for the use of renewable energy. The EIA anticipates that U.S. renewable energy consumption will continue to increase through 2050.⁴

What Is the Kyoto Protocol?

The Kyoto Protocol is an international agreement that aimed to reduce carbon dioxide (CO₂) emissions and the presence of greenhouse gases (GHG) in the atmosphere. The essential tenet of the Kyoto Protocol was that industrialized nations needed to lessen the amount of their CO₂ emissions. The protocol was adopted in Kyoto, Japan in 1997, when greenhouse gases were rapidly threatening our climate, life on the earth, and the planet, itself.

What Is the Paris Climate Accord?

The Paris Climate Accord is an agreement among the leaders of over 180 countries to reduce greenhouse gas emissions and limit the global temperature increase to below 2 degrees Celsius (3.6 Fahrenheit) above pre-industrial levels by the year 2100. Ideally, the agreement aims to keep the increases to below 1.5 degrees Celsius (2.7 Fahrenheit). On Jan. 20, 2021, President Joe Biden signed an executive order announcing that the U.S. would rejoin the Paris Agreement after the Trump administration withdrew from it on Nov. 4, 2020.

What Is Being Done to Encourage the Use of Renewable Resources?

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- [The Kyoto Protocol Ended in 2012](#)
- [The Kyoto Protocol Today](#)
- [Purpose of the Kyoto Protocol](#)
- [Why Was the Kyoto Protocol Signed?](#)
- [Problems for Developing Nations](#)
- [Emissions the Kyoto Protocol Curbs](#)

What Is the Kyoto Protocol?

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The protocol was adopted in Kyoto, Japan in 1997, when greenhouse gases were rapidly threatening our climate, life on the earth, and the planet.¹ Today, the Kyoto Protocol lives on in other forms, and its issues are still being discussed.

KEY TAKEAWAYS

- The Kyoto Protocol is an international agreement that called for industrialized nations to reduce their greenhouse gas emissions significantly.
- Other accords, like the Doha Amendment and the Paris Climate Agreement, have also tried to curb the global-warming crisis.
- Talks begun by the Kyoto Protocol continue in 2021 and are extremely complicated, involving politics, money, and lack of consensus.

- The U.S. withdrew from the agreement on the grounds that the mandate was unfair and would hurt the U.S. economy.
- The Paris Climate Agreement of 2015, which replaced the Kyoto Protocol, includes commitments from all major GHG-emitting countries to reduce their climate-altering pollution.

The Kyoto Protocol Explained

Background

The Kyoto Protocol mandated that industrialized nations cut their greenhouse gas emissions at a time when the threat of global warming was growing rapidly. The Protocol was linked to the United Nations Framework Convention on Climate Change (UNFCCC). It was adopted in Kyoto, Japan on December 11, 1997, and became international law on February 16, 2005.¹

Countries that ratified the Kyoto Protocol were assigned maximum carbon emission levels for specific periods and participated in [carbon credit trading](#). If a country emitted more than its assigned limit, then it would be penalized by receiving a lower emissions limit in the following period.

Major Tenets

Developed, industrialized countries made a promise under the Kyoto Protocol to reduce their annual [hydrocarbon](#) emissions by an average of 5.2% by the year 2012. This number would represent about 29% of the world's total greenhouse gas emissions.

Targets depended on the individual country. As a result, each nation had a different target to meet by that year.

Members of the [European Union](#) (EU) pledged to cut emissions by 8%, while the U.S. and Canada promised to reduce their emissions by 7% and 6%, respectively, by 2012.²

\$100 billion

The amount of the Kyoto Protocol fund that was meant to aid developing countries in selecting non-greenhouse-emitting industrialized processes and technologies.³

Responsibilities of Developed Versus Developing Nations

The Kyoto Protocol recognized that developed countries are principally responsible for the current high levels of [GHG emissions](#) in the atmosphere as a result of more

than 150 years of industrial activity. As such, the protocol placed a heavier burden on developed nations than less-developed nations.

The Kyoto Protocol mandated that 37 industrialized nations plus the EU cut their GHG emissions. Developing nations were asked to comply voluntarily, and more than 100 developing countries, including China and India, were exempted from the Kyoto agreement altogether.

A Particular Function for Developing Countries

The protocol separated countries into two groups: Annex I contained developed nations, and Non-Annex I referred to developing countries. The protocol placed emission limitations on Annex I countries only. Non-Annex I nations participated by investing in projects designed to lower emissions in their countries.

For these projects, developing countries earned [carbon credits](#), which they could trade or sell to developed countries, allowing the developed nations a higher level of maximum carbon emissions for that period. In effect, this function helped the developed countries to continue emitting GHG vigorously.

The United States' Involvement

The United States, which had ratified the original Kyoto agreement, dropped out of the protocol in 2001. The U.S. believed that the agreement was unfair because it called only for industrialized nations to limit emissions reductions, and it felt that doing so would hurt the U.S. economy.⁴

The Kyoto Protocol Ended in 2012, Effectively Half-Baked

Global emissions were still on the rise by 2005, the year the Kyoto Protocol became international law—even though it was adopted in 1997. Things seemed to go well for many countries, including those in the EU. They planned to meet or exceed their targets under the agreement by 2011. But others continued to fall short.

The United States and China—two of the world's biggest emitters—produced enough greenhouse gases to mitigate any of the progress made by nations who met their targets. In fact, there was an increase of about 40% in emissions globally between 1990 and 2009.

The Doha Amendment Extended Kyoto Protocol to 2020

In December 2012, after the first commitment period of the Protocol ended, parties to the Kyoto Protocol met in Doha, Qatar, to adopt an amendment to the original Kyoto agreement. This so-called Doha Amendment added new emission-

reduction targets for the second commitment period, 2012–2020, for participating countries.⁵

The Doha Amendment had a short life. In 2015, at the sustainable development summit held in Paris, all UNFCCC participants signed yet another pact, the [Paris Climate Agreement](#), which effectively replaced the Kyoto Protocol.

The Paris Climate Agreement

The Paris Climate Agreement is a landmark environmental pact that was adopted by nearly every nation in 2015 to [address climate change](#) and its negative effects. The agreement includes commitments from all major GHG-emitting countries to cut their climate-altering pollution and to strengthen those commitments over time.⁶

Every five years, countries engage in the Global Stocktake, which is an assessment of their progress under the Paris Climate Agreement.

A major directive of the deal calls for reducing global GHG emissions to limit the earth's temperature increase in this century to 2 degrees (preferring a 1.5-degree increase) Celsius above preindustrial levels. The Paris Agreement also provides a way for developed nations to assist developing nations in their efforts to adapt climate control, and it creates a framework for monitoring and reporting countries' climate goals [transparently](#).⁷

The Kyoto Protocol Today

In 2016, when the Paris Climate Agreement went into force, the United States was one of the principal drivers of the agreement, and President Obama hailed it as “a tribute to American leadership.”⁸

As a candidate for president at that time, Donald Trump criticized the agreement as a bad deal for the American people and pledged to withdraw the United States if elected. In 2017, then-President Trump announced that the U.S. would withdraw from the Paris Climate Agreement, saying that it would undermine the U.S. economy.

The former president did not begin the formal withdrawal process until Nov. 4, 2019.⁹ The U.S. formally withdrew from the Paris Climate Agreement on Nov. 4, 2020, the day after the 2020 presidential election, in which Donald Trump lost his reelection bid to Joseph Biden.¹⁰

On January 20, 2021, his first day in office, President Biden began the process of rejoining the Paris Climate Agreement, which officially took effect on Feb. 19, 2021.¹¹

A Complicated Stalemate

In 2021, the dialogue is still alive but has turned into a complex quagmire involving politics, money, lack of leadership, lack of consensus, and bureaucracy. Today, despite myriad plans and some actions, solutions to the problems of GHG emissions and global warming have not been implemented.

Almost all scientists who study the atmosphere now believe that global warming is primarily the result of human action. Logically then, what humans have caused by their behavior should be able to be remedied by humans changing their behavior. It is frustrating to many that cohesive action to deal with the human-made global climate crisis has yet to happen.

The major types or sources of renewable energy are:

- [Solar energy](#) from the sun
- [Geothermal energy](#) from heat inside the earth
- [Wind energy](#)
- [Biomass](#) from plants
- [Hydropower](#) from flowing water

They are called renewable energy sources because they are naturally replenished. Day after day, the sun shines, plants grow, the wind blows, and rivers flow.

1. Solar Energy



[Solar power is energy](#) from the sun that is converted into thermal or electrical energy. Solar energy is the cleanest and most abundant renewable energy source available, and the U.S. has some of the richest solar resources in the world.

Solar technologies can harness this energy for a variety of uses, including generating electricity, providing light or a comfortable interior environment, and heating water for domestic, commercial, or industrial use.

There are three main ways to harness [solar energy](#): [photovoltaics](#), [solar heating & cooling](#), and [concentrating solar power](#). Photovoltaics generate electricity directly from sunlight via an electronic process and can be used to power anything from small electronics such as calculators and road signs up to homes and large commercial businesses.

Solar heating & cooling (SHC) and concentrating solar power (CSP) applications both use the heat generated by the sun to provide space or water heating in the case of SHC systems or to run traditional electricity-generating turbines in the case of CSP power plants.

2. Wind Energy

Wind power or [wind energy](#) describes the process by which the wind is used to generate mechanical power or electricity. [Wind turbines](#) convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific

tasks (such as grinding grain or pumping water) or can be converted into electricity by a generator.

You can learn [how wind turbines make electricity](#) and see an illustration of the components inside a wind turbine, or view a wind power animation that shows how moving air rotates a wind turbine's blades and how the internal components work to produce electricity.

3. Geothermal Energy

[Geothermal energy](#) is the heat that comes from the sub-surface of the earth. It is contained in the rocks and fluids beneath the earth's crust and can be found as far down as the earth's hot molten rock, magma.

To produce power from geothermal energy, wells are dug a mile deep into underground reservoirs to access the steam and hot water there, which can then be used to drive turbines connected to electricity generators. There are three types of geothermal power plants; dry steam, flash, and binary.

Dry steam is the oldest form of geothermal technology and takes the steam out of the ground and uses it to directly drive a turbine. Flash plants use high-pressure hot water into cool, low-pressure water whilst binary plants pass hot water through a second liquid with a lower boiling point, which turns to vapor to drive the turbine.

4. Tidal Energy

Tidal energy is produced by the surge of ocean waters during the rise and fall of tides. Tidal energy is a renewable source of energy.

During the 20th century, engineers developed ways to use tidal movement to generate electricity in areas where there is a significant tidal range the difference in area between high tide and low tide. All methods use special generators to convert tidal energy into electricity.

Tidal energy production is still in its infancy. The amount of power produced so far has been small. There are very few commercial-sized tidal power plants operating in the world.

5. Hydroelectric Power

[Hydroelectric energy](#), also called hydroelectric power or hydroelectricity, is a form of energy that harnesses the power of water in motion such as water flowing over a waterfall to generate electricity. People have used this force for millennia.

Over two thousand years ago, people in Greece used flowing water to turn the wheel of their mill to ground wheat into flour.

Most hydroelectric power plants have a reservoir of water, a gate or valve to control how much water flows out of the reservoir, and an outlet or place where the water ends up after flowing downward. Water gains potential energy just before it spills over the top of a dam or flows down a hill.

The potential energy is converted into kinetic energy as water flows downhill. The water can be used to turn the blades of a turbine to generate electricity, which is distributed to the power plant's customers.

6. Biomass Energy



[Biomass energy](#) is energy generated or produced by living or once-living organisms. The most common biomass materials used for energy are plants, such as corn and soy, above. The energy from these organisms can be burned to create heat or converted into electricity.

People have used biomass energy from living things since the earliest “cavemen” first made wood fires for cooking or keeping warm.

Biomass is organic, meaning it is made of material that comes from living organisms, such as plants and animals. The most common biomass materials used

for energy are plants, wood, and waste. These are called biomass feedstocks. Biomass energy can also be a [non-renewable energy source](#).

Biomass contains energy first derived from the sun: Plants absorb the sun's energy through photosynthesis, and convert carbon dioxide and water into nutrients (carbohydrates).

Bioenergy use falls into two main categories: "traditional" and "modern". Traditional use refers to the combustion of biomass in such forms as wood, animal waste and traditional charcoal. Modern bioenergy technologies include liquid biofuels produced from bagasse and other plants; bio-refineries; biogas produced through anaerobic digestion of residues; wood pellet heating systems; and other technologies.

About three-quarters of the world's renewable energy use involves bioenergy, with more than half of that consisting of traditional biomass use. Bioenergy accounted for about 10% of total final energy consumption and 1.9% of global power generation in 2015.

Biomass has significant potential to boost energy supplies in populous nations with rising demand, such as Brazil, India and China. It can be directly burned for heating or power generation, or it can be converted into oil or gas substitutes. Liquid biofuels, a convenient renewable substitute for gasoline, are mostly used in the transport sector.

Brazil is the leader in liquid biofuels and has the largest fleet of flexible-fuel vehicles, which can run on bioethanol – an alcohol mostly made by the fermentation of carbohydrates in sugar or starch crops, such as corn, sugarcane or sweet sorghum.

Benefits Of Renewable Energy

Environmental and economic benefits of using renewable energy include:

- Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution
- Diversifying energy supply and reducing dependence on imported fuels
- Creating economic development and jobs in manufacturing, installation, and more
- Renewable energy won't run out
- Renewable energy has lower maintenance requirements

- Renewables save money
- Renewable energy has numerous environmental benefits
- Renewables lower reliance on foreign energy sources
- Renewable energy leads to cleaner water and air
- Renewable energy creates jobs
- Renewable energy can cut down on waste
- Renewable energy can cut down on waste

Here are some of the top benefits of going green:

1. Renewable Energy Won't Run Out

Renewable energy technologies use resources directly from the environment to generate electricity. These energy sources include sunshine, wind, tides, and biomass to name a few of the most popular options.

Renewable resources are not running out, which cannot be said for many types of fossil fuels. As we use fossil fuel resources, they are becoming increasingly difficult to obtain, which is likely to increase both the cost and the environmental impact of extraction.

2. Maintenance Requirements Are Lower

In most cases, renewable energy technologies require less overall maintenance than generators that use traditional fuel sources. This is because generation technology like solar panels and wind turbines have either few or no moving parts and do not rely on combustible, combustible fuel sources to operate. Fewer maintenance requirements mean more time and cost savings.

3. Renewables Save Money

By using renewable energies, you can save money in the long term. You not only save maintenance costs but also operating costs. If you're using technology that generates electricity from the sun, wind, steam, or natural processes, you don't have to pay to refuel.

The amount of money you save from renewable energy can depend on a number of factors, including the technology itself. In most cases, switching to renewable energy means savings of between hundreds and thousands of dollars.

4. Renewable Energy Has Numerous Health And Environmental Benefits

- Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution
- Diversifying energy supply and reducing dependence on imported fuels
- Creating economic development and jobs in manufacturing, installation, and more

The use of fossil fuels not only emits greenhouse gases, but also other harmful pollutants that lead to respiratory and heart health problems. With renewable energies, you are helping to reduce the spread of these pollutants and contribute to an overall healthier atmosphere.

5. Renewables Lower Reliance On Foreign Energy Sources

Renewable energy technologies allow you to produce energy locally. The more renewable energy you use for your electricity needs, the less you rely on imported energy and the more you contribute to the overall US energy independence.

Disadvantages Of Renewable Energy

Renewable energy has many benefits, but it's not always sunny when it comes to renewable energy. Here are some disadvantages to using renewables over traditional fuel sources:

- High upfront costs
- Intermittency
- Storage capabilities
- Geographic limitations
- Renewables aren't always 100% carbon-free

1. Higher Upfront Cost

While you can save money by using renewable energy, the technologies are usually more expensive upfront than traditional energy producers. To counter this, financial incentives such as tax credits and discounts are often available to help lower your initial renewable technology costs.

2. Intermittency

Although renewable energy sources are available worldwide, many of these resources are not available 24/7 all year round. Some days may be windier than others, the sun does not shine at night, and droughts can occur for some time.

There can be unpredictable weather events that disrupt these technologies. Fossil fuels are non-intermittent and can be turned on or off at any time.

3. Storage Capabilities

Due to the interruption of some renewable energy sources, there is a high demand for energy storage. Although storage technologies are available today, they can be expensive, especially for large renewable energy systems. It's worth noting that energy storage capacity grows as technology advances, and batteries become more affordable over time.

4. Geographic Limitations

The United States has diverse geography with different climates, topographies, vegetation, and much more. This creates a nice melting pot of landscapes, but it also means that there are some regions that are better suited to renewable technologies than others.

For example, a large open space farm can be a great place for a residential wind turbine or solar system, while a townhouse in a city shaded by taller buildings cannot take advantage of either technology on their property. If your property is not eligible for personal renewable energy technology, there are other options.

What is Renewable Energy?

Renewable energy describes a collection of energy technologies, i.e., solar, wind, geothermal derived from sources that are never-ending and can be replenished time after time. Most countries across the world heavily depend on fossil fuels (oil, coal and natural gas) as sources of energy to power their economies. Renewable sources are renewable, sustainable, abundant and environmentally friendly. Unlike fossil fuels, they are not going to expire soon as they are constantly replenished.

Fossil fuels are non-renewable forms of energy, meaning they utilize limited resources that will ultimately deplete, hence, driving up overall energy costs. These countries have responded to the threat by stepping up campaigns to embrace renewable forms of energy like solar and wind.



This is why the question can only be begged: what are the real benefits of using renewable energy? While there are certainly advantages and disadvantages to switching to renewable energy, it is quite arguable that the benefits of using such sources outweigh the shortcomings of it, especially in the future.

Of course, the shortcomings are all things that can, with time and money, be fixed due to the rapid technological advancements our country makes on a nearly annual scale.

The benefits of [renewable energy sources](#) are breathtaking. While we may not entirely be in a position to fully switch over to renewable energy sources just quite yet (requiring a balance of [renewable energy](#) and other sources for now), it is imperative that we look ahead to the future.

Sources of Renewable Energy

The most widespread [sources of energy](#) include:

Wind: This takes advantage of wind motion to generate electricity. Wind motion is brought about by the heat from the sun, and rotation of the earth, mainly via the Coriolis Effect.

Solar: It taps heat from the sun to produce energy for the generation of electricity, heating, lighting [homes and commercial buildings](#).

Hydropower: Utilizes moving water to produce electricity. Moving water creates high energy that can be harnessed and turned into power.

Biomass: Together with snow and rain, sunlight is essential for plant growth. Organic matter that constitutes plants is referred to as biomass, which can be utilized to [generate electricity](#), chemicals or fuels to power vehicles.

Ocean: Takes advantage of rising and falling of tides to generate electricity

Geothermal: Leverages heat from underneath the earth to generate electricity.

While the advantages and disadvantages of renewable energy exist, the advantages of using renewable forms of energy far outweigh the disadvantages, more so moving to the future.

Advantages of Renewable Energy

1. Renewable Energy is Eco-friendly

Renewable energy is considered clean energy since it doesn't cause grave [environmental pollution](#), and it has low or zero carbon and greenhouse emission.

Fossil fuels emit high levels of [greenhouse gas](#) and carbon dioxide, which are greatly responsible for global warming, climate change, and [degradation of air quality](#). Fossil fuels also contribute to sulfur emission to the atmosphere leading to acid rains. [Acid rains](#) can cause damage to buildings.

Solar and wind power are considered eco-friendly because they emit zero toxic gases to the environment. The use of renewable energy dramatically reduces the dependence on fossil fuel as a source of energy, hence, [cutting back on air pollution](#).

2. It's a Renewable Resource

This implies that they do not deplete over a lifetime, and there is zero possibility that they will run out (sustainable source of energy).

Sources of energy like [fossil fuels](#) (oil, gas, and coal) are considered limited resources, and there is a strong possibility that they will run out in the future.

Renewable energy can help developing countries from over-reliance on fossil fuels. Powerful winds, heat emanating from beneath the earth, sunshine and moving water can guarantee a huge and steady energy supply to a nation for many years.

3. Renewable Energy is a Reliable Source of Energy

In the previous few decades, the use of fossil fuel has sharply increased. This over-reliance on fossil fuels has led to our security being threatened. Fossil fuels are prone to trade disputes, political instabilities, a spike in energy prices and unnecessary wars. These variables affect a lot more than a nation's energy policies; they can significantly drain a country's economy.

Although most argue that solar and wind energy is unreliable, a solid infrastructure puts this argument to rest. If solar and wind plants are distributed over a large geographical location, there can be minimal electricity generation interruption because weather disruptions in one location cannot be the same in other locations.

4. Leads to Job Creation

Renewable energy makes real economic sense because it is a cheaper alternative to most traditional sources of energy. Since the inception of renewable energy, new and stable jobs have been added to most world economies. For instance, in Germany and UK, many jobs have already been created. Thanks to their relentless efforts to develop and encourage the use of [renewable forms of energy](#).

Experts project that with the ongoing rigorous campaigns to embrace renewable energy, thousands of stable jobs will be created.

5. Renewable Energy has Stabilized Global Energy Prices

Change up to renewable sources of energy means the stability of energy prices across the globe. This is because the cost of renewable energy depends on the initial cost of installation of renewable energy technologies as [opposed to fossil fuels](#), which increase and decrease depending on the current inflation and availability of the resource. Respective governments would only need to cater to the initial costs, and that's it.

6. Less Maintenance of Facilities

Renewable energy technologies require less overall maintenance than traditional generators that use traditional fuel sources. This renewable energy generating technology like solar panels and wind turbines either have few or no moving parts. Above all, they don't rely on flammable, combustible fuel sources to operate, which makes the operating costs lower too.

Moreover, once the infrastructure for the harnessing of the renewable resource is laid down, there is low to zero maintenance required. This means that the owners of the facilities will reap big profits while providing cheap electricity to the [population](#).

7. Boosts Public Health

This is a no-brainer. The sources for renewable energy generation emit little to no greenhouse gases or pollutants into the air. This means a smaller carbon footprint and an overall healthier atmosphere.

If governments took upon themselves to build more renewable energy facilities, the population would enjoy the [health benefits](#). According to a study by the U.S. Environmental Protection Agency, Americans spend approximately \$361.7 to \$886.5 billion every year on the overall health of the population.

A big chunk of this budget goes to mitigate and cure diseases related to fossil fuel use like [respiratory and cardiac health issues](#), cancer, and neurological disorders.

Greenhouse, carbon and sulfur compounds emitted by the combustion of fossil fuels are risky to our health if inhaled over time. This is reason enough to consider renewable energy moving forward.

8. Empowering of People in the Countryside

Renewable energy generation mainly takes place in remote settings. This means that local towns would get a fair share of [power generated](#), ultimately, catalyzing the regeneration of those depressed areas both socially and economically.

Electrification of those areas will open up untapped opportunities for development through the advancement of greenhouses using [geothermal power](#), district heating of towns and communities through hot water generated by the energy exploitation of forestry and agricultural biomass.

9. It is a Technology

Renewable energy technology is a term used to refer to hybrid technology or other forms of technology that store up energy created or produced by [renewable sources](#). It can anticipate renewable energy supply and helps to deliver energy produced by renewable energy technologies to the final consumer.

Renewable energy technologies include [wind power](#), [solar power](#), [hydroelectricity](#), [biomass energy](#), and [biofuels](#), which are chiefly used for transportation.

Over time, technology becomes cheaper when production and installation methods are refined; therefore, renewables are on a path that will constantly become cheaper.

10. Renewables Save Money and Profitable

Renewable energy helps in saving money in the long term. You will save not only on maintenance costs but on operating costs as well. As you're using a technology that generates power from the sun, wind, steam, or natural processes, you don't have to pay to refuel.

The amount of money one saves using renewable energy can vary depending on a number of factors, including the technology itself. Generally, transitioning to renewable energy means roughly hundreds to thousands of dollars in savings.

11. It Can be Used to Recycle Our Waste Products

Biomass energy tends to have this specific benefit that more than any other form of renewables. Biomass consumes used organic products such as used vegetable oil, corn and soybean byproducts, or even algae to generate energy. At the same time, it reduces the amount of waste that goes into landfills, also reducing the amount of overall carbon that goes into the atmosphere.

12. Lower Reliance on Foreign Energy Sources

Renewable energy technologies allow people to produce energy locally. The more you're using renewable energy for your power needs, the less you'll be dependent on imported energy, and the more you'll contribute to the country's energy independence as a whole.

13. It is Offered in Multiple Formats

We use many different forms of renewable energy today, even without realizing it. Energy diversity is possible through renewable energy. One of the most common forms of renewable energy is hydropower. Dams are built on rivers, and the moving water runs turbines that are able to generate electricity.

New technologies in solar panels, such as road-based, could even allow for energy collection within current infrastructure layouts. There is also wind power, biomass, geothermal and ocean. That means a greater potential for power generation now and into the future.



Disadvantages of Renewable Energy

1. The Electricity Generation Capacity is Still Not Large Enough

There are still challenges to the generation of large quantities of power in renewable energy technology compared to traditional forms of energy generation like fossil fuel. Fossil fuel still produces large quantities of electricity today, by far. This, essentially, means that it can't be solely relied upon to power the whole nation.

This means that either we need to set up more such facilities to match up with the growing demand or lookout for ways to reduce our [energy consumption](#). This phenomenon indicates that a balance of different energy sources will still prevail for some years to come.

2. Renewable Energy Can be Unreliable

Renewable energy technologies totally depend on the weather (e.g., sun and wind) to be able to harness any energy. In case atmospheric conditions are not good enough, renewable energy technologies would lack the ability to generate any electricity.

- Hydro generators require enough rain to fill dams for their supply of flowing water.
- Wind turbines require wind blowing, at least with minimum wind speed, to move their blades.
- Solar panels need clear skies and sunshine to get the heat required to generate electricity, and at night it isn't collected.

This might instigate campaigns by the authorities to reduce energy usage in order to [serve the population](#) for a longer period.

3. Low-efficiency Levels

Renewable energy technologies are still significantly new to the market, meaning, they still lack the much-needed efficiency. Lack of sufficient knowledge on how to effectively harness these forms of energy makes the installation and maintenance cost for such facilities quite high. This poses forecast problems, and investors may shy away from investing their money for fear of not getting returns pretty quickly.

4. Requires a Huge Upfront Capital Outlay

Setting up renewable energy generation facilities requires a huge financial outlay. The installation of wind turbines, [solar panels](#), and [hydroelectricity plants](#) is relatively expensive. These plants require upfront investments to build, have high maintenance expenses and require careful planning and implementation.

Also, the electricity generated needs to be delivered to towns and cities, which means additional cost of installing power lines.

5. Takes a Lot of Space to Install

It takes over 40 hectares of panels to generate about 20 megawatts of energy using current solar energy generation technologies. A nuclear power plant of average size generates about 1,000 megawatts of energy on 259 hectares, whereas a solar energy facility would produce less than 200 megawatts given the same amount of space.

In land-based wind energy technology, a 2-megawatt turbine requires 1.5 acres of space, and in the same amount of space, a nuclear facility would generate a maximum of about 850 megawatts.

6. Expensive Storage Costs

We often overlook the storage cost of renewable energy. In case of renewable energy, you must store the energy collected having a battery installed or else you will lose it.

The overall storage cost for the energy is about 9 cents per kilowatt-hour; however, the cost of the battery is upfront. That means \$10,000 to \$25,000 upon installation just for the battery.

Some types of batteries also wear out very quickly, especially if they are being used with their full capacity on a regular basis.

7. Not Always a Commercially-viable Option

To be effective, renewable energy must have a distribution network created to transfer the energy to where it is required. Those networks require non-renewable energies to be generated, which offsets the benefits that renewable energy generates for many years, if not decades, after its installation.

It can also be manipulated by politics. If renewables are not given a political priority, then the industry tends to falter, and innovation is reduced in favor of non-renewable options.

8. It Still Generates Pollution

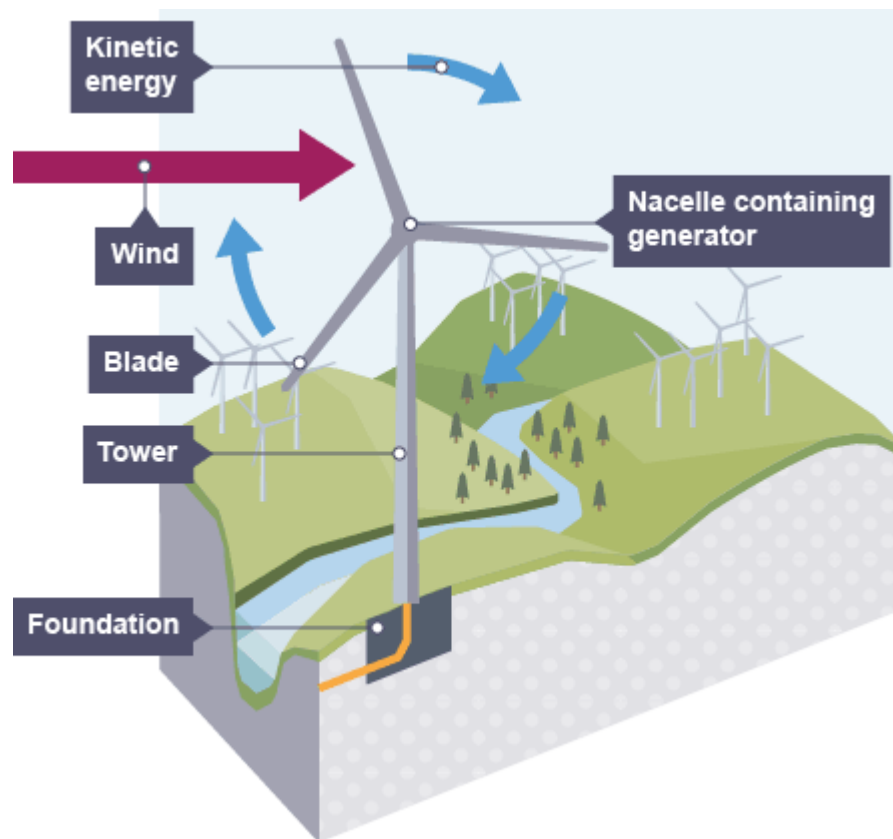
Renewable energy may be a better option for emission than fossil fuels, but they are not completely free from pollution. Many renewable energy forms or their manufacturing processes emit greenhouse gases like particulates into the air, carbon dioxide, or worse – methane. It is partly because the resources needed for renewables are built using fossil fuels.

Still not every renewable resource is clean such as biomass that burns organic matter directly into the atmosphere.

Renewable energy resources

There are many different types of renewable energy resources. Renewable sources of energy are constantly being replaced and will never run out. The most important in Scotland are: wind power, wave power, hydroelectric power, solar power and in the future, tidal power.

Wind power

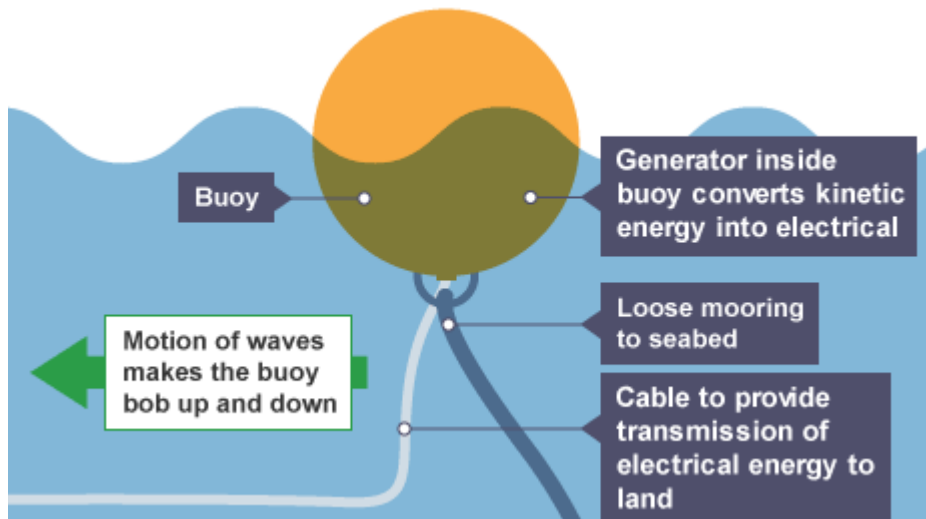


Wind turbines have huge blades mounted on a tall tower. The blades are connected to a generator. As the wind blows, it transfers some of its kinetic energy to the blades, which turn and drive the generator. Several wind turbines may be grouped together in windy locations to form wind farms.

Wave power

Waves in the sea make the water rise and fall. Wave power generators use the kinetic energy in the waves to drive electricity generators inside them. They are buoys that are strung together in long lines so that large amounts of electricity can be generated at the same time.

Many inlets in the Highlands and Islands of Scotland contain these long strings of buoys to help boost local power levels.



Hydroelectric power

Hydroelectric power stations use the energy inside moving water to convert to electrical energy. The water comes from behind a dam built across a river valley. The water high up behind the dam contains gravitational potential energy. This is transferred to kinetic energy as the water rushes down through tubes inside the dam. The moving water drives electrical generators, which may be built inside the dam.

Solar power

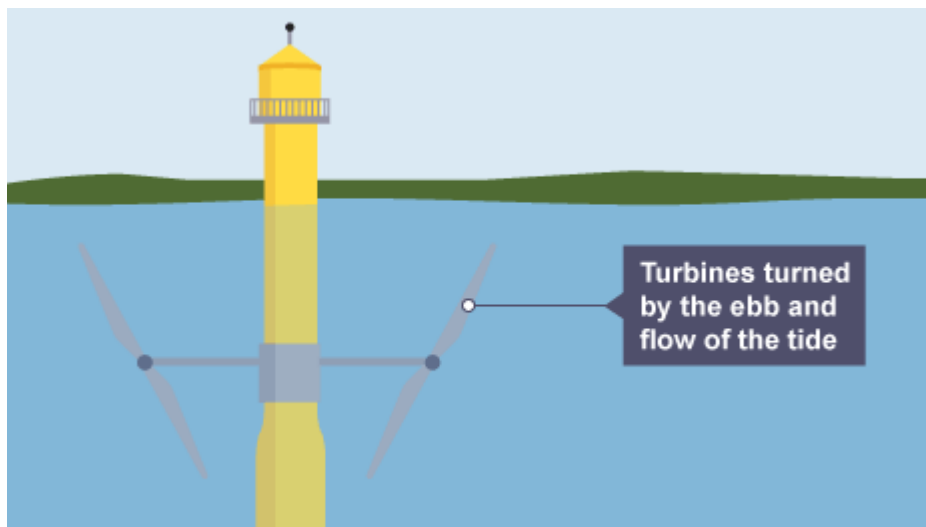
We use the sun as a source of energy in two main ways: solar cells and solar panels. However, only solar cells generate electricity.



A solar panel on top of a parking ticket machine

Solar cells are devices that convert light energy directly into electrical energy. You may have seen small solar cells in calculators. Larger arrays of solar cells are used to power road signs in remote areas, and even larger arrays are used to power satellites in orbit around Earth.

Tidal power



The movement of the tides flowing in and out can be harnessed using a generator like the one shown in the diagram.

Two large turbines are connected to a generator, which converts the movement of the tides into electrical energy. The turbines look very similar to wind turbines but are specially designed to work under water.

These turbines may one day be seen in many sea lochs around Scotland.

Renewable energy and climate change

In any discussion about climate change, renewable energy usually tops the list of changes the world can implement to stave off the worst effects of rising temperatures. That's because renewable energy sources such as solar and wind don't emit carbon dioxide and other greenhouse gases that contribute to global warming.

Non-renewable energy resources

What Are Non-Renewable Resources? | Examples

Renewable and non-renewable resources are sources of energy that human society uses to function on a daily basis. The difference between these two types of resources is that renewable resources can replenish themselves naturally while non-renewable resources cannot. This means that non-renewable resources are limited and cannot be used sustainably.

Non-renewable energy sources include **coal, natural gas, oil, and nuclear power**. When these resources are depleted, they cannot be replaced, which is a major problem for humanity as we currently rely on them to meet most of our energy needs.

What Are Non Renewable Resources?

What Is Nonrenewable Energy?

Non-renewable energy comes from sources that will run out or will not be replenished in our lifetimes—or even in many, many lifetimes. Most non-renewable energy sources are fossil fuels: coal, petroleum, and natural gas. Carbon is the main element in fossil fuels.

Non-renewable resources are a natural substance that is not replenished as quickly as it is consumed. It's a finite resource.

Examples of non-renewable resources are crude oil, natural gas, coal, and uranium. These are all resources that are processed into commercially viable products. Humans are constantly drawing from reserves of these substances, while new stocks take eons to form.

Renewable resources are the opposite: their supply complements itself naturally or can be sustainable. Sunlight used in [solar energy](#) and wind used to power [wind turbines](#) is self-renewing. Wood reserves can be preserved through replanting.

There are four main types of non-renewable resources: oil, natural gas, coal, and [nuclear energy](#). Oil, natural gas, and coal are collectively referred to as [fossil fuels](#). Fossil fuels were formed within the earth from dead plants and animals over millions of years, hence the name “fossil” fuels.

They are found in underground layers of rock and sediment. Pressure and heat worked together to convert the plant and animal remain into crude oil (also known as petroleum), coal, and natural gas.

The plants and animals that became fossil fuels lived around 300 to 360 million years ago during a period called the Carboniferous Period. The energy in the plant and animal remains originally came from the sun; Through the process of photosynthesis, [solar energy](#) is stored in plant tissues, which animals then use and supply the energy to their own bodies. When fossil fuels are burned, this trapped energy is released.

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For this reason, the time period that fossil fuels formed about 360-300 million years ago is called the Carboniferous Period.

MORE: [What is Renewable Energy?](#)

Let's first have a look at the nonrenewable resources list so that we know what they are before we delve a little deeper into them individually.

10 Examples Of Non-Renewable Resources

Here is a list of 10 examples of non-renewable energy resources available out there in the world.

1. Fossil fuels
2. Crude Oil
3. Coal
4. Uranium
5. Natural Gas
6. Tar Sand
7. Steel
8. Phosphate
9. Aluminum
10. Ground Water

Now let's have a look at each of these examples of nonrenewable energy in little more detail.

1. Fossil Fuels

Why are [fossil fuels](#) considered non-renewable resources? Fossil fuels are the energy derived from organic material trapped between the Earth's layers of sediment. This organic matter has existed for millions of years.

As a result, over time they are compressed and decomposed to give life to fossil fuel deposits. These deposits are easily combustible. As a result, it is an excellent source of energy to consider.

However, it is quite difficult to extract fossil fuels. In fact, they are obtained from mining or [drilling](#).

MORE: [What are Fossil Fuels?](#)

2. Crude Oil

Is crude oil a renewable resource? Crude oil can be considered a non-renewable energy source. Crude oil is a liquid fossil fuel used primarily to make gasoline and diesel fuel for vehicles and to make plastics. It occurs in rock beneath the surface of the earth and is pumped out through wells.

[Pumps](#) are installed to suck out the liquid. The liquid is then refined and used to make many different products.

- Crude oil is a versatile fuel used to make things like plastics, artificial food flavors, heating oil, gasoline, diesel, jet fuel, and propane.
- The top three oil producing countries are the United States, Saudi Arabia and Russia.

Petroleum deposits that begin to form underground are known as oil sands, bitumen, or bituminous sands. Bitumen is too thick to be pumped under natural conditions. Scientists refer to it as cold molasses. Using special machinery, much of it is mined in Alberta, Canada and serves as an important source of energy for Canadians and people worldwide.

3. Coal

Is coal renewable or one of the nonrenewable energy sources. Coal can be considered as one of the most prominent non-renewable sources of energy available out there in the world. It is created through the compression of organic matter.

Coal is a solid fossil fuel that is used for heating homes and generating power plants. It is found in fossilized swamps that have been buried beneath layers of sediment. Since coal is solid, it cannot be extracted in the same manner as crude oil or natural gas; it must be dug up from the ground.

China is the biggest coal supplier to the world. In fact, they have been working as the biggest coal supplier for three consecutive decades.

4. Uranium

[Nuclear energy](#) comes from radioactive elements, mainly uranium, which is extracted from mined ore and then refined into fuel.

Uranium is a naturally occurring element found within the Earth's core. Most uranium deposits occur in small quantities, which miners gather, refine and purify. Once gathered, the uranium is brought together and compounded into rods. The rods are then submerged into tanks of water.

When it reaches critical mass, uranium begins to break down and release energy, which heats the water it is immersed in. The breaking down is known as [fission](#). The heated water then creates pressure. This pressure drives the turbines that generate electricity in [nuclear power plants](#).

More Examples Of Non-Renewable Resources

5. Natural Gas

Is natural gas renewable or nonrenewable? Natural gas is another nonrenewable source of energy that is created within the earth's crust. It is quite similar to crude oil. Natural gas is also pumped out through drilling methods.

Natural gas is widely used for cooking and for heating homes. It consists mostly of methane and is found near oil deposits below Earth's surface. Natural gas can be pumped out through the same wells used for extracting crude oil.

Ethane and methane can be considered as the most popular forms of natural gas available out there. Russia, Iran and Qatar are the countries with the largest recorded natural gas reserves.

6. Tar Sand

Tar sand is coming out from the sedimentary rocks. Even though this is a non-renewable source of energy, it is available in plentiful. As per the current calculations, tar sand supply is available to cater the requirements that would arise for the next 15 years.

However, you should also keep in mind that extracting tar sand is quite a labor-intensive process.

7. Steel

Is [metal](#) a renewable or nonrenewable? Steel can also be considered as one of the most durable forms of renewable energy sources available out there to consider. Steel is made out of the elements that are extracted from the iron cores. However, the supply of iron is limited and it makes steel a non-renewable source of energy available out there in the world.

8. Phosphate

Phosphate is a natural source of energy available out there to consider. However, phosphate is also being produced in small quantities. Therefore, you can go ahead and add that to the list of non-renewable sources of energy.

9. Aluminum

Most people believe that aluminum is not a source of energy, but it is not. Aluminum's widely being used out there in the world. It plays a major role in the construction industry.

For example, aluminum is widely being used for the construction of vehicles. Even aircraft are made out of aluminum. However, the supply of aluminum is limited.

10. Groundwater

Last but not least, you can go ahead and add groundwater to the sources of non-renewable energy. People in today's world tend to use groundwater for most of their activities.

They include many day-to-day activities as well. In fact, it is essential for their survival as well. However, groundwater available for the consumption of human beings is limited. Due to the same reason, it is called a non-renewable source of energy as well.

As you can see, these energy sources cannot be made from any practical method, within a short period of time. Currently, these energy sources are widely available.

However, it is important for you to go ahead and start consuming them responsibly. That's because we don't have any practical method to make those energy sources after we consume all that's available.

On the other hand, it is better if we can look for the alternatives available for these energy sources and switch to them as well. Then we will not have to worry too much about our consumption or limit the consumption.

What Are The Top 5 Non-Renewable Resources?

In the United States and many other countries, most energy sources for doing work are nonrenewable energy sources:

- Petroleum.
- Hydrocarbon gas liquids.
- Natural gas.
- Coal.
- Nuclear energy.

Unfortunately, human society is for the time being dependent on nonrenewable resources as its primary source of energy. Approximately 80 percent of the total amount of energy used globally each year comes from fossil fuels. We depend on fossil fuels because they are energy-rich and relatively cheap to process.

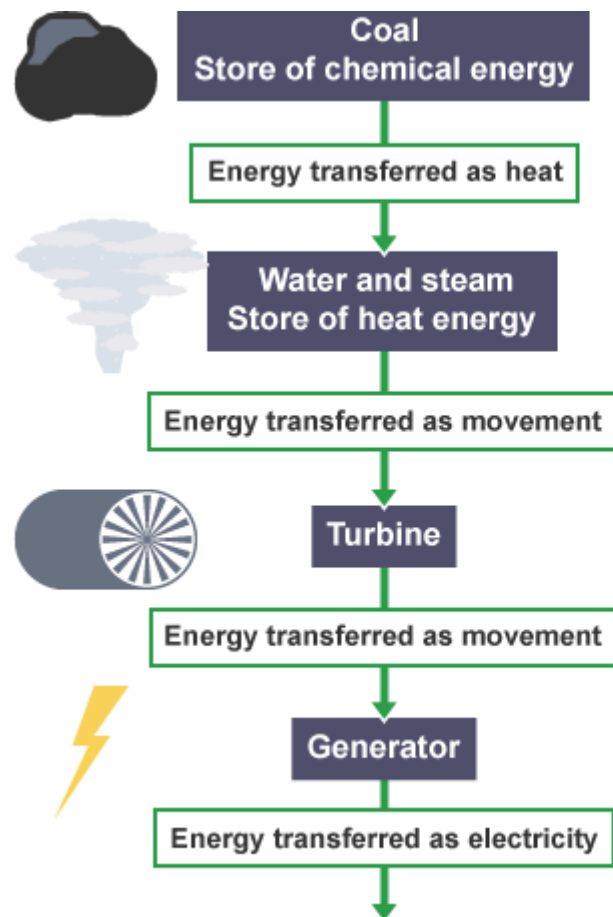
But a major problem with [fossil fuels](#), aside from their being in limited supply, is that burning them releases carbon dioxide into the atmosphere. Rising levels of heat-trapping carbon dioxide in the atmosphere is the main cause of global warming.

Alternative energy sources, such as [wind](#) and [solar energy](#), are a possible solution to the depletion of nonrenewable sources. Both of these [clean energy sources](#) are available in unlimited supply.

Non-renewable energy resources

Most non-renewable energy resources use fossil fuels (coal, oil and natural gas) to generate electricity. In fossil fuel generators, the chemical energy of the fuel is burned to release heat energy.

Below is a flow diagram that describes each energy change that happens inside a fossil fuel power station.



The transfer of energy from fossil fuels to electricity through movement

Nuclear power stations make use of the energy stored inside unstable atoms. A similar sequence of energy changes occurs inside a nuclear power station. Instead of chemical energy being burned to produce heat, nuclear energy itself is used to heat water.

Fossil and nuclear fuels are both non-renewable because the sources of these fuels cannot be replaced and will eventually run out.

Advantages And Disadvantages Of Non-Renewable Energy

by [Haresh Bambhaniya](#)

Unlike [renewable energy](#), [non-renewable energy sources](#) will become depleted. That calls for a closer look at the advantages and disadvantages of [non-renewable energy](#) and its outlook.

Advantages Of Non-Renewable Energy

- **The main advantages** of [non-renewable energies](#) are that they are abundant and affordable. For example, oil and diesel are still good choices for powering vehicles.
- [Non-renewable energy](#) is cost effective and easier to product and use.
- [Non-renewable resources](#) are high in energy. Resources such as coal and oil tend to provide us with more energy compared to renewable energies such as [solar](#) or [wind energy](#).
- There are huge profits to be made from mining coal, selling oil or building natural gas pipelines.
- These resources are easy to use whether at home or anywhere else.
- Consumers can find non-renewable resources at a very affordable price.
- For some people, new machines and other sources of energy cannot replace their traditional minerals like coal and oil. Hence it is also called traditional energy.
- [Non-renewable energy](#) is easy to find anywhere. This implies that they can be conveniently transported around the world. People who live in hard-to-reach areas can make use of non-renewable energy.
- Non-renewable resources create jobs. Extraction, transportation and refining are the parts of non-renewable sources that create jobs.
- Most of the [non-renewable sources](#) are also very easy to store.

Disadvantages Of Non-Renewable Energy

While they have a number of advantages, [non-renewable resources](#) also have many disadvantages. These include:

- One of the major disadvantages of non-renewable energy is that it is **time-consuming**. Mining coal, searching for oil, installing oil drills, building oil rigs, installing pipes for extraction, and transporting natural gas are very time-consuming processes. They also require a lot of effort.
- Fossil fuels took **millions of years to form** in the earth's crust and cannot be replaced after they have been used.
- Coal and gas also release **sulfur dioxide** when burned. Sulfur dioxide can cause breathing problems in living things and is also an integral part of [acid rain](#).

- Sources such as coal, oil and natural gas emit a large amount of carbon dioxide when burned. These chemicals quickly destroy the ozone layer.
- When [fossil fuels](#) burn, they release **carbon dioxide** into the atmosphere. They convert the rain into acid rain, which is harmful to both wildlife and humans.
- Many [non-renewable sources](#) release **smog** that envelops buildings and other important items. Most of the time, people in modern cities complain about it. Black smog can make your building and other objects look dark and dirty.
- Sometimes there is a risk that huge cargo ships and oil tankers could crash while transporting oil and **spill** their contents into the sea or elsewhere. It can be fatal to marine animals and people who come in contact with it.
- In order to keep the [power plant](#) running, we have to keep a large amount of fuel on hand every time. This can be expensive and take up a lot of space.

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• What Are The Uses Of Non-Renewable Resources?

- Non-renewable resources, such as coal and oil, are the primary source of power in the world, and they are used to power vehicles, factories, and homes. Although affordable, they can be harmful to the environment and are one of the notable contributors to global warming.

Renewable energy and health benefits

That increases energy independence and lowers emissions of harmful gases like nitrogen oxides, sulfur dioxide, and carbon dioxide. This **helps reduce premature deaths, heart attacks, asthma exacerbations, and hospitalization for cardiovascular or respiratory issues.**