

## Renewable energy paragraph

We use energy every day of our lives - our electronic devices require electricity for power, our streetlights need the same for lighting, our vehicles require gasoline and diesel. We fuel our homes with domestic oil, propane or electricity from a national or local grid for lighting, heating and for powering our devices. You're reading this article on a website that is hosted on a server that needs power, as does the computer with which you are viewing the site. The places we work use computers, phone networks, security systems and servers, as do our shopping malls, parking lots, sports stadiums, cars, airplanes and so on. All of these things require power from fuel.

From one perspective, the discovery and utilization of fire is a history of civilization, and a history of the use of renewable energy (4). Humanity continued in that fashion for many thousands of years before the discovery of oils (though obviously in smaller quantities than later) in antiquity and the mass drilling of oil during the industrial age. Other uses of renewables in antiquity include animal power (using cattle to drive ploughs or turn millstones) and wind for the sail that has driven trade for some 8,000 years of human history. The use of water sources, such as creating dams to harness the power of the fluid motion of water, is not a new idea either.

The concept of peak oil in the 1950s began a new drive towards renewables. Solar, hydro and others were seized upon by both environmentalists and industrialists. They were both equally concerned about the exponential growth in human population, in oil consumption, and realized that it is a finite resource and will run out (7) regardless of the size of the supply today. A growing environmental movement, the development of environmental sciences and a push against pollution (such as the Clean Air Act in the US and equivalents in other countries most of which passed in the 1960s-1970s) meant that more than ever before, renewable energy became not just a scientific innovation for the future, but a necessity.

Since then, there have been successive debates about whether we have reached peak oil. Many experts agree that it happened around 2008 (8). New pockets are getting fewer and fewer and smaller and smaller. Shockingly, demand has outstripped supply since 1986, spurring on economists, scientific researchers and environmental campaigners to hasten its demise by campaigning that what is in the ground to remain in the ground. Instability in oil-producing countries has led to fluctuations, particularly since the 1990s, and that has brought another issue to the world's attention - energy security.

Energy security has been a major concern to world leaders since the end of the 20th century, but even more so since the beginning of the 21st century. The term refers to the link between each country's national security, and the availability of that country to resources for energy production and consumption. If a country loses, or finds it has restricted access, to oil and other resources, instability is likely as energy is rationed. Energy security can be the result of armed conflict or political instability in gas or oil-producing countries, or a buying country having access restricted when a producing country deliberately cuts a supply.

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According to a report by the International Energy Agency, the increase of amount of electricity produced from renewable sources increased from just over 13% in 2012 to 22% the following year. They also predict that that figure should hit 26% by 2020 (9). In terms of total generation, renewables accounts for 19% of our present usage. More clearly needs to be done though for the reasons stated below, but these figures are encouraging from the perspective of the use of renewables on its own. Most long-term forecast models predict that use will triple between 2012 and 2040, with a greater amount should the planet hit 2° of warming.

There is still much to do though; between 2000 and 2012, the largest growth area in terms of resources was coal - easily the dirtiest form of fossil fuel. The most used resource amid fluctuating price coupled with what we now understand to have been over-production for several years, was oil.

Domestically, the US produces just over 13% of its electricity from renewable sources (10). As one of the world's largest consumers of energy (at 11.4kw per person per year) and consuming around 25% of the world's production every year, the situation in the US is immediate. Exponential growth of production in China, and equal exponential growth in coal mining there, should not be permitted to outstrip renewable use and it seems we are winning that particular battle; a UN report concluded in 2015 that renewable technology is now being produced on an industrial scale (11).

There is a large disparity of energy production by state in the US with some producing a lot more than others. If we look at the map of energy production below (<https://>) we can see just how much variation there is between the 50 states.

Idaho came out on top as it produces most of its electricity from geothermal sources thanks to the volcanic activity of its topography (12). Idaho is a success story of a renewable future and it reports some of the lowest energy prices (to the customer) of any state. Delaware is a net consumer of energy supplied by other states. However, a wind farm grant in 2012 now means that all of its domestic production comes from renewable sources.

Wyoming was reported as the lowest producer / user of renewable resources. The state has a long history of coal production and some 33% of the country's coal supply comes from this single state. It also produces around 6% of the country's natural gas supply. 0.34% of its total energy supply came from renewable sources, but also 11% of its electricity generation (13). Wyoming's source of renewables is wind power. The story is similar for Alaska where the oil rich areas means a large supply of diesel to fuel the generators on which many state residents rely, though geothermal energy supply is also a boon for the state.

The first and main reason for why governments and businesses are keen to move to renewable energies as soon as possible is that fossil fuels are a finite resource. We may or may not have reached peak oil - the point at which demand outstrips supply -and by current figures, many experts seem to agree we did so around 2008 with only external factors creating fluctuations in demand making it difficult to predict precisely when it will run out. That is another debate entirely that our politicians and economists have argued for decades, and will



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continue to argue (14) for many years to come. Whichever way we look at it, fossil fuels will run out eventually and it will take some 10,000,000 years to replenish what we have used in around 150 years.

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