

# Transition to Renewable Energy Resources

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Today, the prices of non-renewable sources of energy like fossil fuels have been skyrocketing, and there seems to be no end to it. Upon their combustion, the gases which are produced by them are not only hazardous to the humankind, but also to our beloved planet Earth's Ozone layer which protects us from the UV radiations of the sun. Mankind has not only seen melting of the Polar Icecaps due to these greenhouse gases, but there seems to be an inevitable need to forego the non-renewable sources of energy now, more than ever. The nuclear disaster at Chernobyl is a stark reminder of how nuclear power can be extremely dangerous as well, if not handled carefully. Renewable energy poses far lesser risks, and as the name suggests, is self-replenishing. Not only is generating power and energy from renewable sources more efficient, it also proves to be cheaper in the long run. In this paper, we discuss alternative technologies for enhancing renewable energy deployment and energy use efficiency.

**Keywords:** renewable, energy, power, fuel, efficiency, ozone, nuclear

## INTRODUCTION

We need energy to run our machines, cars, etc. We need energy to keep us warm during the winters, and cold during the summers. Without any sources of energy, we would not be able to do half the work that we perform in our day to day life. This brings us to the bigger question - where does this energy come from?

The answer is simple. Being the advanced species that we are, us humans have zeroed in on various energy sources that we utilize for this very purpose. We use fossil fuels, nuclear power, solar power, etc. to generate energy that aids us in our daily activities. By their inherent nature, we have classified the sources of energy as renewable and non-renewable. For centuries, humans have been exploiting the non-renewable sources of energy to an extent wherein we have created an imbalance on our planet. The Polar icecaps are melting, greenhouse gases are rising, ozone layer is getting punctured and quite frankly, not only the humans, but the other species are also having to face the wrath of the myriad of consequences galore. We have witnessed many nuclear disasters like the Chernobyl disaster, many crude oil extraction disasters, one of the prominent one being the blowout on Deepwater Horizon - all this led to huge loss of lives of humans and other

species too, all because we were either busy utilizing the non-renewable energy resources, or because we were trying to extract them from our planet.

This has caused us to shift towards alternative sources of energy, or the renewable sources of energy. Not only are these sources inherently safer than the non-renewable sources of energy, by definition, they don't even deplete the planet of the various precious resources that we have. By utilizing the various sources like solar, wind, hydel energy etc., we can derive energy in a clean and efficient manner, and also whilst saving costs in the long term.

## *Hazards Posed by Non-Renewable Sources of Energy*

Not only does the continued abuse of non-renewable energy resources have a myriad of negative impacts on our environment, but it also has a potentially deadly impact on our health too.

### *Air Pollution*



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When non-renewable resources are used for the generation of energy in various forms, they generate a plethora of polluting agents that pose an extremely hazardous risk to anyone around them who inhales them. Deadly gases are produced upon combustion of coal.

Gases like SO<sub>2</sub> can cause a lot of breathing problems, and even diseases like asthma, pulmonary inflammation, etc. According to the EPA (Environment Protection Agency) research, in 2014, fossil fuel combustion at power plants accounted for 64 percent of US SO<sub>2</sub> emissions [1]. In 2013, a study was conducted which found that a mean cost of 32 cents per kWh for coal, 13 cents per kWh for oil, and 2 cents per kWh for natural gas, when it was considered that people fell ill and lost precious workdays.

### Acid Rain

Acid rain may be caused due to emission gases like SO<sub>2</sub>, Nitrogen oxides etc. which may lead to death of biodiversity. According to a research conducted by the US Acid Precipitation Assessment Program in 1991, 5% of the lakes in New England were acidic and 2% could no longer support fish like trout [2].

### Land Pollution



The soil and land of a particular region where mining is being conducted for various ores or fossil fuels is usually left without being treated. The soil in these regions is abused to a huge degree by means of usage of various chemicals, etc. With no proper disposal done for this, and mindlessly throwing the excavated untreated soil here and there, we are left with poor quality polluted soil and polluted land, where we are inherently killing off various species which call this land their home. The worst case scenario is

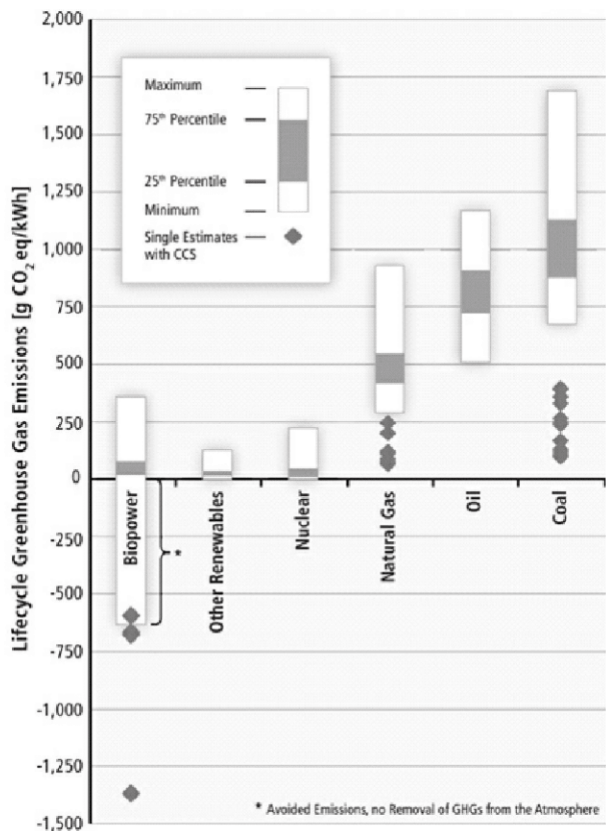
seen when Nuclear ores are being mined. Due to their radioactivity, the land is left polluted for multiple years. Not only this, the nuclear waste that may be dumped or buried in the ground may cause severe land pollution, death of species and polluted water table.

### Water Pollution

Wastes generated by factories are often dumped into the water bodies or flowing rivers nearby. Researchers have estimated that in this chemical infused waste that is released into the water bodies, about 30% of the chemicals are carcinogens or may cause mutations of some kinds when consumed by humans or in aquatic species which thrive in those waters. It's of utmost importance that due effort is made in cleanup of the wastes before they are released into the water bodies.

### Global Warming

Global warming is a very serious problem, and trends have shown that the temperature of our planet has indeed risen over the years. The below graph shows how the various non-renewable energy sources stack up next to each other when we compare their respective Greenhouse gases emission profiles [3].

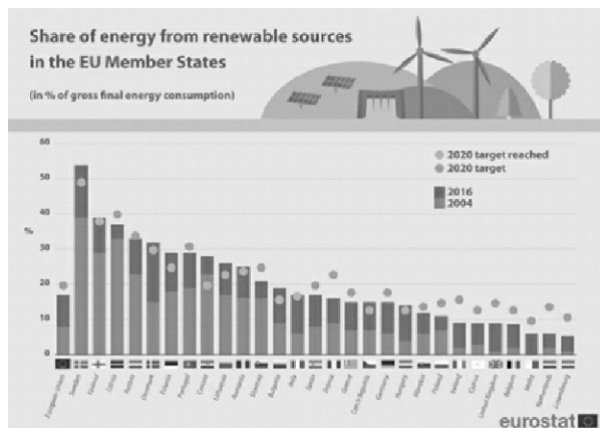


## RENEWABLE ENERGY SOURCES AND THEIR BENEFITS

“Can A Country Achieve 100% Renewable Energy??”

If you think 100% renewable energy will never happen then I urge you to think again and again up to the extent of agreeing to it Yes it can happen. Many Countries have adopted assertive plans to obtain their power from renewable energy. Coming to the fact Iceland is getting 85% of the country's electricity from earth's heat. Norway is around 98% renewable and uses hydroelectric, geothermal and wind to achieve its goal. Portugal uses hydroelectricity from 38% to 58% as their electric supply. Paraguay uses hydropower to provide 90% of its electricity. Denmark uses 30% wind and 15% biomass for its energy needs. Scotland has promised to become 100% by renewable by 2020. Germany is already using 98% of renewable energy [4]. So yes if we work on it we can come to the extent of 100% renewable energy.

The below graph shows the share of energy from renewable sources in the EU member states.

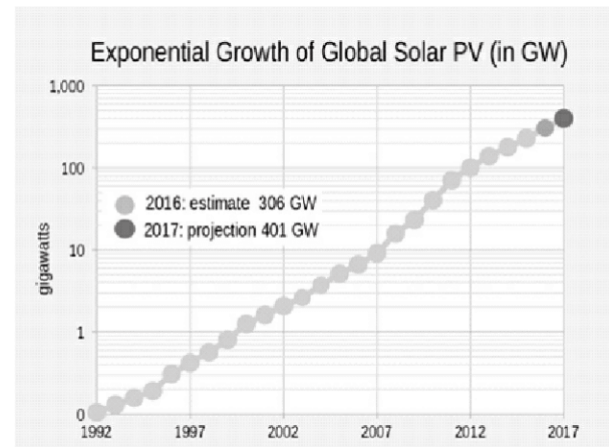


Renewable energy is collected from renewable resources that can be replaced or replenished in the same or lesser amount of time that is taken to actually harness them. Renewable energy provides energy in mainly four important areas: electricity generation, air and water heating/cooling, transportation, and rural energy services [5]. There are many forms of renewable energy.

### Solar

Various methods can be used to convert the energy from the Sun into heat, electricity, etc. Photovoltaic systems are capable of converting light into DC, by making good on the principles of the photoelectric effect. Solar Panels can be easily found in various

online as well as offline markets, and can be easily set up for personal use. Solar Panel industry has turned into a multi-billion-dollar industry [6]. The below graph shows the global exponential growth of solar photovoltaic systems.



### Wind

The energy of the flowing wind can be harnessed by means of installation of windmills. This energy can be further used for various purposes - from generation of electricity to doing work like pumping, grinding, etc. Windmills, or wind turbines provide the easiest way to convert the power available from the wind. The power generated by the wind turbine is directly proportional to the wind and wind speed. In 2014 global wind generation was 706 terawatt-hours or 3% of worlds total electricity which reached to 4% within the next year i.e. 2015 [7].

### Hydroelectric



Dams that store water in a reservoir are opened, water is released, and this water flows through various turbines which generate electricity. Currently, most of the available locations for hydroelectric dams are already being used in the world. There is a need to construct more dams that can assist in generating hydel power. 2015 was the

year noted that hydropower generated 70% of all renewable electricity and 16.6% of worlds total electricity.

**Biomass**

Biomass is basically any organic matter that is derived from plants or animals. Bioenergy generates a similar amount of carbon dioxide as fossil fuels. It must be noted however that as a principle of power generation via bioenergy, plants are grown as a replacement for those which are used. These remove an equal amount of CO2 from the atmosphere, thereby making it more viable than using fossil fuels. Biomass energy is primarily used for generation of gases like methane. These days, it is also being avidly used for fueling electric power plants. Utilizing biomass energy can minimize the greenhouse gases in our environment in the long run, and also prevent the harms of excessive greenhouse gases in our environment.

**Geothermal**

Geothermal power plants store the energy left over from Earth in the form of thermal energy. The heat can be trapped close to surface, from heated rocks, or from hot water reservoirs. In certain areas, geothermal energy is high enough that it can be exploited to generate electricity. US stands the highest in use of geothermal energy.

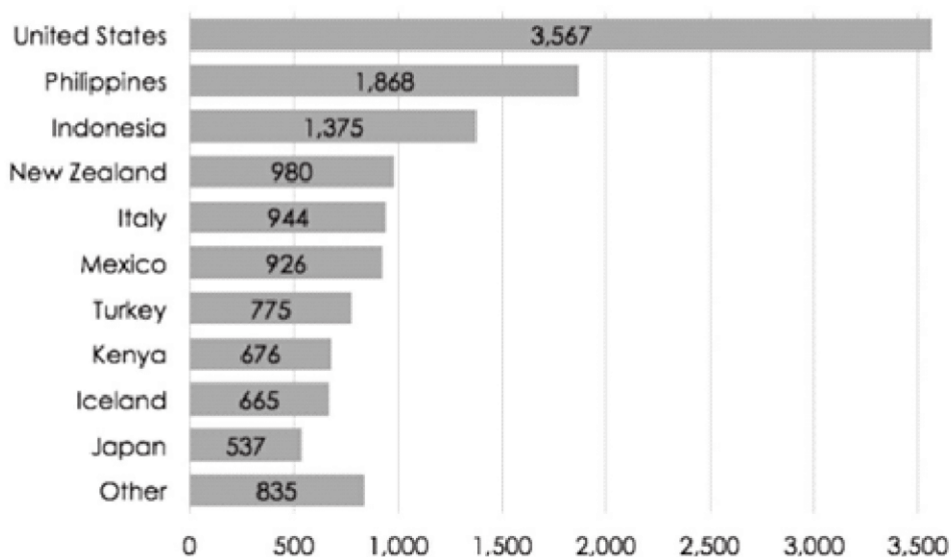
**CONCLUSION**

Our planet is in desperate need of our attention. Talking realistically, a transition to completely renewable sources of energy is only possible in stages. It is impossible to wake up to a green future if steps aren't taken towards it.

The following steps may be taken to shift us over to a clean and green future –

- We need to focus on making the engines etc. more efficient, so as to ensure that they consume lesser fuel.
- Mass adoption of renewable energy sources wherever and whenever possible.
- Encouraging the use of solar panels, solar water heaters, etc. instead of increased reliance on diesel powered generators.
- Reduced dependence upon crude and crude products.
- Setting up windmills in areas of heavy wind currents like deserts, coastal regions etc.
- Increased dependence upon Hydel energy sources etc.
- Encouraging the use of hybrid vehicles, if not all electric ones.
- Involvement of the Government in providing appropriate subsidies so that automobile manufacturers may feel motivated to launch all electric models.

**TOP 10 GEOTHERMAL COUNTRIES  
INSTALLED CAPACITY (NOV 2016)**



Source: TGE Research (2016), GEA (2014), IGA (2015), Energi Alternatif (2014)

Apart from the above direct suggestions, we also need to take indirect measures to reverse the harms that we have already caused to our planet, by –

- Planting more trees.
- Promoting recycling of products.

Overall, it is extremely essential that a move over to renewable energy resources must happen for the betterment of the environment, and the entire species on Earth.

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