

14 Alternative Energy Sources That Can Make a Difference

Reality

- Record of **2.3%** reduction by Germany in 2017
- 1.7%** rise in energy related CO₂ in 2017
- 9 of 10** top oil companies have increased output since 2009

Goals

- 2025** majority of UK's electricity should be generated from low CO₂ power
- Target decrease **5.5% and 8%** per year CO₂ emissions
- Limit global warming to **1.5°C**

Facts and predictions

| Source | Capacity |
|------------|----------|
| Hydro | 1,173 GW |
| Wind | 564 GW |
| Solar | 488 GW |
| Bio-energy | 121 GW |
| Geo | 13 GW |
| Marine | 0.5 GW |

30% of electricity demand expected from renewable sources

Renewable Energy growth by 2023

- Electricity: **30%**
- Heating: **12%**
- Transport: **3.8%**

Electrified heating & transport = **60% LESS CO₂**

\$110 Trillion investment by **2050**

Global Investments 2018

\$288.9 bn Global investment

\$91.2 bn Share by China

11% drop since 2017

China's decision to cut solar subsidies affected global total investments in 2018.

Renewable Energy Overview

- ### 1. Hydroelectricity

Using hydroelectricity saves:

 - particles: **148** MILLIONS OF TONNES
 - sulfur dioxide: **62**
 - nitrogen oxide: **8**
- ### 2. Waves

New player in the grid: under-water **Wavehub**

5MW capacity (size of a large offshore wind turbine)
- ### 3. Tidal

New record in 2019: **17.5 GWh**

Scottish tidal array **HowGen** = **2,200** UK homes
- ### 4. Floating Turbines

80% of the ocean's potential lies in deep waters

High installation/maintenance costs
- ### 5. Wind turbines

Average turbine size is **150m**

Wind energy supplies **4 million** UK homes

Larger turbine developments: 150m, 170m, 240m
- ### 6. Airborne

90% less materials compared to similar size wind turbine

Harvests wind from higher altitudes

In Europe, high altitude winds over 500m are much stronger (and steadier)

Total Wind Production

Total Electricity Consumption (TWh): **2,645**

Total Wind Produced (TWh): **162**

Onshore (TWh): **309**

Offshore (TWh): **53**

Wind Turbine VS Airborne Altitude

7. Solar PV

In large-scale Solar Farms kWh produced would require up to **9,259 m²**

Equivalent to a small student room

Sunny forecast: Experts predict a rise of **25%** compared to last year.

8. Solar Roads

0.5% of energy efficiency is lost for every 1° due to dust & dirt

Installed in Netherlands produces **3,000kWh**, enough to cover the needs of single-occupant house

9. Space Solar

Enables consistent energy supply to places without plenty direct sunlight

It can produce **3,000 GW** vs Solar Farm in Egypt - **180W**

Population expected to reach by 2050: **9.7 bn.**

Space Solar could be key to rising energy demand

10. Solar Thermal

70% more efficient in harvesting energy than solar PV

11. Geothermal

Unlike solar and wind, geothermal is always available

Geothermal heating is **90%** geothermal

12. Solid Biomass

Biodiesel net energy is around **70%** more than ethanol per gallon

Biofuels are cheaper than hydrogen

Bioenergy

1. Food waste, agricultural and animal waste, pellets

2. Fermenting alcohol

3. Anaerobic digestion

4. Bioethanol, Biogas

13. Biofuels

Verified Renewable Fuel by Type in the UK

- Biodiesel: **57%**
- Bioethanol: **37%**
- Other: **6%**

256 million litres sustainably verified renewable fuel in 2019

81 % less greenhouse gases compared to fossil fuel

14. Hydrogen

Almost any energy source can be used to produce it

High costs for infrastructure and fuel cell vehicles

Surplus renewable energy can be transformed into hydrogen gas

Centralised energy goes off-grid...

364.1 mil. tonnes (MT) CO₂ emissions

1/4 from factories and retail chains

57 mil. companies

UPS uses its own smart grid to power their vehicles

Sainsbury's and Marks'n'Spencer use own off-the-grid energy sources

GREENMATCH by Kieran's Goodness