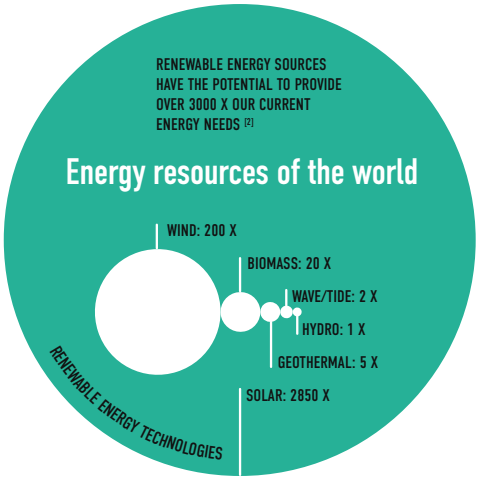
RENEWABLE ENERGIES
NATURAL SOURCES

Renewable energies are energy sources that are continually replenished by nature - the sun, the wind, water, biomass and the Earth's heat. Renewable energy technologies turn these natural energy sources into usable forms of energy - electricity, heat and fuels. Their common feature is that they produce little or no greenhouse gases.[1]



Most renewable energy sources originate directly or indirectly from the sun. The sun's energy can be directly used for heating in solar thermal collectors or for electricity production in photovoltaic systems. The sun makes the wind blow, the waves go and the biomass grow. Wind power and wave power depend on weather patterns that are caused by the sun's energy. Sunlight is needed for the photosynthesis process which makes all sorts of plants - biomass - grow. So indirectly, the sun's energy can be used to power wind turbines, hydro power and biomass systems.

Geothermal energy originates from the original formation of the planet, from radioactive decay of minerals, and from solar energy absorbed at the surface. It can be used for heat and electricity production. Tidal power, used for electricity generation, is the only form of energy which derives directly from the relative motions of the Earth–Moon system. The tidal forces produced by the Moon and Sun, in combination with Earth's rotation, are responsible for the generation of the tides.

We have more than enough Energy

Renewable energy sources could provide over 3,000 times the current global energy needs. The amount of renewable energy we can actually access using current technology is lower – but there is still enough to provide about six times more power than the world currently consumes – forever.[1]

PHOTOVOLTAIC (PV) TECHNOLOGY involves the generation of electricity from sun light. The secret to this process is the use of a semiconductor material, such as silicon. When light shines on the semiconductor, electrons are released and an electric direct current (DC) is generated. A PV system does not need bright sunlight in order to operate, and can generate electricity even on cloudy days.

CONCENTRATING SOLAR POWER (CSP) PLANTS, also called solar thermal power plants, produce electricity by concentrating solar radiation and converting it to high temperature steam or gas to drive a turbine or motor engine. Large mirrors concentrate sunlight into a single line or point. The heat created there is used to generate steam. This hot, highly pressurised steam is used to power turbines which generate electricity.

SOLAR THERMAL COLLECTORS are based on a centuries-old principle: the sun heats up a liquid contained in a dark vessel. Solar thermal technologies provide energy for a wide range of applications - from domestic hot water and space heating to swimming pool heating, solar-assisted cooling, industrial process heat and the desalination of drinking water.

WIND ENERGY has become the world's fastest growing energy source over the last 20 years. Turbines range from a few kW to over 7,000 kW - the largest are over 130m in height. One large wind turbine can produce enough electricity for about 5,000 homes. In 2008, wind energy produced electricity for 35 million EU households. Most commercial turbines now operate on a horizontal axis with three evenly spaced blades attached to a rotor from which power is transferred to a generator. The electricity output is then channelled down the tower to a transformer and eventually into the local grid.

BIOMASS is a broad term used to describe material of recent biological origin that can be used as a source of energy. This includes wood, crops, algae and other plants as well as agricultural and forest residues, urban and vegetable waste. Biomass can be used for a variety of end uses: heating, electricity generation or as fuel for transportation.

GEOTHERMAL POWER PLANTS use the earth's natural heat to vaporise water or an organic medium. The steam created powers a turbine which produces electricity. In New Zealand and Iceland, this technique has been used extensively for

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decades. In Europe the technology is still in trial stage, but Geothermal heating plants are in widespread use. These plants require lower temperatures and the heated water is used directly. A significant share of Europe's demand for heating and cooling can be supplied by geothermal energy.

HYDRO POWER is "water power" and hydroelectric power is electricity generated using the power of water that is stored behind a dam in a reservoir. Water pressure (from the weight of the water and gravity) forces the water onto the blades of a turbine to turn the mechanical energy into electricity. Small hydro power is mainly 'run-of-the-river' and does not collect significant amounts of stored water, requiring the construction of large dams and reservoirs.

The EU – global leader in renewable energy

Just as climate change is a real problem,, so renewable energy is a real solution. In 2008, the solar thermal sector experienced a growth of 51.5 %[3].

At the end of 2008, European wind power capacity had risen to 65 thousand MW installed capacity, which is a 15.1% increase on 2007.

It's not that easy - renewable energy barriers

HIGH INITIAL CAPITAL COSTS: Usually the investment costs of renewable energy technologies are higher than those of competing old power systems. However, there has been a continued and significant reduction in the cost of renewable energy over the last 20 years.[5]

SUBSIDIES FOR COMPETING FUELS: Massive public subsidies for nuclear power and fossil fuels, as well as the way that our electricity grid is organised, mean that there is not a level playing field for renewable energy. That's why financial support systems are needed for renewable energy. The German 'feed in tariff' which is copied all over the World has been a great success story supporting renewable energy.

EXTERNAL COSTS: Although environmental impacts and associated costs are often included in economic comparisons between renewable and conventional energy, investors rarely include such environmental costs to make decisions.

There are controversial debates over the environmental and economic sustainability of biofuels. Most environmental organisations believe that under the current circumstances biofuels could cause environmental and social problems if they play a significant role in transport or energy policy.

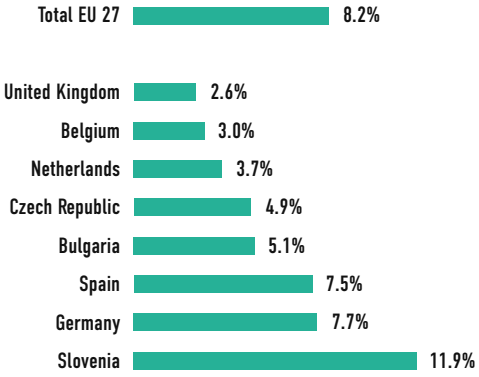
Small scale versus large scale – 100% RES is possible

The study 'RE-thinking 2050' by the European Renewable Energy Council (EREC) outlines a pathway how the EU could switch to a 100% renewable energy supply for electricity, heating and cooling as well as transport. Achieving this is not a matter of technology but of political will.[5]

A large proportion of global energy in 2050 will be of energy will be produced by small, decentralised energy sources, although large scale renewable energy supply will still be needed in order to achieve a fast transition to a renewables based system. Large offshore wind farms and concentrating solar power plants will therefore have an important role to play.[3]

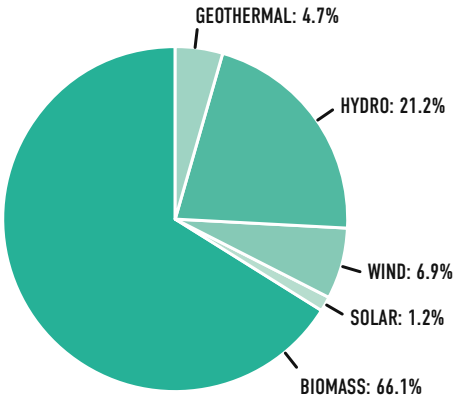
Share of renewable energies in primary energy consumption

2008 [4]



Share of each resource in renewable energy primary consumption

2008 TOTAL: 147.7 Mtoe (estimate) [4]



References

[1] EREC/Greenpeace Energy [R]evolution, Sven Teske, Arthouros Zervos, Oliver Schäfer, January 2007
www.erec.org/fileadmin/erec_docs/Documents/Publications/energy_revolution.pdf

[2] Diagram source: Brightonart adaptation from WBGU in EREC/Greenpeace Energy [R]evolution, 2007

[3] The state of Renewable Energies in Europe, 9th EurObserv'ER Report, 2010
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[4] Diagram Source: Brightonart adaptation from 9th EurObserv'ER Report, 2010
www.energies-renouvelables.org

[5] EREC, RE-thinking 2050 study
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