

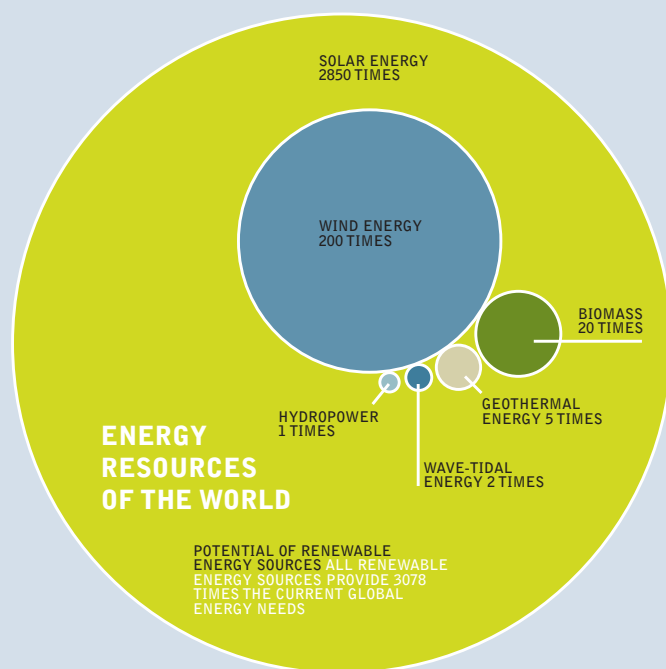
ENERGY REVOLUTION: A SUSTAINABLE PATHWAY TO A CLEAN ENERGY FUTURE FOR EUROPE

A EUROPEAN ENERGY SCENARIO FOR EU-25

I ENERGY TECHNOLOGIES

unlimited clean energy Nature offers a variety of options for producing energy. It is mainly a question of how to convert sunlight, wind, biomass or water into electricity, heat or power as efficiently, environmentally friendly, and cost-effectively as possible.

sunlight becomes energy On average, the energy in the sunshine that reaches the earth is about one kilowatt per square metre worldwide. According to the results of the Research Association for Solar Power, power is gushing from renewable energy sources at a rate of 2,850 times more energy than is needed in the world today. In one day, the sunlight which reaches the earth produces enough energy to meet the world's current power requirements for eight years. Only a percentage of the potential held by renewable resources is technically accessible. According to scientists and the solar industry, with reference to the current state of technology, this percentage is still enough to provide just under six times more power than the world currently requires.



TECHNICALLY ACCESSIBLE TODAY

The amount of power that can be accessed with current technologies supplies a total of 5.9 times the global demand for power.

Sun	3.8 times
Geothermal heat	1 time
Wind	0.5 times
Biomass	0.4 times
Hydrodynamic power	0.15 times
Ocean power	0.05 times

SOURCE: Dr. Joachim Nitsch

i renewable energy technologies – a technical overview

sunlight into electricity

The sun is an inexhaustible source of energy for our future. It is the basis for nearly all natural processes, including human life. It will continue to provide abundant, clean and free energy, available everywhere now and for billions of years to come. Making maximum use of solar thermal energy is a necessary step in securing a sustainable energy supply and safeguarding our planet and the health of future generations. There is more than enough solar radiation available all over the world to satisfy a vastly increased demand for solar power systems. The sunlight, which reaches the earth's surface is enough to provide 2,850 times as much energy as we can currently use. On a global average, each square metre of land is exposed to enough sunlight to produce 1,700 kWh of power every year. In Europe, the average output is between 850 kWh/m² in Northern Europe, 1,200 kWh/m² in Central Europe and 1,200-2,000 kWh/m² in Southern Europe and the Mediterranean.

5.1.1.1 solar electricity – photovoltaics The word "photovoltaic" is a marriage of two words – "photo", meaning light, and "voltaic", meaning electricity. So photovoltaic (PV) technology, involves the generation of electricity from light. The secret to this process is the use of a semiconductor material which can be adapted to release electrons, the negatively charged particles that form the basis of electricity. The most common semiconductor material used in photovoltaic cells is silicon, an element most commonly found in sand.

All PV cells have at least two layers of such semiconductors, one positively charged and one negatively charged. When light shines on the semiconductor, the electric field across the junction between these two layers causes electricity to flow, generating DC current. The greater the intensity of the light, the greater the flow of electricity. A photovoltaic system does not therefore need bright sunlight in order to operate. It also generates electricity on cloudy days, the amount of energy output depending on the density of the clouds. Due to the reflection of sunlight, days with only a few clouds may even result in higher energy yields than days with a completely blue sky.

Solar PV is quite different from a solar thermal system where the sun's rays are used to generate heat, usually for hot water in a house, swimming pool, etc.

time required to recoup initial energy investment: between one and three years (depending on climate zone/sunlight hours per year).

