



Renewables
make
the difference

Directorate-General
for Energy
and Transport



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A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (<http://europa.eu>).

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Foreword

Energy is the driving force of our society. Pressing issues such as climate change, an increasing dependence on oil and other fossil fuels, and rising energy costs are causing us to rethink the way we produce and consume it. In this respect, renewable energy sources represent an important part of the solution towards a sustainable energy future. The European Union has therefore made a commitment to raise the share of renewable energy to 20% by 2020 as well as to increase the level of biofuels in transport fuel to 10% by 2020.

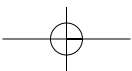
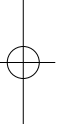
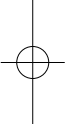
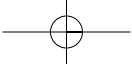
Reaching these targets in practice means that everyone needs to do their share. Small yet important individual steps, such as using less energy and choosing renewable energy to heat our homes, for our electricity supply and as fuel for our cars, can all contribute towards reaching these goals.

Increasing our production of renewable energy will bring other benefits as well. It will boost the development of new technologies in the field and create a need for a knowledge-based industry. In other words this means new jobs, increased competitiveness, new export opportunities and economic growth.

Energy production has a key impact on climate change – using renewables for heating and cooling and in other sectors means lower greenhouse gas emissions and reduced air pollution. Furthermore, the increased use of energy produced from renewable sources, such as biomass, is an important means of diversifying our energy sources. It improves the security of our energy supply by reducing our dependence on imported oil and gas.

The EU is fully committed to reaching these targets – we are unanimous in this respect. I am convinced that it is now time to put the words into action.

Andris Piebalgs
European Commissioner for Energy





RENEWABLES IN DEMAND

Millions of people across Europe are trying to reduce their contribution to the emissions of greenhouse gases (GHG), including carbon dioxide, which are responsible for global warming. At the European level, meanwhile, we are putting in place policies that will help you to do just that.

Increasing the use of renewable energy is certainly one way of making our energy supply more environmentally-friendly. Many of you are asking to be better informed about what renewables are and how they can best be utilised.

So, why is renewable energy so attractive? Climate change is not the only reason for promoting renewable energy. It also means producing more of our own energy in Europe, making our energy supply more secure and helping the European economy.

Protecting the environment

The way we produce our energy lies at the heart of efforts to tackle climate change. The energy supply is still dominated by fossil fuels, which give off greenhouse gases when we burn them for energy.

Renewable energy sources (RES), on the other hand, emit only small amounts of greenhouse gases or even none at all. Increasing their share in our energy mix will help cut greenhouse gas emissions and reduce our collective 'carbon footprint'. Renewable energy will also help reduce air pollution.

Making our energy supply more secure

EU countries are highly and increasingly dependent on imports of fossil fuels (oil and gas) for their transport and electricity generation. In fact, in the EU, we rely on energy imports for about half of our energy consumption. Moreover, fossil fuels account for 79% of the EU's gross inland energy consumption. The problem is that fossil fuel resources are finite; furthermore, supplies are vulnerable to price fluctuations or logistical or political difficulties.



It is therefore important to reduce our dependence on fossil fuel imports and to diversify our supply of energy. Renewable energies help us do this because it means using more 'home-grown' energy – energy based on Europe's own natural resources. This helps to diversify the energy mix and the sources of energy that we rely on.

Boosting the economy

Renewable energies also have huge potential to boost Europe's industrial competitiveness. They are expected to be economically competitive with conventional energy sources in the medium- to long-term, so we should gain if we take the lead now.

Boosting investment in renewable energies should help create businesses and jobs, and promote innovation in the EU economy. Exporting renewable energy technologies to other countries will also bring business opportunities, further boosting the EU economy.

THE USES OF RENEWABLE ENERGIES

Renewable energy has three different applications:

- Electricity generation
- Heating and cooling
- Biofuels for transport

These three applications represent different technological processes and industrial sectors, but all can contribute to the EU's aim of a more sustainable, secure and competitive energy supply.

The different types of renewable energies (pp.10-18) may be used in different ways and are not all suitable for every application (see table). Hydro and wind are exclusively used for generating electricity, while other resources like biomass (organic matter), geothermal and solar can be used to produce both electricity and heat.

Uses of different types of renewable energy

	ELECTRICITY	HEAT	TRANSPORT FUEL
BIOENERGY	✓	✓	✓
SOLAR	✓	✓	
GEOHERMAL	✓	✓	
WIND	✓		
OCEAN	✓		
SMALL HYDRO	✓		

Electricity

Renewable energy is already helping to generate the electricity that we use every day when we turn on a light or watch television (see table). The fact that EU energy markets have been opened up to greater competition also gives you, the consumer, the chance to choose electricity suppliers that use more renewable energy sources.

Under EU legislation, all EU countries have set national targets for the proportion of electricity consumption that should come from renewable energy. If they all achieved these targets, over a fifth of our electricity consumption in the EU would be produced from renewable energy by 2010. However, increased efforts are still needed to achieve this target.

Contribution of renewables to electricity production (EU-27, 2005)

	TWh*
WIND	70.5
SOLAR PHOTOVOLTAIC	1.5
BIOMASS	80.0
HYDRO	306.9
GEOHERMAL	5.4
TOTAL RENEWABLE ENERGY SOURCES	464.4
TOTAL ELECTRICITY GENERATION EU-27	3 309
SHARE OF RENEWABLE ENERGY SOURCES	14.0%

Source: Eurostat
*Terawatt-hour



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Heating and cooling

The heating and cooling sector accounts for half of EU final energy consumption, serving to heat our homes and buildings, produce domestic hot water and supply heat for industry. Heat production is, in fact, the largest energy sector, ahead of electricity or transport.

Renewable energies like biomass (which currently dominates renewable heating consumption), solar and geothermal energy have huge potential in the heating and cooling sector. However, with renewable energy sources accounting for only 10% of total heating and cooling, this potential is far from being realised.

This means that more must be done to integrate renewable technologies into the mainstream heating and cooling industries. There is also potential to widen the use of biomass-fired combined heat and power plants that simultaneously generate electricity and heat, thus increasing global energy efficiency.

Contribution of renewables to total heat needs (EU-27, 2005)

	Mtoe*
BIOMASS	56.2
SOLAR THERMAL	0.7
GEO THERMAL	0.7
TOTAL RENEWABLE ENERGY SOURCES	57.6
TOTAL HEAT NEEDS	576
SHARE OF RENEWABLE ENERGY SOURCES	10%

Source: Eurostat

*Million tons of oil equivalent

Transport

The share of transport in energy consumption and greenhouse gas emissions has increased over the years, making it all the more important to improve fuel efficiency and find ways of reducing emissions from our transport. Furthermore, 97.3% of energy in the transport sector is from oil-derived products (2005).

Biofuels (fuels derived from organic matter) are the main substitute for petrol and diesel in transport available on a large scale and usable in ordinary vehicles. The use of biofuels such as biodiesel, bioethanol and, to a lesser extent, biogas can therefore be an important way of promoting more sustainable energy use in transport and of reducing dependence on fossil fuels. Moreover, biofuels generally have a better greenhouse gas performance than fossil fuels and therefore help the EU meet its obligations to reduce greenhouse gas emissions.

Currently, biofuels account for only a minimal proportion of transport fuel in the EU (1.1% in 2005), but the EU is working to increase this share (see also next chapter).

EU ENERGY TARGETS – 2020 VISION

The EU raised the bar in 2007 for the desired share of renewable energies in our energy mix. The European Commission made proposals in January 2007 for a new energy policy for Europe, including ambitious energy and emissions targets, as well as a renewable energy roadmap and plans for a stronger legal framework. The targets endorsed in March 2007 by EU Heads of State are as follows:

**Renewable energies target:
A binding 20% share of renewable energy sources
in overall EU energy consumption by 2020**

EU countries will have to develop national action plans with a view to meeting their own targets that will globally meet this target, and set specific objectives for electricity, heating and cooling and biofuels. The plans will reflect national circumstances, given the differences in renewable energy sources that are available from country to country.

**Biofuels in transport target:
A 10% minimum target to be achieved by all EU
Member States for the share of biofuels in overall
EU transport petrol and diesel consumption by 2020**

The aim of increasing the share of biofuels will be accompanied by a sustainability scheme to ensure that biofuels that count towards the target are produced – whether inside or outside the EU – in a sustainable way.

The Commission consulted the public in 2007 about how to achieve the 10% biofuel share and, inter alia, the design of the sustainability scheme, monitoring land use, and encouraging so-called 'second generation' biofuels like bioethanol from straw.

Climate change and energy efficiency targets

The targets for renewable energy and the separate target for biofuels in the transport sector contribute to the broader effort to meet the EU target of at least a 20% reduction of greenhouse gas emissions by 2020 compared to 1990. Efforts also need to be combined with better energy efficiency – with an objective of improving by 20% the EU's energy efficiency compared to projections for 2020 – and reduced consumption of fossil fuels.

Key EU Directives on renewable energy and energy efficiency:

- Electricity produced from renewable energy sources (Directive 2001/77/EC)
- Energy performance of buildings (Directive 2002/91/EC)
- Biofuels or other renewable fuels for transport (Directive 2003/30/EC)
- Taxation of energy products and electricity (Directive 2003/96/EC)
- Cogeneration (Directive 2004/8/EC)

How do we meet the targets?

The targets require substantial growth in all three renewable energy sectors – electricity, heating and cooling, and transport. This is achievable as long as there is a concerted effort from all EU governments, industry and the public too. If you 'buy green' and opt for more renewable energy, you are contributing directly to the growth of renewable energy.

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The EU has supported renewable energy through policy, legislation, funding and research since the 1980s. Measures already in place include legislation on renewable electricity and biofuels (see previous page) and provision for possible tax exemptions or reductions for renewable energy sources.

Getting involved – ManagEnergy and Sustainable Energy Europe

If you want to know more about renewable energy, there is good news: the EU has a number of schemes to promote wider involvement. The European Commission's **ManagEnergy** initiative supports work on energy efficiency and renewable energies at local and regional level through training workshops and online events. The Commission's **Sustainable Energy Europe** campaign raises public awareness about sustainable energy and helps you play your part in changing the energy landscape.

Find out how to get involved at:

www.managenergy.net/

www.sustenergy.org



RENEWABLES IN THE EU

The EU is a world leader in renewable energy and the sector is already important economically. Renewable energy in the EU has a turnover of € 30 billion, providing 350 000 jobs.

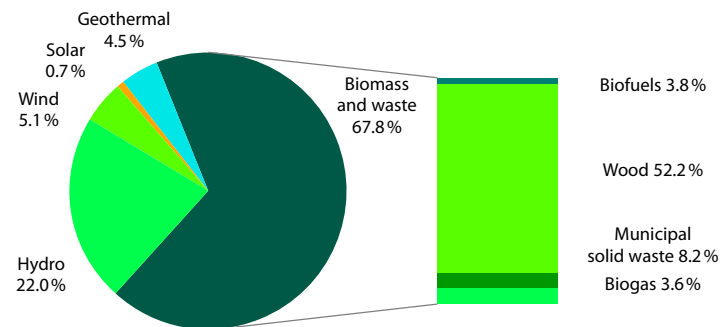
As renewable technologies have matured, some of them – particularly wind – have been much more widely used. Production of renewable energy has risen steadily, and costs have come down. But development has been uneven across the EU, and renewable energies still represent only a small share of the EU's total energy mix relative to the dominance of gas, oil and coal. Because the external costs of fossil fuels – such as environmental impact – are not fully taken into account, renewable energies are generally still not competitive with conventional energy sources.

Different renewable energies are at different stages of technological and commercial development. Sources such as wind, hydro, biomass and solar thermal are already economically viable. But others, like photovoltaic (which uses silicon panels to generate electricity from sunlight), will depend on increased demand to improve economies of scale.

So, while they have begun to make their mark and provide us with more environmentally-friendly energy, there is still great potential for renewable energies to increase market share and establish themselves as cost-effective, widely-used energy options.

The figures on these pages give you more information about the state of renewable energy in the EU. And further details about different renewable energy sources – all of which have their part to play in meeting the EU's energy and emissions targets – can be found in subsequent chapters.

Primary energy production from renewable energy sources, breakdown by individual source (EU-27, 2005)



Source: Eurostat

EU-27 renewable final energy consumption 2000-2005 (Mtoe*)

2000	2003	2004	2005	SHARE IN CONSUMPTION (2005)
87.0	93.8	99.4	104.2	8.5%

Source: Eurostat
*Million tons of oil equivalent



KEY TYPES OF RENEWABLE ENERGY

Bioenergy: biomass, biogas and biofuels

Biomass is derived from different types of organic matter: energy plants (oilseeds, plants containing sugar) and forestry, agricultural or urban waste including wood and household waste. Biomass can be used for heating, for producing electricity and for transport biofuels.

The use of biomass significantly reduces greenhouse gas emissions. The carbon dioxide it gives off when it is burned is counterbalanced by the amount absorbed when the plant in question was grown. However, there are always some emissions from processes like cultivation and fuel production, so biomass is not completely carbon-free.

Different types of biomass use different technologies and processes for the production of bioenergy:

Solid biomass (like wood and straw) can be put through processes including combustion, pyrolysis, hydrolysis or gasification to produce bioenergy.

Biogas can be produced from organic waste through anaerobic fermentation and obtained from landfill gas. It can be used in vehicles adapted to run on natural gas.

Why biomass?

- Diversifies the energy supply
- Replaces high CO₂-emitting conventional fuels
- Helps recycle waste
- Protects and creates jobs in rural areas
- Extends the EU's technological leadership in bioenergy

Developing bioenergy: AGROPTI biogas

The 'AGROPTI-gas' project saw the construction of a biogas production plant in Västerås, Sweden, which co-digests energy crops and household waste. There is also a facility for upgrading biogas to vehicle fuel quality and for providing filling stations for buses and cars, as well as storage facilities for silage. The biogas plant, inaugurated in November 2005, is based on a sustainable interaction between city and countryside, and represents a concept for biogas production and waste management that could be applied in cities all over Europe.

http://ec.europa.eu/energy/res/sectors/doc/bioenergy/anaerobic_digestion_biogas/nne5_2000_484.pdf

Biofuels originate from renewable resources using biomass (organic matter or plants). They represent the only widely available energy resource that can replace fossil fuels in the transport sector.

Today, there are two main types of biofuels used for transport fuel – biodiesel and bioethanol. These are both liquid fuels processed from agricultural crops or plants.

Biodiesel is mostly produced from so-called 'oleaginous' plants such as rapeseed or sunflower. It is the product of vegetable oils reacting with methanol.

Bioethanol is produced mainly by fermentation of sugar from sugar beet, different cereals, fruits or even wine distillation. **Second generation biofuels** are being developed that are made from cellulosic biomass feedstock, which would allow new methods of biofuel production from products, by-products and waste from agriculture, forestry and wood, pulp and paper with more sophisticated chemical reactions.

Why biofuels?

- Constitute the only widely available renewable alternative to fossil fuels in transport
- Help recycle waste
- Diversify the sources of energy supply to non-oil producing countries
- Generally reduce CO₂ emissions and other pollution
- Offer jobs, especially in the field of agriculture

Developing biofuels: BEST alternative motor fuels

The BEST (BioEthanol for Sustainable Transport) project looks to give a boost to bioethanol and pave the way for a market breakthrough for ethanol-fuelled vehicles – via marketing campaigns and the introduction of vehicles and distribution lines at 10 strategically chosen sites in an integrated public-private partnership of cities/regions, car manufacturers, fuel producers, fuelling stations and fleet owners. Almost 9 000 vehicles and more than 150 fuelling stations are expected to result from the project, making this the largest demonstration of alternative-fuelled vehicles yet supported by the European Commission.

http://ec.europa.eu/energy/res/fp6_projects/doc/amf/factsheets/best.pdf



Solar electricity: concentrating solar power

The sun is the world's primary source of energy, and solar power systems can harness the sun's rays as a high-temperature, clean energy source for heat or electricity.

But to produce electricity, the solar power has to be concentrated or focused. This is because solar radiation reaches the earth's surface with a density that is adequate for heating but not for an efficient thermodynamic cycle for producing electricity.

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There are different types of concentrating solar power (CSP) technologies/systems:

Parabolic solar collectors or curved 'troughs' enable the sun's rays to converge towards a single point to collect heat from the sun.

Solar tower power plants involve hundreds or even thousands of mirrors following the sun's path and concentrating its rays onto a receiver at the top of a tower.

Solar dish/engine systems see parabolic dishes transfer solar radiation to a 'Stirling engine' – an engine using heat to act on a fluid.

The sun's rays can also be used to activate chemical reactions to produce fuels and chemicals. In the medium- to long-term, other applications will include environmentally-friendly technologies.

Why solar power?

- Diversifies the energy supply
- Saves carbon dioxide emissions
- Creates local jobs and stimulates the local economy
- Uses an inexhaustible energy source
- Can generate both heat and, when concentrated, electricity

Developing Concentrating Solar Power:

PS10 tower power

Seville in Spain hosts the first commercial concentrating solar power plant in Europe, called 'PS10'. The plant was developed with the help of funds from the EU's Research Framework Programme and was inaugurated in March 2007. PS10 is designed to produce enough electricity to supply a population of 10 000 – avoiding the emission of about 16 000 tonnes of CO₂ each year. More than 600 movable mirrors concentrate solar radiation onto the top of a 115m-high tower where there is a solar receiver and a steam turbine. PS10 is the first of a set of solar electric power generation plants to be constructed in the same area.

http://ec.europa.eu/energy/res/sectors/csp_diss_en.htm



Solar electricity: photovoltaic

Photovoltaic (PV) power generation uses solar cells to convert light directly into electricity. The energy can be stored by chemically-charged batteries or other means. Photovoltaic systems connected to the electricity grid do not require storage.

Photovoltaic is for the time being an expensive solution, which is why some EU Member States have decided to stimulate the technology, helping to gradually bring down its cost. Moreover, EU-funded research is fostering technological improvements and economies of scale to lower the cost of grid-connected photovoltaic electricity in Europe.

The EU is already a world leader on photovoltaic: about one third of global photovoltaic power is produced in the EU.

Why photovoltaic?

- Uses a free and inexhaustible energy source
- Does not produce noise, harmful emissions or polluting gases
- Suits both high-density populations and remote areas
- Requires minimal maintenance
- Is easily installed and expanded thanks to the use of modular systems

Researching solar photovoltaic: PV-Light in buildings

Using photovoltaic systems in buildings is an attractive way to generate renewable energy. As well as producing energy, photovoltaic louvres in front of glass façades and windows can provide shade from direct sunlight to prevent a building overheating, while allowing enough daylight through to avoid the need for artificial lighting. Solar tracking optimises both energy generation and shading according to the time of day, the season or the weather. The PV-Light project worked on the integration of lightweight photovoltaic solar control systems into façades and roofs with a view to increased market potential. For details of this and a number of other photovoltaic projects, see:

http://ec.europa.eu/energy/res/sectors/doc/photovoltaic/european_photovoltaics_en.pdf



Solar heating and cooling

Solar thermal systems are based on a simple principle that has been known for centuries: the sun heats up water contained in a dark vessel. The conversion of solar radiation for heating and cooling purposes has a wide range of applications including domestic hot water, heating in buildings and industrial processes, solar-assisted cooling, desalination, and swimming pools.

Solar thermal heating can be achieved through systems that mechanically transfer heat by means of a working fluid such as oil, water or air.

Heating: even the simplest solar thermal systems can provide a (sometimes large) part of domestic hot water needs. Whilst such systems are clearly more productive in sunny climates, the efficiency of new equipment means that they can, anywhere in the EU, at least contribute to hot water or space heating (often combined with existing boiler systems). This is why Germany and Austria are second only to Cyprus and Greece among EU countries in their share of solar heating.

Cooling: solar power can also be used in a cooling system to create air conditioning with heat absorption systems (a bit like a refrigerator). When backed up by biomass boilers, 100% renewable cooling systems are possible.

Why solar thermal?

- Offers a cheaper solution for using the sun's energy
- Is simple, affordable and readily available, even for detached houses
- Requires minimal maintenance
- Makes use of an abundant, free and inexhaustible energy source
- Does not produce any side effects

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Developing solar heating and cooling: SOLAIR (air conditioning)

Electricity consumption for air conditioning is increasing dramatically throughout the EU. The use of solar thermal energy for air conditioning – so far a relatively new technology – offers an alternative with huge potential. The SOLAIR project aims to increase the market presence of solar air conditioning systems for small and medium applications in residential and commercial buildings. It is looking to overcome market obstacles like a lack of awareness, know-how and coherent information through market surveys, capacity-building and promotion.

www.solair-project.eu/



Wind energy

Wind energy is one of the most promising renewable energy technologies, and is an area in which there have already been many developments and improvements to make electricity generation more effective. Between 1995 and 2005, cumulative wind power capacity in the EU increased by an average of 32% per year.

Modern wind turbines extract energy from the wind by transferring the momentum of passing air to rotor blades. The power that can be generated by the turbines depends on the density of the air, the wind speed and the size of the turbine. The rotors of most wind turbines face into the wind and move to follow changes in wind direction. Energy is concentrated into a rotating shaft and converted into electricity.

Why wind energy?

- Is a source of clean energy free of carbon dioxide emissions
- Provides low-cost indigenous power
- Is already an important export industry
- Changes the landscape but agricultural/industrial activities can continue around it
- Can be deployed both on land and offshore

Researching wind energy: DOWNVIND offshore wind farms

The DOWNVIND (Distant Offshore Windfarms with No Visual Impact in Deepwater) project is targeting step-change technological advances to enable the development of large-capacity wind farms offshore in deep water. It incorporates a demonstrator project to install and monitor two wind turbine generators in deep water off the coast of North East Scotland. This demonstrator project should serve, among other things, to pioneer the development of deep water wind farms, improve and commercialise the technology, and share knowledge and experience across Europe.

www.downvind.com

Ocean energy

Oceans cover three quarters of the planet and consequently ocean energy represents one of the most plentiful renewable energy sources. This energy comes from energy flows such as waves, tides, ocean currents, as well as differences in salinity and temperature. It still needs time to be competitive with the more advanced renewable energy sources.

Wave energy technologies differ according to the location of the energy converter device relative to the shoreline. The devices can be shoreline devices fixed to, or embedded in, the shoreline. Or they can be devices placed in the sea near the shore or offshore, the latter drawing on the more powerful wave regimes available in deep water.

Europe is the world leader in wave energy technology. And, with some European countries investing in research and development or demonstration projects, the EU should be well placed to compete when a commercial market for the technology evolves.

Tidal schemes exploit the natural ebb and flow of tidal waters in order to generate electricity. This can be done either by harnessing the rise and fall of the sea level using barrages, or by drawing energy from tidal currents using turbines in a way comparable to wind power.



Why ocean energy?

- Needs no fuel
- Produces no waste
- Does not have a major environmental impact
- Makes use of the total predictability of the tides
- Represents a fascinating field for further research

Researching ocean energy: CA-OE coordinated action

Ocean energy industries and research communities are at present small and scattered. At the same time, several ocean energy systems featuring new and unproven technologies are seeking financing to develop working prototypes at sea. The Coordinated Action on Ocean Energy (CA-OE) project is working to develop a common knowledge base, to bring a coordinated approach to key areas of ocean energy research and development, and to provide a forum for the longer-term marketing of promising research deliverables. Attention will be paid to evaluating data from ocean energy systems tested in real sea conditions.

www.ca-oe.net/home.htm



Hydro and small hydro

Hydro power is produced from the movement of a mass of water such as a river, canal or stream. Hydro schemes convert the potential energy of the water, flowing with a certain fall (or 'head'), into usable energy. This has been the historical development of electricity in the world.

Such schemes require a suitable rainfall catchment area, a hydraulic head, a pipe or device to carry water to a turbine, and a turbine house containing power generation and water regulation equipment. Water is returned to its natural course after it has been used.

Small hydro sites are generally defined as those with installed capacity of less than 10 MW, while large-scale hydro schemes have large dams and storage reservoirs. Small hydro is useful for producing electricity, especially for isolated areas. Large hydro is reaching saturation point, hence the focus on small hydro where development is possible.

Why small hydro?

- Diversifies the energy supply
- Aids local development
- Assists in the maintenance of river basins
- Suits rural electrification
- Has a high energy payback ratio

Developing small hydro: SHERPA promotion campaign

There are a number of barriers to the wider use of small hydropower, including lack of knowledge about the technology and unsuitable spatial planning methods. The Small Hydro Energy Efficient Promotion Campaign Action (SHERPA) looks to overcome such barriers, in particular in the new EU Member States, through a promotion campaign on small hydropower. SHERPA is looking to make decision-makers more aware of the benefits of small hydropower as a renewable energy resource, and to help create favourable conditions for its further development.

www.esha.be/index.php?id=80



Geothermal energy and heat pumps

Geothermal energy has been used for centuries for bathing and heating water. It is extracted from the earth's natural heat in dry, steam or liquid form and can be used for electricity and heating.

Deep geothermal resources include: hydrothermal (hot water and/or steam trapped in fractured or porous rock), geo-pressured (hot water aquifers under high pressure), and enhanced geothermal systems (geological formations that are dry but abnormally hot).

In Europe, the 'heat pump' is the most promising way of using geothermal energy. This consists of extracting heat from hot, shallow geothermal fluid and transferring it to water or air which is used to supply heat for space heating. Even at shallow depths of 50-100m, the earth harbours heat that can be extracted by heat pumps – often located in the gardens of suburban houses – and used directly in domestic heating. Heat can also be returned to the earth for storage as a way of 'air conditioning' homes and buildings.

Why geothermal energy?

- Reduces greenhouse gas emissions
- Uses an inexhaustible source of energy
- Can supply direct heating
- Needs less land than other energy resources
- Is continuously available

Researching geothermal energy: LOW-BIN power

The LOW-BIN project aims for efficient low-temperature geothermal binary power. It is striving to improve the cost-effectiveness, competitiveness and market penetration of geothermal electricity generation schemes, targeting both hydrothermal resources for immediate market penetration and future hot dry rock systems. The project involves theoretical research, laboratory experiments, pre-prototype development, as well as technology evaluation, validation and dissemination.

http://ec.europa.eu/energy/res/fp6_projects/doc/geothermal/factsheets/low_bin.pdf



LOOKING TO THE FUTURE

The EU's Framework Programmes for Research and Development (FPs) have contributed, over many years, to bringing you more efficient renewable energy technologies and enabling their connection to the power grid.

The research effort will continue under the seventh Framework Programme (FP7) for 2007-2013, with the aim of developing a more sustainable, secure and competitive energy system. € 2.4 billion has been earmarked for energy in the 'Cooperation' part of FP7.

Renewable energy priorities include:

- Renewable electricity generation technologies to increase efficiency and reliability
- Renewable fuel production systems and technologies
- Technologies for cheaper, more efficient heating and cooling from renewable energy

Meanwhile, European Technology Platforms have been established in the energy field – including photovoltaic, biofuels, solar thermal technologies and wind energy – and allow the research community, industry and other stakeholders to develop specific research roadmaps.

Intelligent energy

The EU's Intelligent Energy-Europe (IEE) programme is also at the cutting edge when it comes to promoting the use of renewable energy. Part of a broader EU programme called Competitiveness and Innovation, IEE is worth € 727 million for 2007-2013. It helps to remove barriers, particularly administrative ones, that still block the penetration of renewable energies.

Its aims include:

- Increasing the uptake and demand for energy efficiency
- Promoting renewable energy sources and energy diversification
- Stimulating the diversification of fuels and energy efficiency in transport

Welcome to your new carbon-neutral home!

Homes are responsible for a significant amount of carbon dioxide emissions, but all that could change in the future thanks to the arrival of the carbon-neutral or zero-emission home. These newly designed 'eco-houses' generate their own energy from renewable sources, and are extremely well insulated to prevent heat loss. Such houses may not be the norm yet, but do not be surprised if in a few years' time you are living in one with your heat and electricity supplied by your home's very own biomass boiler and solar panels, significantly reducing your 'carbon footprint'.



THE OUTLOOK FOR 2020

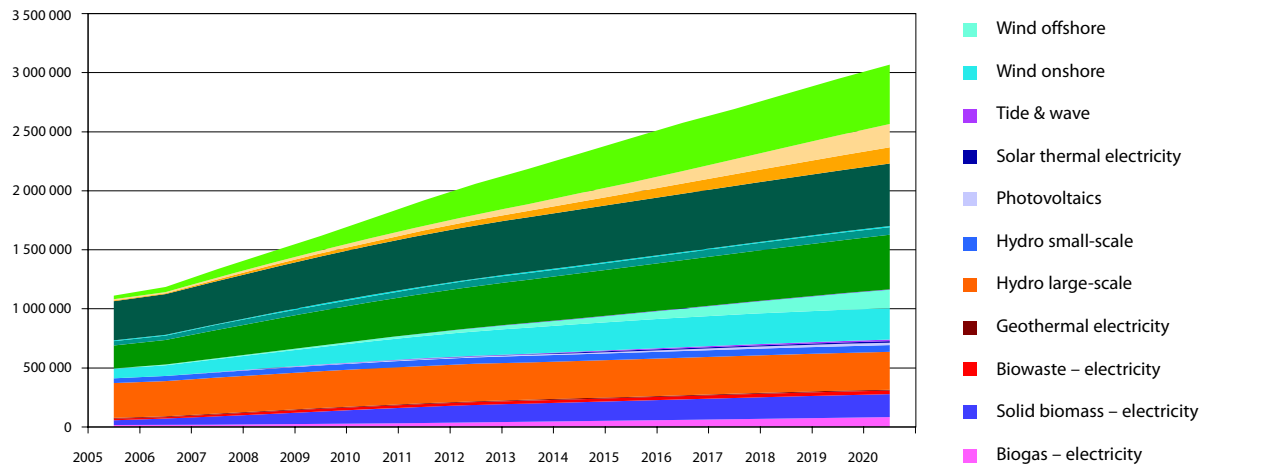
The European Commission's projections for renewable energy up to 2020:

- Renewable energies are set to produce increasing amounts of electricity over coming years – with projections showing that renewable electricity output could roughly triple between 2004 and 2020.
- Renewable heating is also on the rise – with output projected to increase consistently up to 2020.

- Increased renewable energy production is set to bring significant environmental benefits – avoiding hundreds of millions of tons of CO₂ emissions every year.

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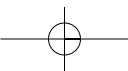
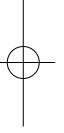
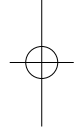
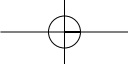
Illustrative growth of EU25 renewable energy by technology (GWh/a*)



Source: Green-X Model from Fraunhofer Institute and EEG
*Gigawatt-hour per year

Further information:

http://ec.europa.eu/energy/index_en.html





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