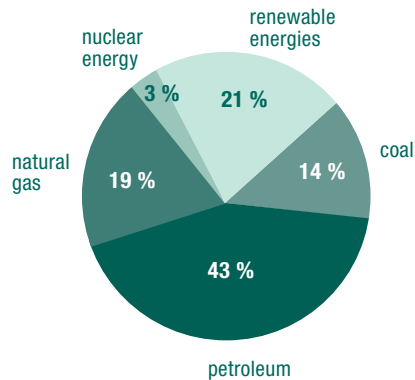


# POTENTIALS OF WIND ENERGY

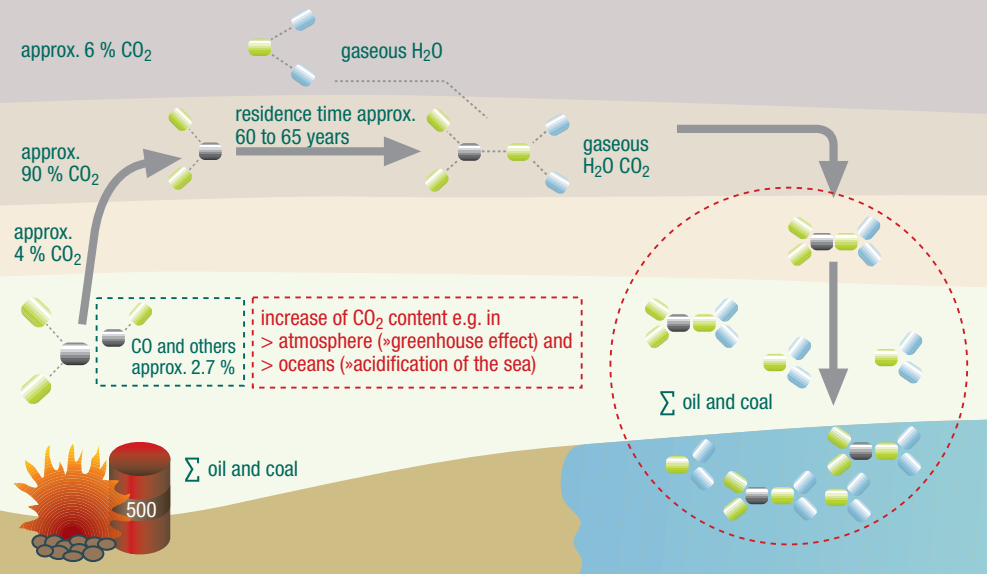


## WORLD'S ENERGY CONSUMPTION



Source: IEA Key World 2004/BP Statistical Review of World Energy June 2004

## CARBON CYCLE



## ENERGY SUPPLY TODAY: PROBLEMS – RISKS – CONSEQUENCES

Climate change and environmental damage necessitate a change in energy policy. Increasing energy demand causing the depletion of fossil fuels and thus the rise in costs necessitate determined action. Our current energy mix must undergo fundamental revisions in order to preserve our life essentials and do away with poverty due to lack of energy, particularly in developing countries.

Currently approx. 75 % of the world's energy consumption is based on coal, petroleum and natural gas, which contain fossil carbon. Therefore, carbon dioxide is always released when they are combusted. This carbon dioxide lastingly destroys the natural balance of our climatic system.

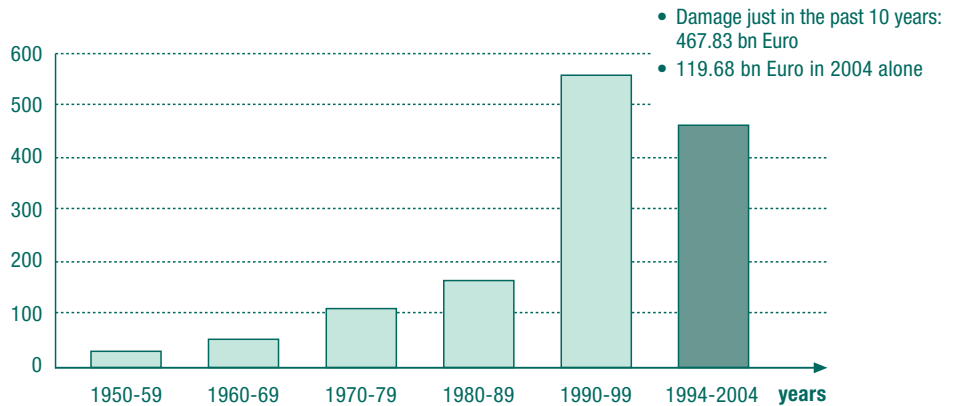
Among other pollutants, carbon dioxide emissions are responsible for the destruction of our planet's protective shield (filter system). As a consequence certain harmful sun radiation wave lengths can reach the biosphere unhindered. Climatic changes (anthropogenic greenhouse effect), air pollution and diseases (predominantly cancer) result from this defective filter system.

The consequences of global warming are dramatic. The frequency of unusual weather conditions is dramatically increasing, causing considerable economic damage. According to conservative estimates the average costs amount to more than € 50 billion a year.

In Germany, renewable energy makes up 10 % of the electricity supply and is a significant component of the energy mix. Fossil and nuclear fuels will increasingly be replaced by renewable energy sources, among other reasons due to rising commodity prices and the necessity to reduce dependence on commodity imports, as an increasing energy demand is faced with a decreasing supply of resources.

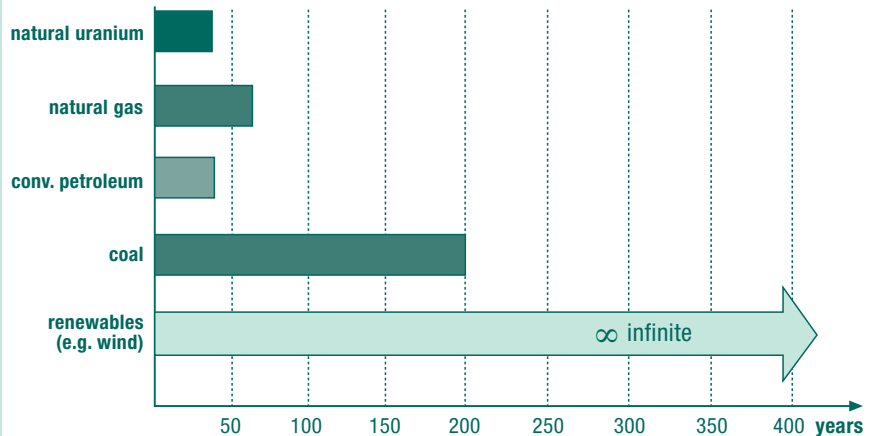
Furthermore, emissions of greenhouse gases can only be reduced effectively through the use of renewable energy. Renewable energy already prevents the production of about 70 million tons of carbon dioxide in Germany today.

### ECONOMIC DAMAGE CAUSED BY CLIMATE CHANGE IN BILLION EUROS



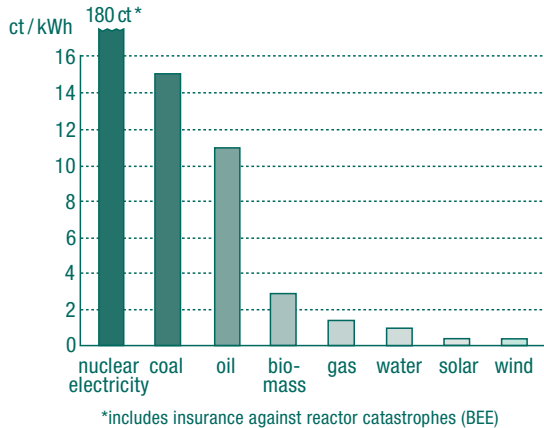
Source: Munich Re (Topicsgeo, Annual Review: Natural Catastrophes 2004)

### THE RANGE OF FOSSIL ENERGY RESERVES (WORLDWIDE) COMPARED TO RENEWABLE SOURCES



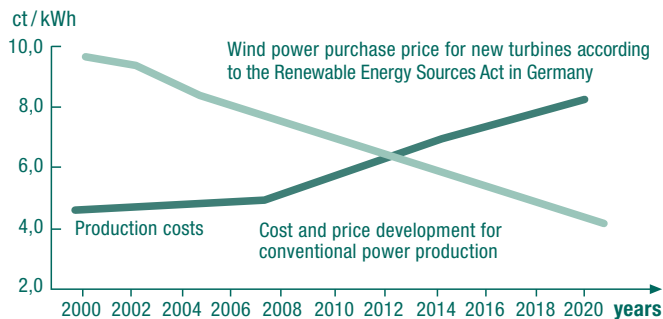
Source: Bundesanstalt für Geowissenschaften und Rohstoffe, 2005  
(Federal agency for earth science and commodities, 2005)

## COMPARISON OF EXTERNAL COSTS



Source: G8 Renewable Energy Task Force

## COST EFFECTIVE ELECTRICITY PRICES WITH WIND ENERGY



Source: BEE

Not only the availability but also the costs are a decisive factor when choosing a particular type of energy generation. Current electricity prices do not take the harm caused to people, environment and global climate into consideration nor do they include risks occurring during the operation of conventional power plants. If these external costs were taken into account when calculating electricity prices, wind energy would already be more cost-effective than conventional energy.

## POTENTIALS OF WIND ENERGY

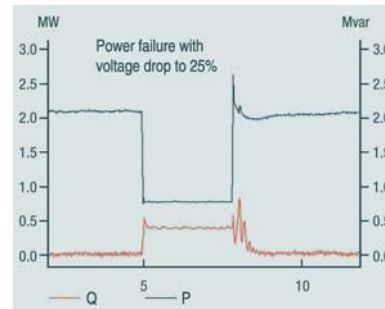
Today, wind energy is an advanced and sophisticated technology, which belongs to the most economical renewable energy sources. The costs of energy production have been reduced by more than 50 % during the last decade and will continue decreasing in the future. On the other hand, prices for fossil energy sources such as coal, petroleum and natural gas have already increased noticeably due to high demand and limited availability. The necessary modernization of power plants and the replacement of outdated plants will lead to a further increase in electricity generation costs.



Based on installed wind power capacity, Germany has a leading position worldwide. A share of now 6 % of the consumption of electricity confirms the enormous potential of wind energy. In some regions, wind energy already contributes more than 50 % to the power supply.

This proves that a secure energy supply based on intelligent and flexible wind energy technology can be achieved without problems. To further integrate wind energy into the energy supply structure, the wind energy converters and the windfarms have to possess the respective power plant characteristics. The ENERCON concept features options for critical situations caused by grid short-circuits or shortages as well as for normal operation such as reactive power management and voltage regulation. The behaviour of windfarms is thus comparable to that of conventional power plants. Further use can be made of this in local grid structures.

## PERFORMANCE DURING GRID FAILURES



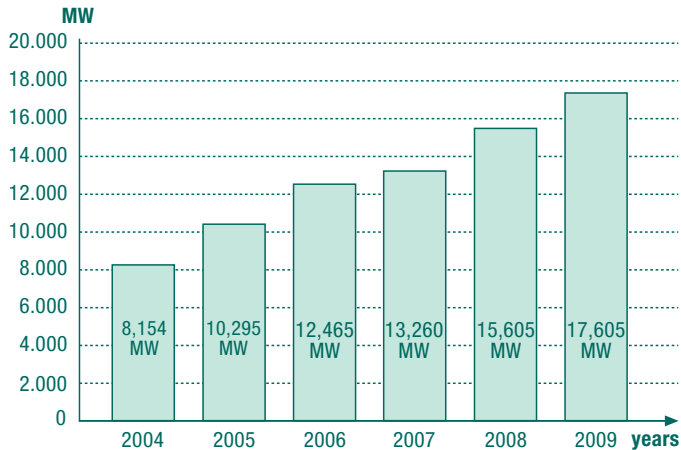
ENERCON wind turbines support the grid in critical situations. The risk of a blackout during increased wind feed can be ruled out. The ENERCON concept allows full active power to return immediately after a network failure.

## CERTIFICATE FOR TURBINE PROPERTIES

Certification Office of E.ON Energy Research Center Accredited according to EN ISO 9001 10010, 10011, 10012		
<b>Certificate</b> of Wind Turbine Power Generation		No.: 2004-01 Only signed copy No. 2
Type:	Enercon E-6620/70 Transmission Rated power: 2000 kW Rated voltage: 690 V Rated wind speed: 12.5 km/h Rated frequency: 50 Hz or 60 Hz For further details and technical data see page 2	
Manufacturer:	Enercon GmbH Osterstraße 1 D-28695 Aurich	
System Specification:	Netzanschluss- und Netzleistungsregeln der Verteilnetze (Europäische Transmissions Code, 2004-08-13)	
Reference Standards:	IEC 61400-22 (2005) IEC 61400-21 (2005) EN 61400-22 (2005) EN 61400-21 (2005)	
<p>The power generation characteristics of the above specified wind systems with the technical data given in table 1 are in line with the requirements of the power system operator (operator of the transmission system).</p> <p>The wind turbine has been tested with the requirements of the reference standard concerning the rated value, the start/stop requirements and the turbine testing requirements.</p> <p>The manufacturer has demonstrated the fulfilment of the quality management system according to ISO 9001.</p> <p>This certificate according to EN ISO 9001:2001/2008 (Clause 8.6) has been issued on basis of the certificate procedure of EGH Certification. It does not prove the compliance with product standards included in table 1 or other technical data.</p> <p>This certificate is valid until December 31, 2008. The actual state of validity of all certificates issued by EGH Certification shall be valid until the certificate procedure is given in the catalogue of EGH Certification.</p> <p>Aurich, December 18, 2008</p>		
		Certification of E.ON Energy Research Center  Ing. Dr. Peter Dreyer (Director)
EGH Certification, Osterstraße 1, D-28695 Aurich Tel.: +49 (0) 49 41 91 10 10 Fax: +49 (0) 49 41 91 10 11 E-Mail: info@egh-certification.de www.egh-certification.de		 E.ON Energy Research Center 10010, 10011, 10012

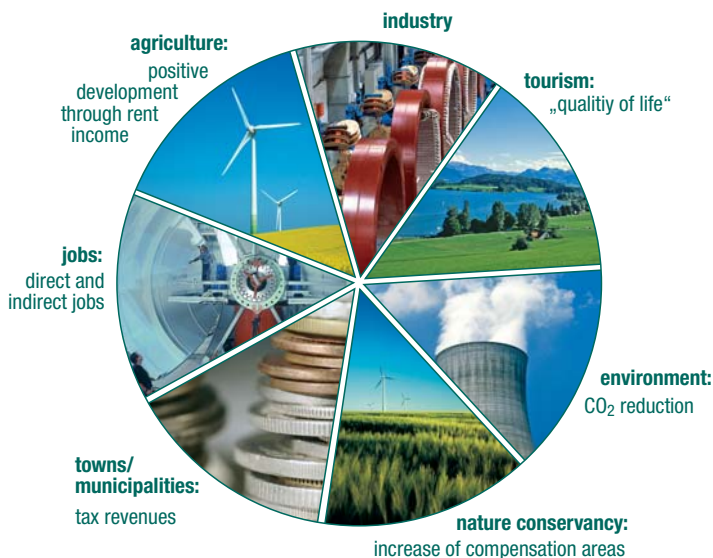
ENERCON is the first manufacturer worldwide to receive certification for turbine properties which are usually only attributed to power stations.

## WIND ENERGY POTENTIAL WORLDWIDE



Source: BTM Consult ApS – March 2005

## REGIONAL ADDED VALUE OF WIND ENERGY



The wind industry has become a significant sector of the economy with a total turnover of about € 16.5 billion (new installations and operation of plants) and approximately 200,000 employees worldwide.

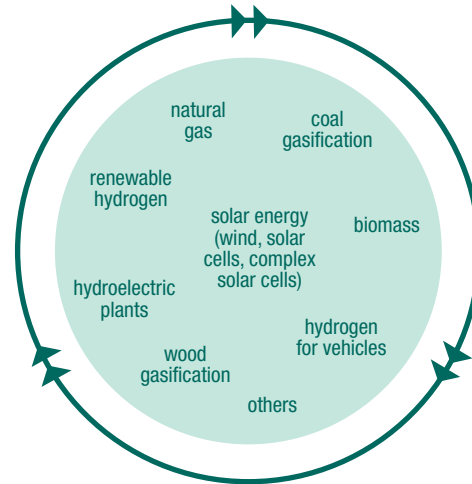
According to the German Wind Energy Institute (DEWI), the annually installed capacity will double to approximately 18,000 MW between 2005 and 2012. This corresponds to an investment volume of about € 130 billion. BTM Consult ApS, an independent consultancy company specialized in services regarding renewable energy, estimates that the worldwide installed capacity will increase by an average of 16 % per year between 2005 and 2009.

The economic benefits of wind energy are not only evident in the creation of new jobs for manufacturing and supplier companies but also in strengthening regional potential. With the realisation of wind parks, additional income opportunities have been created for the people in the respective regions. Furthermore, towns and municipalities may get significant tax revenues, provided that they have positively implemented the designation of preferred sites for wind energy converters. For some German municipalities the tax revenues from the wind energy sector are already higher than the conventional revenues from tourism and small and middle-class enterprises.

The positive development of wind energy in Germany is observed with interest abroad. Meanwhile nearly all European governments have dealt with the preparation and introduction of stable conditions for electricity generation from renewable sources. The successful German instrument, the Erneuerbare-Energien-Gesetz (EEG – Renewable Energy Sources Act), has been adapted by the majority. The German wind industry's export share of more than 50 % of the added value in 2004 proves the increasing interest of other countries in German wind energy technology.

Renewable energy sources are of central importance for effective climate protection as well as for the creation of a sustainable, cost-efficient and safe energy supply. Together with other energy options, they play a key role in the portfolio of future energy solutions. Clean drinking water, a sustainable energy supply and the conservation of our culture are essential prerequisites for humanity.

## SUSTAINABLE FUTURE ENERGY MIX





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