



# Renewables exceed even optimistic expectations

The growth of renewables has outpaced even the most optimistic forecasts. However, even the expansion rate we've seen so far won't be enough to close the energy gap threatening to open up within conventional energy sources.

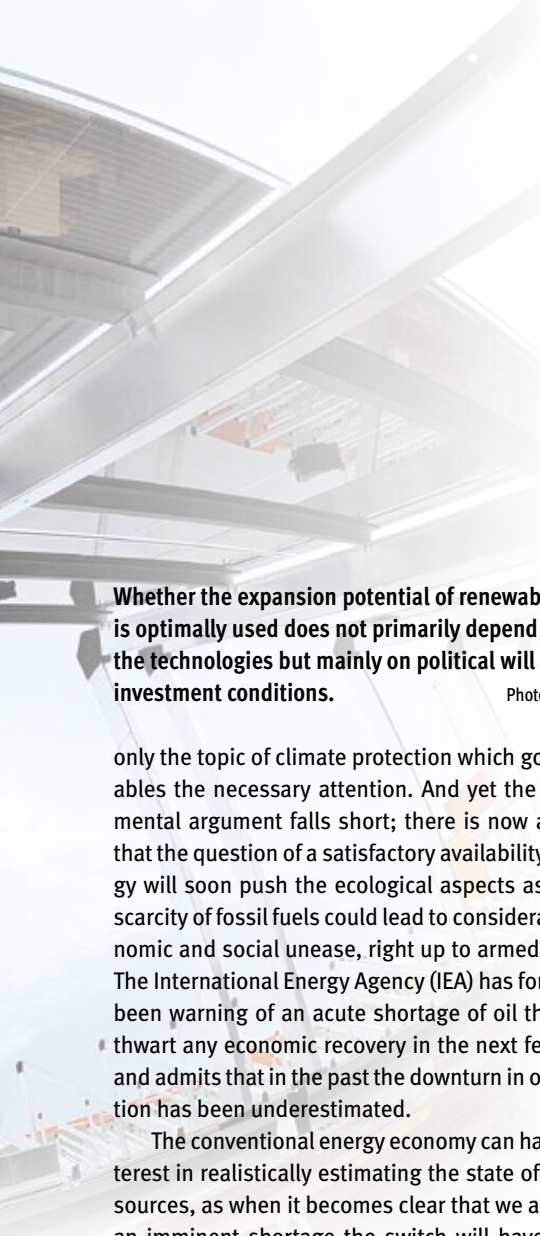
In the four parts of the series preceding this article, the already growing scarcity of fossil fuels has been described. If we put the analyses of oil, natural gas, coal and nuclear power together, we can see that we are at the peak of conventional energy supplies. For the first time in our modern industrialised history these energy sources will not be enough to power the economic growth which could stabilise our economy.

At the same time, renewable energies are still at the start of their growth. They will only be able to

close the gap between growing demand and decreasing availability of fossil fuels quickly enough if their growth can be made to exceed all scenarios so far postulated. Basically, the expansion of renewable energies is following the classical three-phase growth curve for the introduction of new technologies. First there is an initial stage with a relatively slow growth, in which a lot of development takes place in order to make the technology suitable for the masses. Then there is rapidly accelerating exponential growth with mass production. Finally, when reaching a high market share, the development turns and becomes saturation.

## Climate protection is falling short

Unfortunately, the opening up of undoubtedly the only long-term and inexhaustible energy sources was blocked instead of supported for many years. It was



Whether the expansion potential of renewables is optimally used does not primarily depend on the technologies but mainly on political will and investment conditions.

Photo: dpa

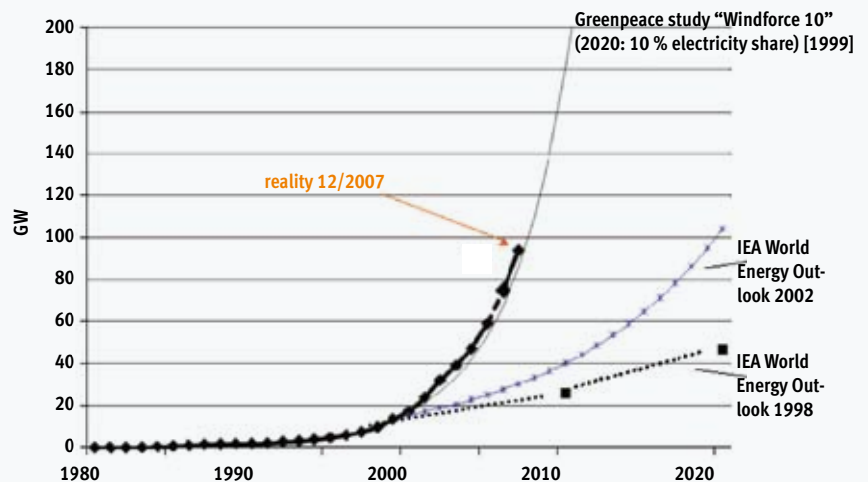
only the topic of climate protection which got renewables the necessary attention. And yet the environmental argument falls short; there is now a danger that the question of a satisfactory availability of energy will soon push the ecological aspects aside. The scarcity of fossil fuels could lead to considerable economic and social unease, right up to armed conflict. The International Energy Agency (IEA) has for months been warning of an acute shortage of oil that could thwart any economic recovery in the next few years, and admits that in the past the downturn in oil extraction has been underestimated.

The conventional energy economy can have no interest in realistically estimating the state of their resources, as when it becomes clear that we are facing an imminent shortage the switch will have to take place much faster purely for economic reasons. But a quick switch threatens the business models and income of the old energy industries. Nevertheless, the switch to renewables will be the more cost-effective overall the more ambitiously it is pursued – also because the new technologies will become cheaper more quickly through mass production and technical development.

## Wind power is growing faster than expected

Two analyses by the Energy Watch Group (EWG) show that this assumption [on costs] is plausible. Their central finding: renewable energies can play a much bigger role in supplying energy much faster than is often thought – but it has to be wanted that way to come about. Already the growth has even exceeded optimists' hopes. Rudolf Rechsteiner, member of the EWG science advisory council and a member of the Swiss parliament, has studied this for wind power as an example. In the 80s a doubling of installed capacity took six years. Since 1998 the average has been just three years. In 2008 the 100,000 MW mark for installed capacity was exceeded for the first time. If you project wind power's global growth and energy demand into the future, then from 2019 onwards, more

## IEA: forecasts and reality



than half of all newly built power plant capacity will be in the shape of wind turbines. The renewable energy sources solar, wind power and others could even meet the entire worldwide electricity demand by as early as 2037 if development is continued at the same pace.

Even today a kilowatt hour of wind-powered electricity can be generated for €-ct 6 to 8 in many regions, and at very good sites even more cheaply. Wind power is thus often the cheapest electricity generating technology among new power plants. In the last 25 years the productivity of wind turbines has increased 100-fold and the average power of a single turbine has increased by over 1,000 %. International companies such as General Electric, Siemens, Areva, Alstom and Suzlon have taken up the technology and a growing number of Chinese companies are following suit.

## Global expansion scenario for electricity and heat

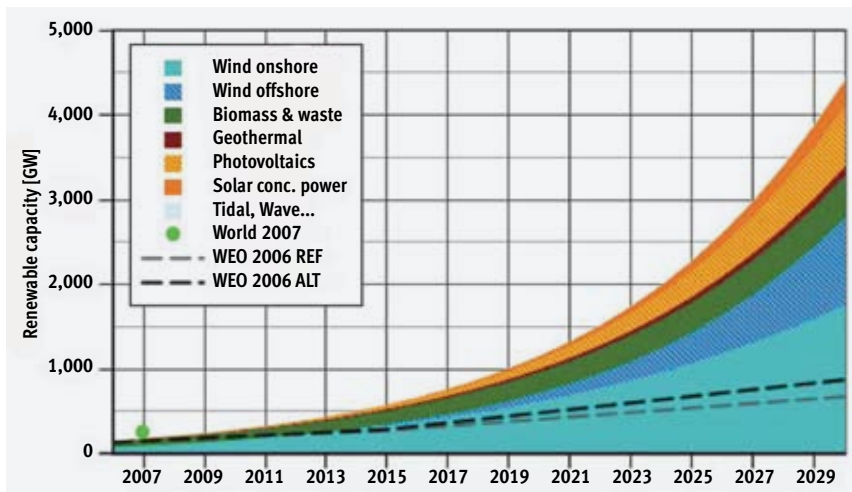
The Institute for Sustainable Solutions and Innovations, ISuSI, has looked at the expansion potential in the fields of electricity and heat in a so far unique scenario drawn up for the EWG, the "Renewable Energy Outlook REO-2030". This scenario is not a forecast and is not designed to show what will happen, but what would be possible under certain conditions. The expansion of renewable energies can take place much faster than assumed and with much less investment than some people fear. In turn, representatives of the fields of energy studied consider even the more ambitious of the two scenarios in the REO-2030 to be very conservative, however, and criticise that promising technologies currently under development have not yet been considered at all.

Investment volumes were defined in terms of investment per head of population for various regions of the world. The assumptions made lead to a share of renewable energies in the electricity and heating mix of at least 29 % in the year 2030. The degree of coverage for electricity is higher than for heat here.

The real development of wind power (black) has exceeded all the IEA forecasts by far. Even the Greenpeace scenario from 1999 (thin black line), which forecasts a 10 % share in electricity supplies in 2020, is staying slightly below reality.

Graphic: Rechsteiner / EWG

## Renewable energy outlook



Expansion scenario for renewable energies in electricity generation in the more ambitious scenario for REO-2030 (2008). You can see the development of installed plant capacity for renewable energies (coloured area) compared to the reference and alternative scenarios which the IEA drew up in their World Energy Outlook of 2006.

Graphic: ISuSI / EWG

The renewable energy share in the year 2030 thus lies at 16 % for heating and 62 % for electricity, with wind power providing almost half of this.

This may seem low at a first glance, but the figures used for energy consumption were taken on the basis of the unrealistic assumptions in the International Energy Agency's "World Energy Outlook", even though the EWG doesn't believe that conventional energy sources will be available in sufficient quantities then. If you thus consider the share based on current global consumption, the share of renewables in 2030 would be over 40 %.

### High degree of coverage, moderate investment

Even the scientists at the Energy Watch Group did not expect such high degrees of coverage for the relatively modest investment volumes required. This means that if politically desired, more could be achieved. And, if energy consumption doesn't rise, but stabilises or even falls, even more would be possible even faster.

The prerequisites for the development shown are strong political support, free market access and in-

vestment volumes which rise to over a trillion euros a year by 2030. In the target year 2030 this equates to € 124 per head of world population. As a comparison: the average over the years 2008 to 2030 is a quarter less than today's annual average military expenditure. This comparison is even disadvantageous to the renewables, as the military expenditure is consumption expenditure by the country, so to speak, in which no new income is generated, whereas investments in energy technology will be refinanced through the sale of the energy generated.

The financial effort required is thus manageable. A further comparison underlines this: if you add together the IEA figures for planned investment volumes in new power stations for the member countries and the annual global subsidies for fossil fuels, then you get approximately the sum of the investments in the REO-2030 scenarios.

The requirements are also far below what is achievable in terms of technology too. Industry manufactures car engines with a total power of approx. 6,500 GW each year. In comparison, in the year 2030, in which the REO scenario has (REO scenarios have) the highest expansion, power technology totalling just 550 GW would have to be installed.

If you compare the two REO-2030 scenarios in terms of their effect, then it can also be seen that the scenario with higher investment achieves an over-proportionally high energy share. Higher investment thus not only leads to more rapid expansion but also to lower total energy costs overall. It would thus pay off to put substantially higher investment incentives in place right away.

Old and new at the Emshaven wind farm in the Netherlands: the productivity of wind turbines has risen 100-fold in the last 25 years. Photo: Jan Oelker



## No competition with energy efficiency

Those who believe that saving energy and using energy efficiently are key to the energy revolution and must therefore be given priority, are failing to see the perfect synergy of the two approaches. Energy which isn't used obviously doesn't need to be made available. But renewable energies aren't competing with energy-saving investments at all; they can and must both be implemented simultaneously where energy is being wasted today. This is mainly in the industrialised countries, with their energy-consuming industries and consumer economies. For this reason the European Union aims to reduce its energy consumption by 20 % by 2020 within the framework of its climate protection targets.

In many cases, subsidies for the old energy sources are hindering a switch to renewables and a more efficient use of energy. Especially in threshold countries the use of energy is highly subsidised in well-intentioned "development aid". But energy subsidies are at the same time the most effective obstacle to energy saving. It is only when at least the true costs are reflected in the energy prices that users treat energy sparingly.

In the long term, saving energy is simply a question of calculation. Which is cheaper, investing in making renewable energy available or investing in energy savings? Virtually no efficiency measure is without cost, whereas renewable energies are getting ever-cheaper. And after all, the manufacture of new energy-saving products and energy-saving technologies also consumes energy. In the transition phase towards renewables we should always keep an eye on the sparing use of energy: and do both together, not one or the other.

## The crucial raw material is money

The critical opposing forces against renewable energies are of a structural nature, for the renewable energies also differ from raw-material-based energies in terms of their financing structure. These forces must be dissolved through political measures and other framework conditions. For the expansion of energy generation from wind, solar, biomass and geothermal is not limited by the size of the reserves, as is the case with coal, oil, gas and uranium, but is mainly dependent on investment in the systems.

Whether the expansion potential is made use of quickly enough is not primarily a question of the potential itself or of technologies, but rather is dependent on political will and investment conditions. The German Renewable Energy Act (EEG) has shown how effectively expansion can be accelerated when the framework conditions are right. And it shows that forecasts based on the current technical and economic potential are much too pessimistic, for they underestimate by far the power of political frameworks, the dynamics of mass production and the development zeal of the engineers.

*Thomas Seltmann*

### Further information:

International Energy Agency (IEA): [www.iea.org](http://www.iea.org)

Institute for Sustainable Solutions and Innovations (ISuSI): [www.isusi.de](http://www.isusi.de)

Thomas Seltmann is Project Manager of the Energy Watch Group ([www.thomas-seltmann.de](http://www.thomas-seltmann.de)). All the studies, supplementary material and press information are available for free download at [www.energywatchgroup.org](http://www.energywatchgroup.org).



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