



Wermuth's Investment Outlook

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The case for green investments

by Dieter Wermuth^{*}

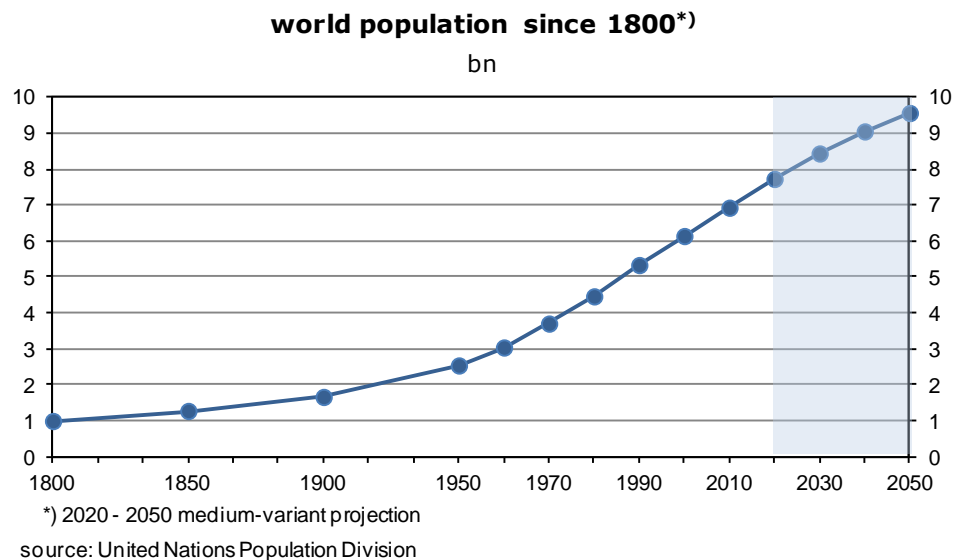
1. **For two fundamental reasons cleantech assets have a bright future: the world's habitat continues to deteriorate – which must and will be stopped – while prices of energy from renewable sources keep declining, in both absolute and relative terms.**
2. **The demand for “green” products and processes is increasingly well supported by calls for a better environment. On the other hand, alternative energy is on the cusp of being competitive vis-à-vis oil, coal and gas; subsidies are still important but will be scaled back as the industry matures.**
3. We are approaching the point where all new capital spending on energy focuses on solar panels, wind turbines, storage facilities and decentralized back-up capacities. Inevitably, **equities of conventional utilities and other consumers of fossil fuels as well as those of fossil fuel producers themselves are about to turn into “stranded” assets.** A regime shift is coming. Hemingway once said that a man goes bankrupt slowly – and then suddenly. I expect something similar to happen in the production and consumption of energy.
4. As the pollution of air, water and soil reaches unacceptable levels, consumers will force governments and companies to act. The richer a country, or indeed the world, the more important is a livable, pleasant and sustainable environment – the green movement was launched by the children of the well-to-do in Western Europe and North America who did not have to worry about basic needs such as food and shelter. The world's average per capita incomes will rise by at least 2 percent a year for the foreseeable future which means that green issues will steadily move up on the public's priority list. **Cleantech is still an infant industry but most certainly also a growth industry.**

The pollution of the environment continues to get worse

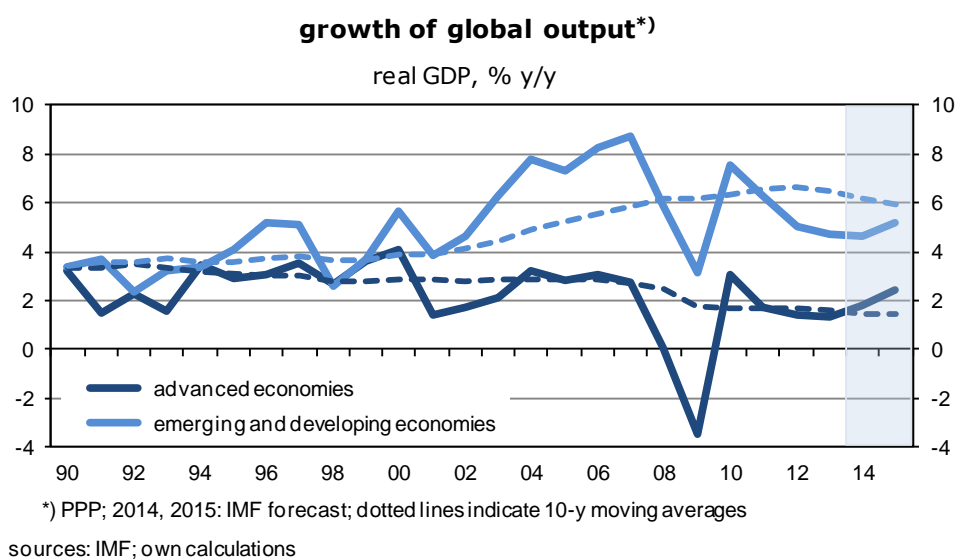
5. So what is happening to the environment? The first graph shows that the explosive growth of the world's population is not about to end in the next half century, even though the average number of children per mother is on a downtrend. But especially in many poor and emerging countries the average age is still very low which means that the number of young women who reach child bearing age continues to rise. It goes without saying that the strains

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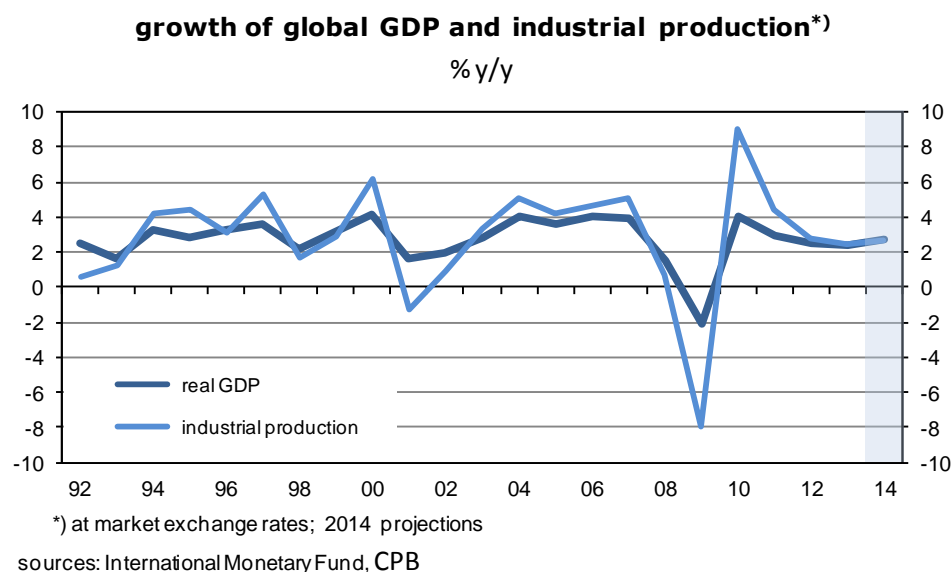
on the environment are a function of population trends. From this perspective, the outlook for the coming decades is quite bad.



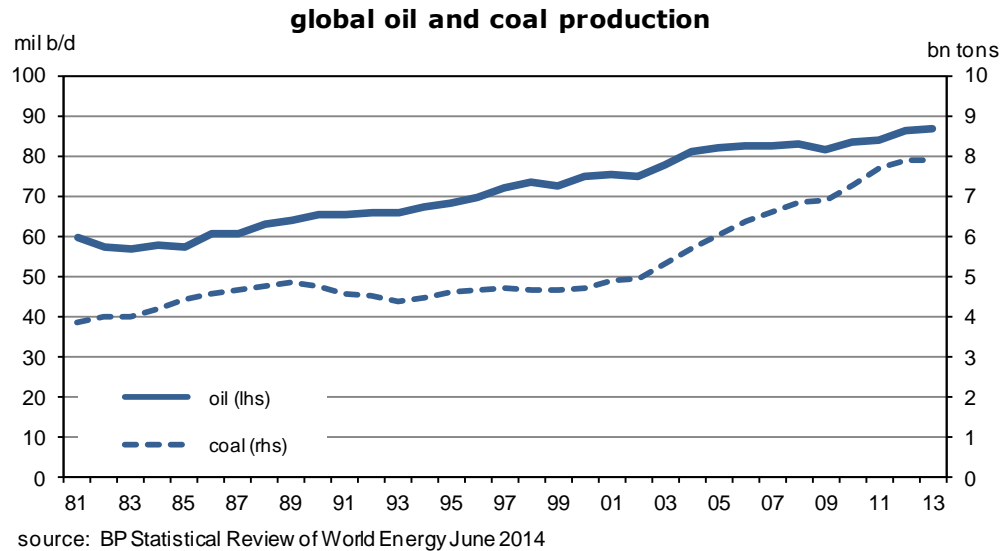
6. **It is not just that there will soon be many more people around, their average standard of living is rising as well, and with it the pollution of the environment.** The growth rate of global GDP has slowed in recent years, which has been a relief, if only in the sense that the deterioration has slowed. Global GDP growth may never again resume the pre-crisis momentum because the emerging countries that had been its drivers in this century have had their easy early gains and must now improve their institutional set-up, their infrastructure and the qualification of their workforces - which is considerably more challenging than combining cheap labor with imported Western technology and processes, their present growth model (see "[The headwinds return](#)", The Economist, September 23, 2014, p. 24 - 26).



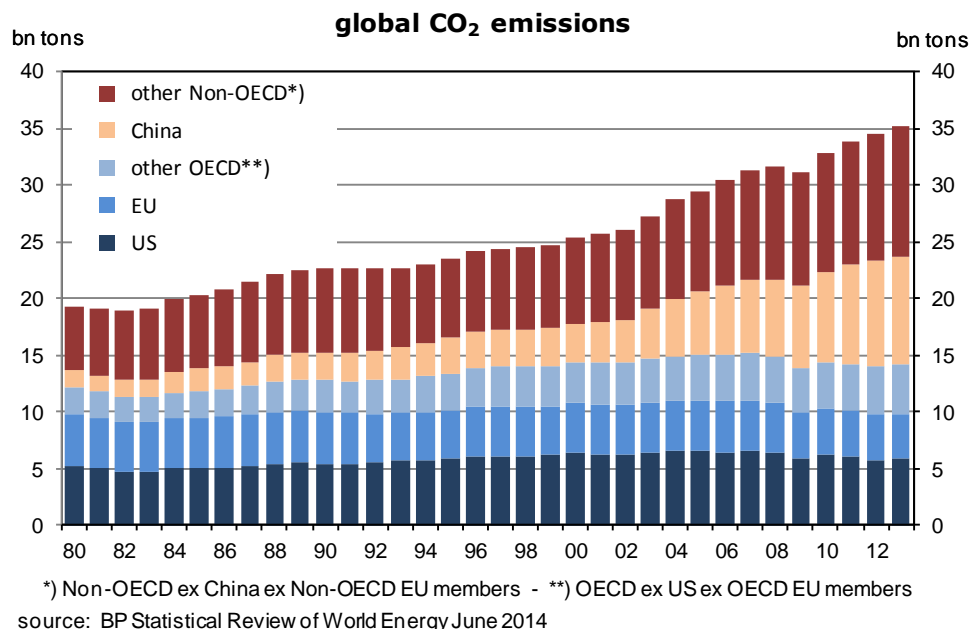
7. This is a valid point, but even though the pace of catching up with the West may slow, their GDP growth rates will exceed those of rich countries for many years to come. The trend growth rate of emerging economies' real GDP on a purchasing power parity basis is still close to 6 percent, compared to 1½ percent for the advanced countries, and they account for half of the world's output by now. In other words, **the deterioration of the global environment may slow, but a reversal is not yet in sight.**
8. **Manufacturing still plays a central role in the world's growth process. Industrial products are mostly resource intensive.** In terms of actual exchange rates, global real GDP had increased by an annual average of 2.7 percent in the ten years to 2013 while industrial production expanded at a rate of 3.0 percent. The share of services – which require fewer resources – is rising, but for the poor part of the world, “things that can fall on your foot” still have priority. Cars and trucks, ships, airplanes, railway systems, schools and factories, dwellings, central heating, air conditioners and other household appliances, roads, airports and container terminals have to be produced and installed before people consider buying services; these are less essential in the early stages of catching-up processes. A further increase in the demand for products that require fossil fuels for their fabrication and operation is thus virtually certain.



9. There had been frequent warnings that the world is running out of oil, gas and coal which would be good news for the environment. But the data do not support these predictions. So far, the output of fossil fuels has been on a steady upward trend. The famous scare scenario, that we are close to “peak oil”, and that oil prices would explode thereafter, has not yet materialized. Output growth has been boosted by high market prices which had led to the profitable exploration and extraction in formerly inhospitable places like the arctic and the deep seas. **Once fossil fuels get cheaper in response to the low prices of “renewable” energies and/or because there is so much of them – think “fracking” – their output will shrink, to the benefit of the environment, but not because there is a lack of them.**

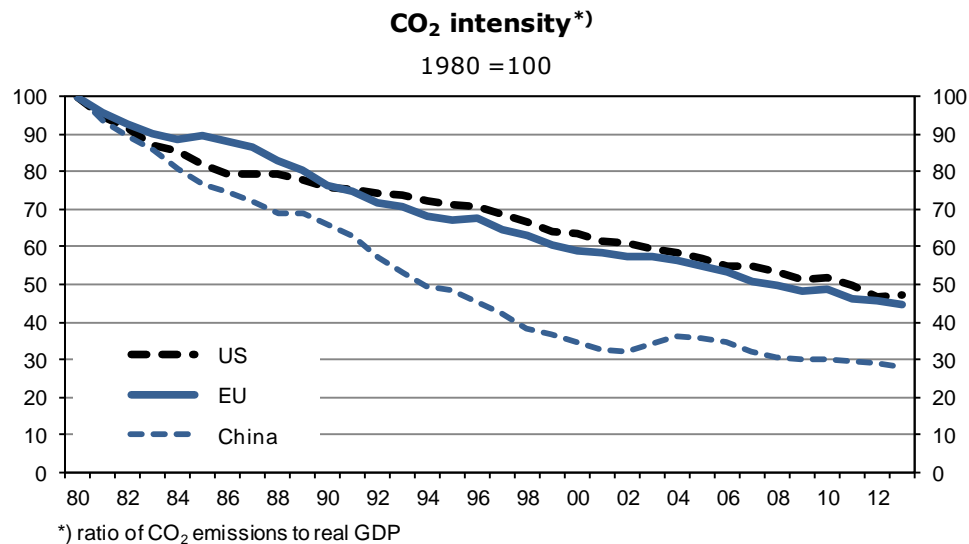


10. The next graph shows that so far the emission of carbon dioxide – which accounts for three quarters of all greenhouse gases released into the atmosphere - has continued to rise. In the nineties, the growth rate of carbon dioxide was 0.94 percent a year, or about 220 million tons. In the past six years which saw a significant decline of economic growth rates – but still a much higher level of economic activity -, emissions kept rising by an average of 635 million tons a year. Things are getting worse, not better. Nuclear energy has been scaled back while the amount of “dirty” lignite and hard coal in electricity generation has increased steeply, as has the purchasing power of households around the globe.



11. One piece of good news is in the final graph of this section. Over the past 35 years, CO₂ emissions have declined relative to GDP in all three major economies. Technical progress and climate policies had a positive impact of sorts, if only in relative, not absolute terms.

China is the main sinner in terms of overall emissions. It is still a poor country, but CO₂ emissions per capita are now similar to those in the European Union and will be higher next year, or in 2015 at the latest. The US remains by far the worst polluter among the main economies, at 18.5 tons a year per person, compared to China's 6.9 and the EU's 7.7 tons (according to data on CO₂ emissions from the BP Statistical Review of World Energy, June 2014).



sources: BP Statistical Review of World Energy June 2014; IMF; own calculations

12. There is so much momentum in the emission of greenhouse gases that **a further significant pollution of the world's air is not just a possibility but a certainty, just as the further increase of the average global temperature caused by this.** The latter is, as we are learning, not necessarily a linear process but rather consists of fluctuations around a rising trend. The dangers for the earth's climate are significant even though the exact effects are hard to predict.

It's not just carbon dioxide

13. **On other fronts the situation is also getting out of hand.** Think of water, deforestation, biodiversity, overfishing, urban blight, household and industrial waste, noise, traffic jams and other negative externalities that come with the present growth model of producing, consuming and throwing away.
14. **Water is becoming a scarce resource in many parts of the world.** Industrial production is often water-intensive, and households love to squander water as they get richer, but the most severe threat comes from agriculture where irrigation plays an increasingly important role, especially in the arid parts of the world. As consumption patterns in the formerly poor part of the world more and more resemble those in the rich countries – more meat and milk, less cereals and vegetables – the need for water rises exponentially. But the supply of fresh water is limited by nature and groundwater levels are falling dangerously. Given the above assumptions about population and income growth, the recycling of used water and the

desalination of sea water will become an increasingly important and profitable, if capital intensive economic activity.

15. **Waste recycling** is another one. It seems that the amount of waste households and commerce are generating is increasing much faster than income and production. Many emerging economies go under in a hazardous flood of plastic bottles and bags, electronic junk, household waste in general, used cars and tires, cardboard, paint buckets, batteries and so on. Theoretically at least, waste disposal is not a serious problem. Modern methods of separating rubbish leave more or less just two categories: stuff that can be recycled, and stuff that can be incinerated. To take an example, car tires can be both recycled (their metal content) and burned (the oil-based components). **In rich countries such as Sweden and Germany, garbage dumps are disappearing – both countries are trailblazers in terms of a circular economy, ie, resource efficiency. But recycling is a capital intensive activity as well.**

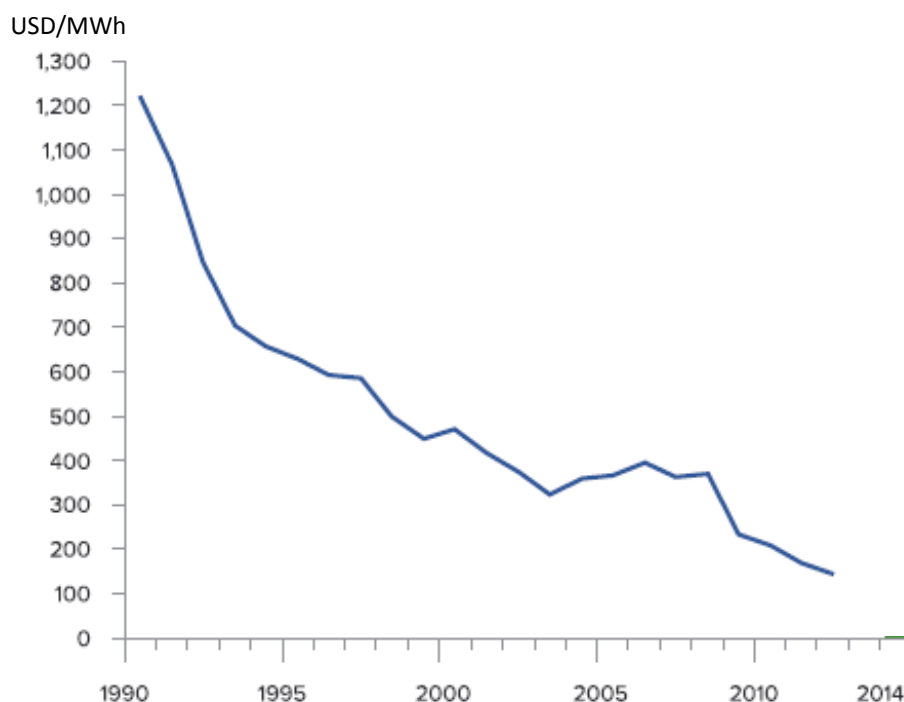
Investors - beware of government interventions

16. **Governments and voters are increasingly aware that many markets cannot be left to themselves and must frequently be controlled by means of regulations and financial incentives.** Sustainable growth in general and green investments and resource efficiency in particular have become policy goals. Market forces are good at solving some problems such as channeling labor and capital into the most productive uses, or establishing prices that bring demand and supply into balance, but external effects are beyond them, just as assuring a fair distribution of income and wealth, an optimal degree of competition or organizing the education of the young.
17. Interventions by the government have become the normal state of affairs. They are often erratic, reflecting the power of lobbying groups and conflicts between different policy goals such as preserving jobs in old industries and the reduction of greenhouse gas emissions. **For investors in green assets, changes in the regulatory framework can therefore make all the difference between success and failure and must be monitored closely.** In Germany, for instance, the reduction of guaranteed feed-in tariffs for electricity from solar panels had led to a wave of bankruptcies among the producers of these panels; the decision, after the March 2011 catastrophe in Fukushima, to close down all nuclear power plants by 2022 has led to a crash of the stock prices of the leading utilities; the bill for subsidizing the producers of energy from renewables is mostly footed by households while many energy-intensive, ie, polluting companies are exempt – if in doubt about job effects, the long-term goals of environmental policies are put on a backburner.
18. Certainly in the European Union, **another factor argues for the further promotion of green energy by governments: the dependence on gas imports from Russia.** These are used as a tool to keep the Ukraine out of the EU and NATO. Much of Europe's oil also comes from unstable parts of the world where local wars can easily and at any time escalate and spread. Even though gas and oil inputs are less than 5 percent of EU GDP, they are an essential part of production. Disruptions would be very costly and must be prevented. **The nice thing about electricity from wind and sun is that it is home-made.**

Electricity from renewables is rapidly getting cheaper

19. As I pointed out at the beginning, **the other megatrend which supports green assets are the falling prices of electricity from wind and sun, combined with cheaper storage facilities such as batteries or hot-water tanks and back-up capacities in the form of block heat and power plants, for instance.** Special software is coming to the market that better matches the demand for and the supply of electricity from renewables, both over time and across regions. Technical progress, decentralization, international trade and economies of scale are the catalysts of these developments. Green industry was often jump started by government incentives and regulations but in the meantime market forces have become the main drivers of the process.
20. In some parts of Asia sun power is already cheaper than electricity from fossil fuels. On present trends, it is only a matter of time before this will be the case almost everywhere else. Since the damage done to the environment by this source of energy is negligible, compared to burning fossil fuels, it has also an important cost advantage. Pollution abatement is not an issue. Investors will appreciate this in the form of accepting lower risk premia.

cost of solar photovoltaic electricity



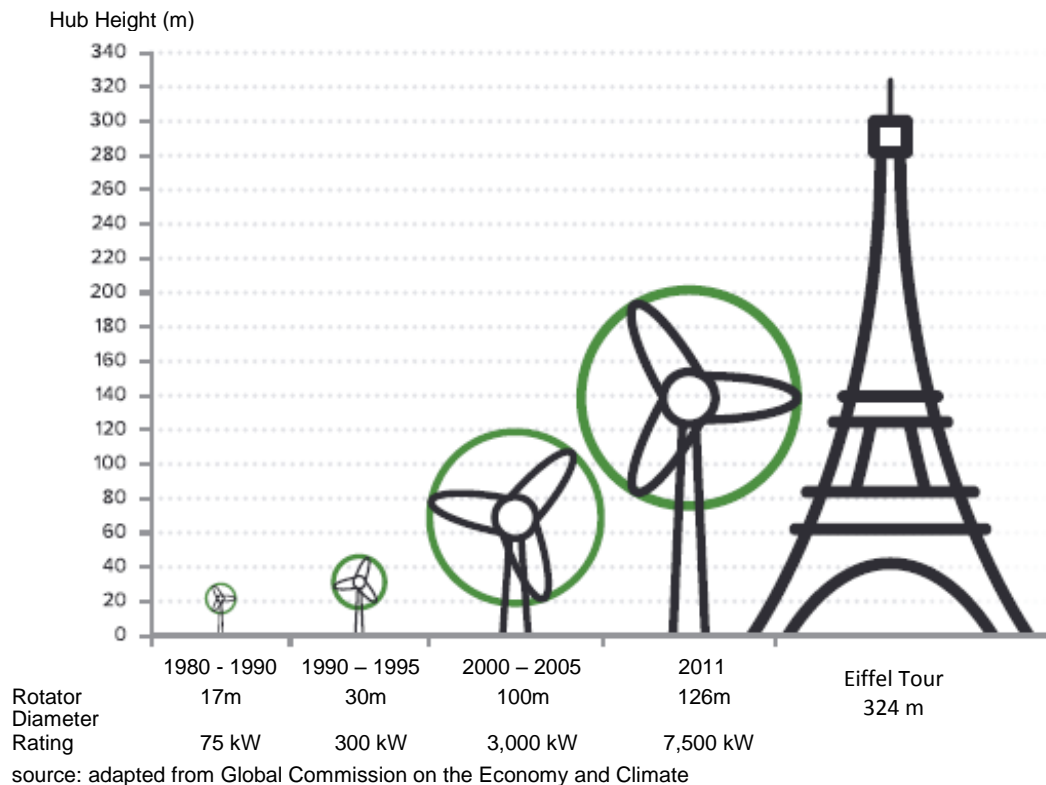
source: Global Commission on the Economy and Climate

21. Electricity from windmills is also getting cheaper, but I do not have a graph to show that directly. What I do know is that by replacing old windmills with taller ones, with hub heights of 150 meters and rotators with diameters of 125 meters, it is possible to harvest significantly more wind from the same location. Matthias Willenbacher of juwi AG, a leading German entrepreneur in the field of renewable energies, shows in his recent book called ["My indecent proposal to the German chancellor"](#) (page 123) that it is now possible to

achieve, in any given location, almost three times as many “full-load hours” than in the year 2000. This repowering significantly reduces the cost of one kilowatt hour.

22. In a report of the Global Commission on the Economy and Climate called “[Better Growth, Better Climate](#)”, published this month, the authors argue that modern wind turbines can generate 100 times more power than 30 years ago. There is no doubt that wind energy is becoming very competitive as well.

Wind turbines can generate 100 times the power of 30 years ago

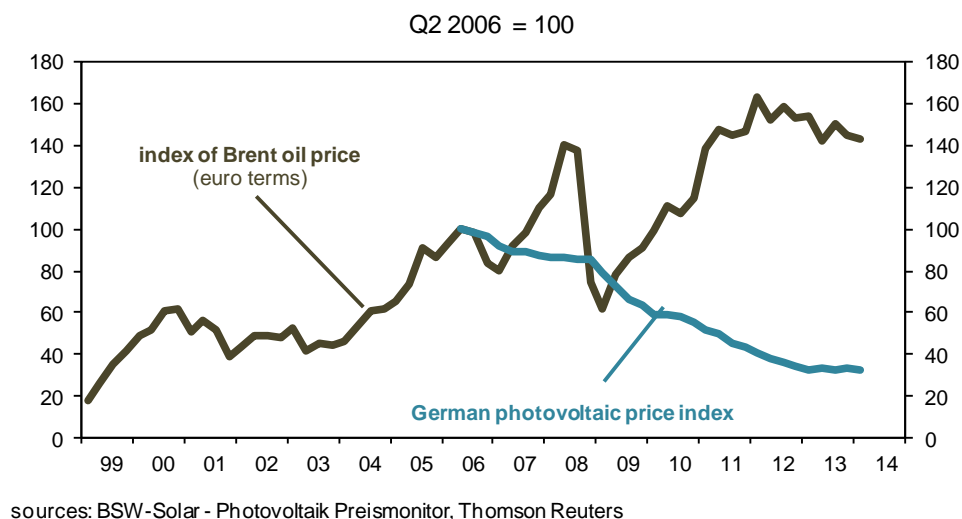


23. **The big problem with these alternative energies is matching supply and demand.** The wind does not always blow, and the sun does not shine at night, but the demand for electricity follows a fairly predictable – and different - pattern. To provide energy when and where it is needed requires large-volume storage facilities as well as back-up power plants. Biomass or gas produced by alternative energies on days when supply exceeds demand can be used to run these plants. They will be much smaller than the ones operated by today’s large utilities. Many of them will be found in people’s basements. Decentralization is the catchword here, and technical progress is rapid.
24. **Battery technology is moving ahead in big strides.** In a report published on August 20, investment bank UBS has forecast that battery costs will move down from \$360/kWh today to as low as \$100/kWh ten years from now (“[Will solar, batteries and electric cars re-shape the electricity system?](#)”, p. 15). The analysts of the bank consider electric vehicles to be the key drivers of battery storage technologies – once they move from being niche to mass products, economies of scale will kick in. In general, research efforts are a function of the

size of the future market for batteries which in turn depends on the momentum at which alternative energy takes over the supply of electricity.

25. A large step in this direction has been taken by the Californian electric car company **Tesla which is launching a “gigafactory” for batteries** that will produce half a million of them annually. In a related development, **a gym-sized battery storehouse**, Europe’s largest, has been connected to the grid by Wemag, a utility, in Schwerin on Germany’s Baltic coast this month. In other words, the standard objection to solar and wind power – that it unreliable – is becoming less and less convincing as the market is about to solve the storage problems.
26. **On the demand side, incentives to improve energy efficiency such as home insulation or mileage per liter of gasoline will be a permanent feature of green policies and contribute to falling energy prices as well**, including those for renewables. We are probably entering an era of global energy deflation. Gains in alternative technologies will relentlessly erode the viability of the economic model based on fossil fuels.

prices of photovoltaic modules down 68% since 2006



Stranded assets all around

27. **When will the crossover occur?** Photovoltaic energy can already compete with oil, diesel and liquefied natural gas in some of the world’s sunnier parts. The graph above shows that even Germany, which is a relatively cloudy country, is heading in this direction as well. And we are only at the beginning of the process – only a fraction of the country’s roofs has so far been equipped with solar panels.
28. **The other main momentum comes from electric vehicles. The market is still very small, but growth is rapid.** Last year, just 210,000 plug-in hybrids and pure electric vehicles were sold globally, but UBS (in its report cited above) expects that this figure will rise to 5.1 million by 2025 – which translates into an average annual growth rate of 30 percent. The “penetration” rates of these vehicles have already reached 6.1 and 5.6 percent in trail-

blazing Norway and the Netherlands, but in Germany, the UK and China they are only between 0.1 and 0.2 percent (UBS, p. 19). A long way to go! But I am convinced that electric mobility will become the new standard. More and more governments will promote electric driving as burning fossil fuels is increasingly regarded as hazardous and irresponsible – and too expensive.

29. Such forecasts have serious implications for the producers of upstream oil, gas and coal as well as for the oligopolistic utilities which use these fuels as inputs for electricity generation. **In recent years there has been a blitz of exploration and production based on the assumption that prices would either remain high, or rise.** According to the International Energy Agency, the global investment in fossil fuel supply has doubled in real terms between 2000 and 2008 and has since stabilized at around \$950 bn a year, yet little has come of it. Average break-even costs of the new ventures are the equivalent of \$80 per barrel.
30. **The new reserves will become largely fictional once there is a binding international agreement about acceptable CO₂ levels.** To meet the goal of limiting the rise of the planet's temperature to less than 2 degrees Celsius above its pre-industrial era average, CO₂ emissions must be capped. The world is already very close to that maximum, which means that air pollution and the demand for fossil fuels may not rise much more from here. This would in turn push down their prices and cause massive write-downs of fossil fuel assets. The other attack on the prices of fossil fuel comes, as I have shown above, from renewable energy: it is getting cheaper all the time – and it is the natural substitute.
31. **So far the stock prices of the oil majors have held up quite well. The large declines of European utility stocks (by about two thirds from their recent peak) mostly reflect the losses from idling nuclear power plants. But utilities all around the world will also have to write down their lignite, hard coal and oil-based power stations.**
32. Some analysts predict that the effects of a bursting fossil fuel bubble will be bigger than those of the housing bubble that got the world into its present predicament. Too much money has been sunk into unprofitable investments.

Investment considerations

33. So from an investor's perspective, cleantech is a plausible alternative to "old energy". But as I have said before, it is still an infant and volatile industry. Aside from Tesla, **the industry consists mostly of small firms.** IPO events have been rare in recent years and have paled in terms of size in comparison to IT software start-ups. Time frames are long, and many of the firms are capital-intensive and require a fairly big budget. Since they are mostly several stages removed from consumer markets they also lack the necessary sex appeal.
34. With the exception of Tesla and SolarCity, IPOs have lagged and shown weak aftermarket performance. Keep in mind that the turn-over in the industry is still considerable, as is the number of bankruptcies. **Seasoned investors these days will, for instance, not touch producers of solar panels or biofuels.** They prefer to let private equity cleantech specialists to do the groundwork in the early stages.

35. Presently, "Green" IPOs make only sense for firms which have about €50m in revenues, are either already profitable or clearly on track to profitability and have a compelling growth story. Cleantech is the future, but the road from here to there is long and winding.
36. There are, of course, **several of the large established players which have moved into the cleantech business**. UBS, for instance, believes that Siemens, ABB or Schneider Electric will benefit from renewables directly but also from new constellations in transmission and power grid solutions; car producers such as Toyota, Tesla, Renault-Nissan and BMW, or Valeo, are also well positioned; as to batteries, firms such as Panasonic, Sumitomo Metal Mining, Umicore or BASF have ambitious expansion plans. **All their equities are rather liquid.**

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