

Renewable Energy Markets

Will the boom go bust?



Power generation from renewable energy sources is growing at an impressive rate. Even more impressive is the projected growth in the wake of the European Union’s policy to increase the share of renewables in energy supply to 20 percent by 2020 and the renewed interest in key energy markets like the United States. The financial markets have caught on, and valuations of publicly listed renewable energy companies have exploded. Investors are eager to bet on the boom, and the press is eager to report on it.

But as with every boom, a bust lurks. Largely, recent growth in renewable energy in Europe and elsewhere comes as a result of subsidies. Hence, any discussion regarding subsidy levels has an impact on investment activity—as seen, for example, in the strong decline of new investments in the wind and biogas markets or the delay in offshore and re-powering investments in Germany, long the front-runner in renewable market development. High subsidies for photovoltaics in some markets caused bold investment in production facilities worldwide, and now commentators see overcapacities in the market. Also, the “green” reputation these technologies enjoy suffers as reports of imported palm oil

depleting rainforests, monocultures supplying biogas installations and public resistance to the installation of wind turbines have halted several significant investment projects.

This paper examines the renewable energy boom against the background of other recent technology booms, and evaluates whether transition to a bust-cycle is occurring or long-term growth in renewable energy should be expected.

The Ongoing Renewable Energy Boom... and Booms We’ve Seen Before

Clearly, a renewable energy boom is taking place. The rapid development of renewable energy installations (excluding hydro) in the European

Union has an average annual growth rate of about 14 percent. Forecasts predict a doubling or tripling of the renewable energy share in EU power generation within the next 12 to 15 years, driven by the ambitious EU policy of reaching a 20 percent renewable energy share in total final energy consumption by 2020.

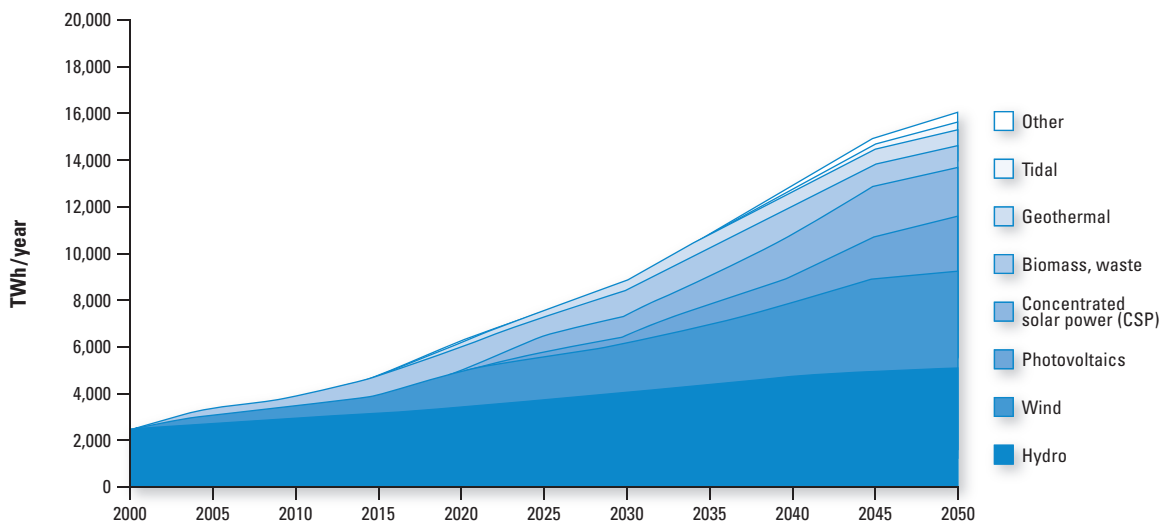
While this paper focuses on power generation, growth in renewables is discernible in electricity, heat generation and the biofuels sector, and it is happening throughout Europe and the world. With regard to power generation, even traditionally conservative organizations like the International Energy Agency now project a five-fold increase in global power generation from renewable energy sources by 2050 (see figure 1). Financial markets and the media have caught on, and as a result stock prices and market capitalization of renewable energy companies are rising rapidly, with market capitalizations of previously

small- or mid-sized companies now reaching many billions of dollars (see figure 2).

Media coverage of the current renewable energy boom often adds to the impression of a fad, and is reminiscent of earlier booms—in particular, the Internet boom of the 1990s. The performance of key indices of Internet and telecommunications stock in the late 1990s bears a striking resemblance to the current renewable energy boom (see figure 3 on page 4). In the five-year period before the boom peaked, the NASDAQ outpaced the MSCI World Index at its apex by a factor of 2.3. This is even more pronounced in the case of the RENIXX, a global renewable energy stock index, which beat the MSCI by a factor of 2.7 in late 2007 before a significant correction occurred in early 2008.

While parallels exist between previous booms in other industries and the current renewables boom, the latter differs in ways that make it less

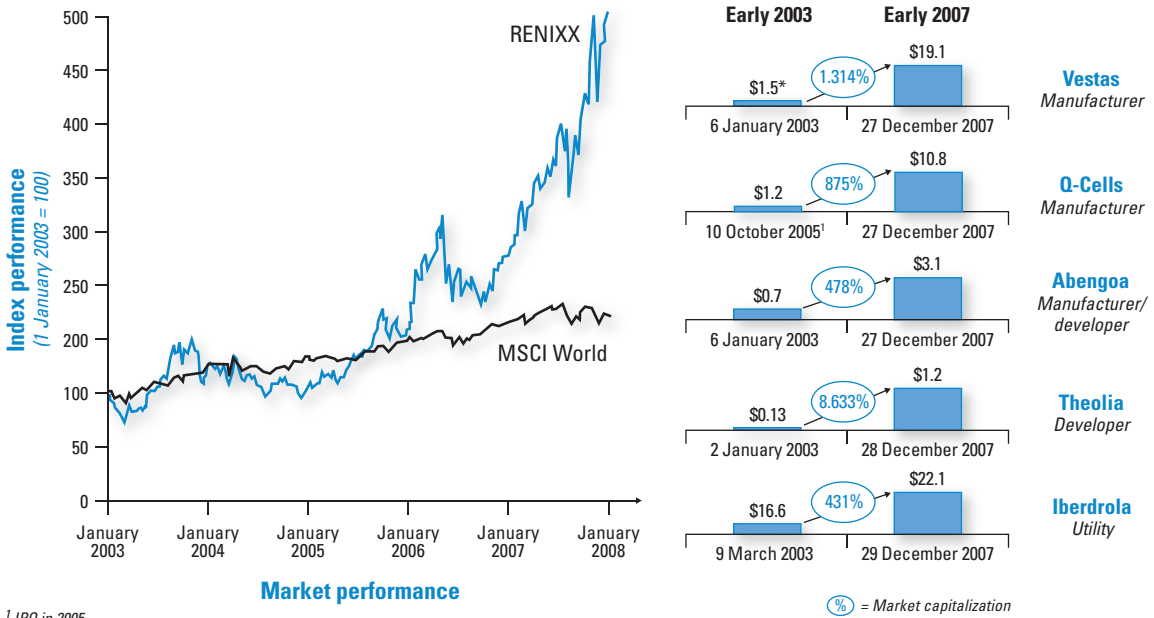
Figure 1
Projected growth of global renewable power generation until 2050



Source: International Energy Agency, *Energy Technology Perspectives*, June 2008

Figure 2

Stock prices and market capitalization of renewable energy companies are increasing



¹ IPO in 2005
* Dollar amounts in U.S. billion

Sources: Internationales Wirtschaftsforum Regenerative Energien (RENIXX); Morgan Stanley (MSCI World); AOL Börse; DAB Bank; boursorama.com; ariva.de; sourced companies' annual reports

vulnerable to a sudden bust. This can be seen by comparing the P/E ratios (market capitalization divided by net annual profit) of selected renewable energy companies in the past two years with those of telecommunications and Internet players in 1999 and 2000, just before the dot-com bust (see figure 4 on page 4). While P/E ratios of major telecommunications and dot-com companies were either negative or extremely high, the market capitalizations of renewable energy corporations appear to be much more reasonable—which is a key reason why we conclude that the slump in stock-market valuations in early 2008 is more likely a correction than the beginning of a bust.

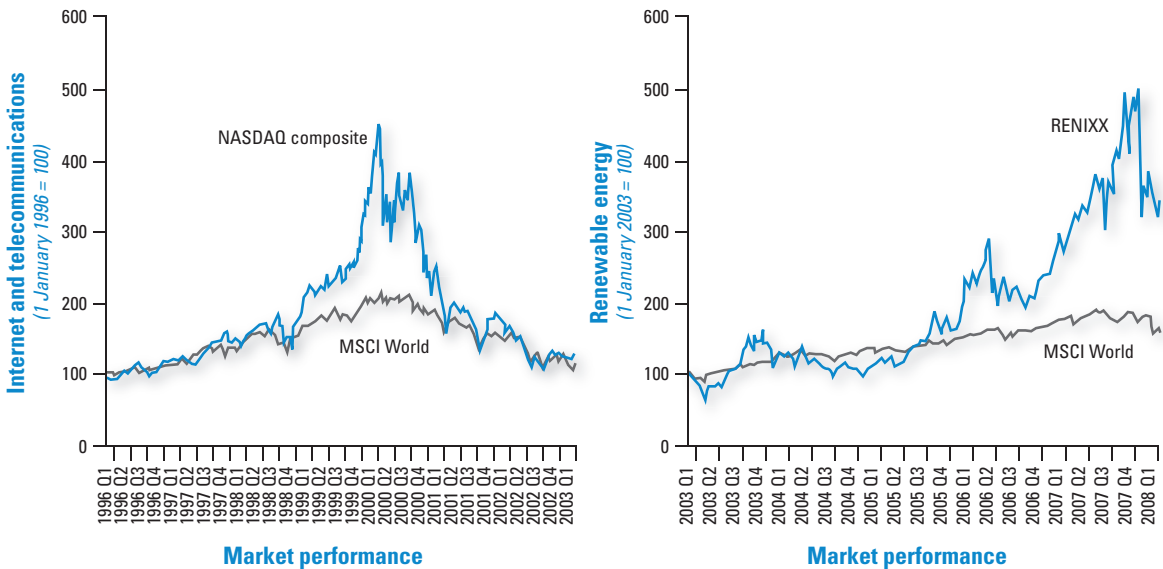
Past booms and busts in other industries are not the only comparison for today's boom

in renewables. The renewable energy sector has its own history of booms, exemplified by the solar and wind energy booms that were sparked by the oil crisis of the late 1970s in the United States—though the installed capacities were several orders of magnitude smaller than today's (see figure 5 on page 5). The common factor in these booms, however, is their significant dependence on policy decisions that affect capacity addition. The Production Tax Credit, for example, has virtually turned the boom on and off at various points in the past—and remains a key factor that could make today's boom go bust.

To conclude our brief look at booms we've seen before: factors that should worry renewable energy proponents include the media hype that

Figure 3

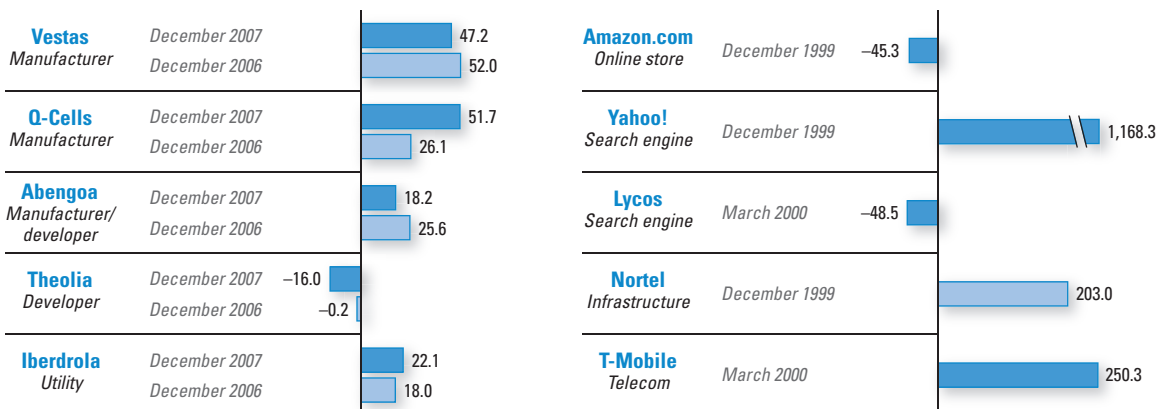
Internet and telecommunications stock performance in the 1990s resembles the current renewable energy boom



Sources: E.A. Couper et al., "Boom and Bust in Telecommunications", Federal Reserve Bank of Richmond Economic Quarterly, 2003; NASDAQ; Morgan Stanley; Internationales Wirtschaftsforum Regenerative Energien (RENIXX)

Figure 4

P/E ratios of selected renewable energy companies versus telecommunications/Internet companies, 2006–2007 versus 1999–2000



Sources: Sourced companies' annual reports; nasdaq.com; hoursorama.com; ariva.de

could cause hurried investors, in their rush to capitalize on the boom, to fund companies with poorly conceived business plans, as well as the ever-present threat of policy changes, which have “switched off” renewable energy booms in the past. In the following section, we examine some more current signs of potential ruin to the present boom.

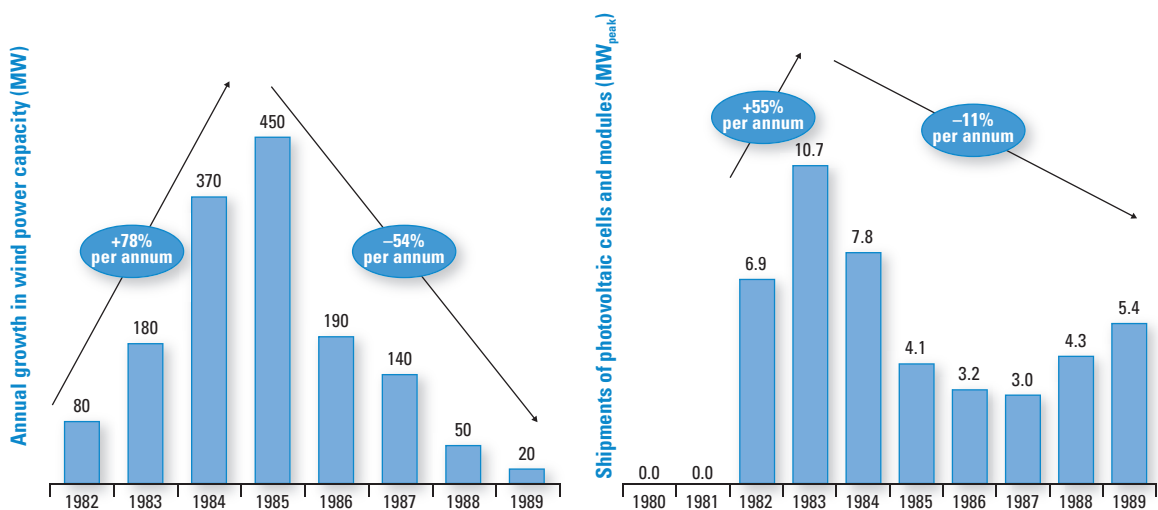
Signs of Doom for the Renewable Energy Boom?

Much—but not all—of the news regarding the growth of renewable energy has been good. Several recent developments could cause serious setbacks in the growth of renewables (see figure 6 on page 6). In Germany—the world’s biggest wind power market over the past decade—there has been a drop in the rate of new installations in wind power projects. At the same time, likely over-capacities in photovoltaic module factories make

investors anxious, as the dependency on politically determined subsidy levels becomes apparent. In recent months, stock markets have reacted to these uncertainties, with the result that some renewable energy stocks plunged by as much as three-quarters of their highest market value. While this slump may well be more a market correction than the beginning of a bust, such strong fluctuations can undermine trust in the renewables boom and deter investors, thus slowing growth.

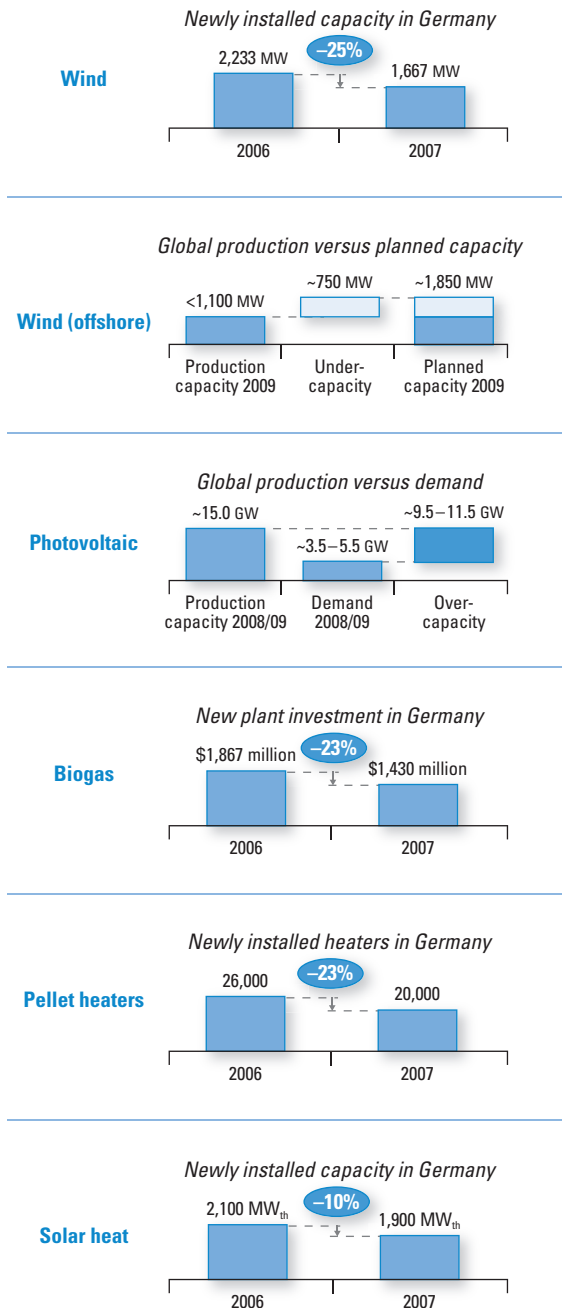
Other policy and technology options vie with renewable energy for policy support and investment funds. Energy efficiency policies become increasingly stringent as policy-makers understand that slowing the growth of energy consumption is imperative in the long run in order to address climate change. On the generation side, nuclear power and carbon capture and sequestration (CCS) are options that are capable

Figure 5
Wind power and photovoltaics booms in the United States, 1980s



Sources: U.S. Department of Energy’s Efficiency and Renewable Energy’s Annual Report on U.S. Wind Power, May 2007; U.S. Department of Energy’s Energy Information Administration

Figure 6
Possible signs of a setback in the growth of renewable energy



Sources: German Wind Energy Institute; European Photovoltaic Industry Association; European Solar Thermal Industry Federation; Deutscher Energie-Pellet-Verband eV; German Federal Ministry of Environment

of reducing carbon emissions from traditional coal- or gas-fired capacity and could crowd out investment in renewable energies. In the United Kingdom, for example, calls for building new nuclear power plants could hinder potential large-scale tidal power projects. Similarly, French efforts to promote nuclear power in Northern Africa and the Middle East could thwart solar thermal power projects in those regions. At the same time, CCS competes for investment funds, and its projected availability supports those who urge the construction of new coal-fired capacity. As this technology is not likely to be available on a large scale by 2020, renewables have time to penetrate shared markets.

Another important impediment to the growth of renewable energy is supply bottlenecks. These bottlenecks affect the availability of biomass fuels as well as the key raw materials, parts and services for the production and installation of renewable energy technologies such as photovoltaics, wind and geothermal. Supply bottlenecks are a typical side-effect of a boom; they occur when demand grows faster than supplier capacities. Under market conditions, this is a self-regulating mechanism—as prices for scarce resources increase, demand decreases. In the case of renewable energy, price increases are significant, partly compensating the effect that economies of scale have on the cost of generating power. As demand is largely determined by subsidy levels, however, price increases have led to a call for increased subsidy levels, which, at least in the United Kingdom and Germany, appear to have been successful. Hence, demand will likely continue to be high, which should eventually overcome supply bottlenecks.

Building Blocks for Sustained Growth

The factors that can lead to a renewable energy bust can be offset by what we call “building blocks”

for sustained growth (see figure 7). These stabilizing factors are likely to mitigate risk and support continued growth of renewable energy technologies for power generation. We believe the fundamental drivers for renewable energy demand are diverse, strong and long term. They include:

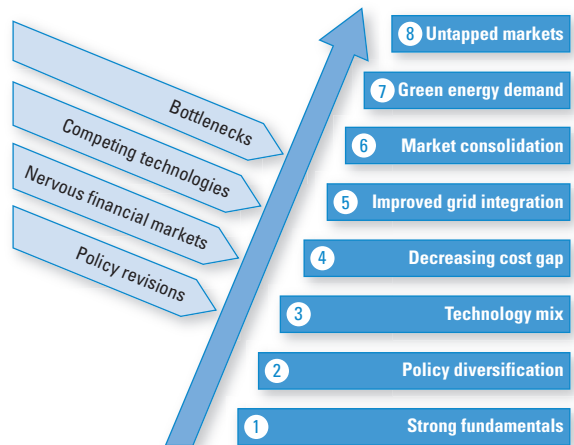
- Climate protection policies
- Energy-supply gap caused by exploding demand and restricted resource potential
- Growing concern regarding the “energy nationalism” of global suppliers
- Increasing consumer demand for “green” energy

While these drivers overlap and partly amplify each other, they will sustain demand for renewable energy even if one of them fails to materialize—at present an unlikely scenario. Furthermore, these drivers are no longer restricted to a particular country. While the European Union recently led the field in betting on renewables as part of the energy solution, other countries and regions either have followed suit or soon will. A case in point is the United States, where concerns about energy dependency and climate protection are major drivers on a state level, and where the growth in wind power capacity, for example, outperformed previously leading countries, such as Germany, in 2007.

Even major fossil fuel producers like Middle Eastern countries are now acutely aware of the opportunities offered by renewable energy options. Given declining oil production and the increasingly high-opportunity cost of burning oil for domestic power generation rather than exporting it at soaring market prices, renewable energy—perhaps ironically—has become quite attractive to oil-producing countries.

As discussed above, regulatory and policy factors may pose the greatest threat to the renewable energy boom. However, unlike in previous renewable energy booms in the United States, this threat is mitigated somewhat by the fact that

Figure 7
Summary of risk and risk mitigation factors



Source: A.T. Kearney analysis

renewable energy support policies now exist in many countries, and these are unlikely to switch levels of support at the same time or to the same degree. Nevertheless, the fact that the market is still dominated by several key countries—Germany, Spain, the United States and, to a degree, the United Kingdom—means that factors such as the slump in German renewables growth, the delay of the U.S. Production Tax Credit system and the U.K.’s nuclear energy policies could not only dampen demand for renewables in those markets, but also function as a negative signal to other countries that may be considering a move to renewables.

A positive sign for renewables is the proposed “guarantees of origin” trading system within the European Union. This would maintain diverse national support systems while providing a possibility to improve economic efficiencies of investment by trading guarantees of origin internationally. This is an important step in the evolution of renewable energy support, because

with growing shares of power generation from renewable energy technologies, consumers' willingness to pay the costs in mandatory systems will likely deteriorate. For this reason, a move toward more market-based incentives for renewables investment is urgently needed.

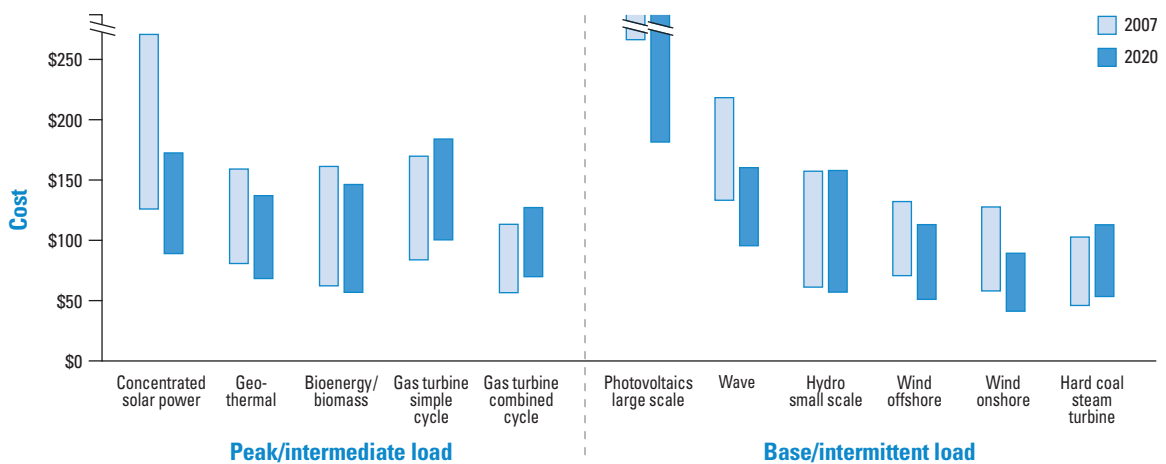
Similarly, the diverse portfolio of available technology, which offers a broad range of applications, costs and environmental effectiveness, serves as a buffer to a possible bust. The availability of various renewables technologies implies that renewables as a whole can grow, even if an individual technology might fall short of expectations. A key stabilizing factor for the boom, however, is the decreasing cost gap between renewables and conventional energy sources (see figure 8). This is being driven by steep price increases in oil, gas and coal, as well as the cost of CO₂ emissions associated with power generation from these fuels. At the same time, technological progress and

economies of scale will further reduce the cost of renewables, although this cost reduction is dampened—albeit temporarily—by the aforementioned supply bottlenecks.

But even if rising raw material prices and supply bottlenecks lead to an increase in the cost of renewable energy technologies, renewable energy's competitive position relative to conventional fuels is still likely to improve. Our assessment is that the high prices of oil, gas and coal are based on long-term structural factors, while bottlenecks in renewable energy technology supply chains will eventually be overcome. Furthermore, high raw material prices and technology supply bottlenecks also affect conventional power generation technologies—therefore the relative competitive position of renewable energy is unlikely to be affected significantly.

Proponents of renewable energy frequently face the criticism that intermittent power sources

Figure 8
Levelized costs of electricity generation in new plants in US\$/MWh¹



¹ In 2007 prices, for typical European site conditions and costs, uniform real discount rate of 8% for all technologies, including costs for CO₂ emissions
Sources: Commission of the European Communities, "The Support of Electricity from Renewable Energy Sources," 2008; International Energy Agency, "Projected Costs of Generating Electricity," 2005 update; UK Royal Academy of Engineering, "The Cost of Generating Electricity," 2004; A.T. Kearney analysis

such as wind and solar power place a burden on existing power grids, which were designed for conventional fuels. This is indeed a real problem and not, as has been suggested, merely an attempt by established utilities to block the development of renewable energy. However, methods are emerging that can overcome this problem, and they do not necessarily require time- and cost-intensive grid extensions. Instead, improved forecasting and grid management, as well as system approaches such as virtual power plants, offer innovative, cost-effective ways to significantly decrease intermittency problems. We think established utility companies will increasingly employ such approaches and will move toward renewable energy generation. After all, with their existing conventional power plants and storage facilities, these companies are well positioned to embed renewable energy capacity in their overall portfolios.

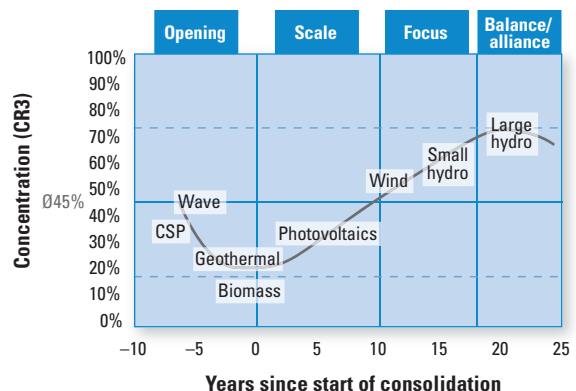
The continuing consolidation of renewable energy systems manufacturers is another positive sign that the boom will not fail as players become stronger—and is an inevitable process as the industry matures (see figure 9). Note, however, that the consolidation positions of the various renewables industries differ significantly.

While the relatively mature wind power industry has already experienced a number of significant mergers and shows a large degree of technological convergence, the field of biomass technologies is characterized by many small- and medium-sized companies and a multitude of technological approaches—a shakeout in biomass is expected to begin in the next two to three years. Meanwhile, emerging technologies such as geothermal, concentrated solar power (CSP) and wave energy are still in a phase where the number of players is likely to increase due to new entrants rather than decrease due to mergers. Accordingly, specific consolidation drivers differ from industry

to industry. In photovoltaics, where R&D financing and access to technology are important drivers, overcapacities are currently limiting takeover appetite. In biomass, presence in regional markets is likely to become a key driver for consolidation as well as emerging technology leadership. Common to all technological subsectors, however, is a need to react to the potential volatility of the stock market and the resultant difficulties in securing financial sources for growth. Gaining size and diversifying geographic reach and technologies are strategies to mitigate vulnerability to such risks.

Another encouraging sign for renewables is the increasing demand for green energy products. Take the case of green energy consumers in Germany, where “post-materialists” and “modern performers” were among the early adapters. Today, more traditional and middle-class consumers are also switching to green energy. What remains in question, however, is whether there also is broad consumer willingness to pay for green energy in other countries, where it is still largely a niche product.

Figure 9
Trends of consolidation of renewable energy systems manufacturers



Source: A.T. Kearney analysis

In Germany, the move of green energy from niche to mainstream was boosted when an established power-market player suffered a public-relations fiasco following technical failures in its nuclear power plants, while other players posted record profits in a time of rapidly rising electricity prices. This underscores the fact that the growth

renewable energy special-interest groups become more influential.

As for potential markets for renewables, the most growth has occurred so far in Europe—but there are very significant untapped markets that are ripe for penetration. The recent boom in North America is a case in point, and many players are targeting this large market. Looking to the future, Mediterranean and Middle Eastern countries are attractive markets, as skyrocketing oil and gas prices have increased the viability of renewable energy power production. Indeed, solar and wind power are particularly appropriate for desert regions with low population densities, as direct-current, high-voltage grid technologies enable efficient transport to demand centers.

The building blocks for growth will enable renewable energy technologies to continue their dynamic growth. Thus renewables will provide a very significant share of power generation in the future.

of green energy is also an expression of customer dissatisfaction with established players in oligopolistic markets and, as such, is not immune to potential setbacks. In fact, the large share of renewable energy generation that is subsidized by mandatory mechanisms can crowd out unsubsidized green energy demand—that is, consumer choice in favor of green energy is ultimately discouraged if government policies impose mandatory renewable energy. To avoid this risk, a scaling-back of subsidy schemes needs to remain an explicit political objective, especially as this will become increasingly difficult to achieve as

energy technologies to continue their dynamic growth. Thus renewables will provide a very significant share of power generation in the future. The supply bottlenecks will likely be overcome, and the identified “signs of doom” indicate that while there might be policy-induced setbacks for particular markets or individual technologies, the global growth outlook for renewables as a whole is very solid.

In order to sustain this growth and minimize the risk of setbacks, however, action by both renewable energy companies and policy-makers is necessary. Policy-makers must move

The Future of Renewable Energy Technologies

The building blocks for growth will enable renewable

toward greater efficiency while maintaining support for emerging technologies—this will go a long way toward maintaining renewable energy’s positive momentum in the long term. A mere continuation or scaling-up of existing systems appears risky, as the large cost burden for final consumers associated with such a policy might eventually cause a backlash in public support for renewables.

As for the private sector, our recommendations for renewables growth include “de-hyping” the media coverage and responsibly managing expectations of the public. At the same time, the industry needs to maintain pressure on cost reduction, as supply bottlenecks and increasing subsidy levels are likely to fall by the wayside.

Authors

Jochen Hauff is a global program manager of the firm’s Sustainability Initiative. Based in the Berlin office, he can be reached at jochen.hauff@atkearney.com.

Orlando Wagner is an A.T. Kearney alumnus and works for a leading power generation equipment supplier. He can be reached at orlando.wagner@gmx.net.

The authors would like to thank Mr. Michael Stiegler of the University Erlangen-Nürnberg, Germany, for his support regarding the various company analyses, as well as Dr. Norbert Allnoch and Mr. Bernd Kleinmanns of the Internationales Wirtschaftsforum Regenerative Energien (IWR) in Münster, Germany, for their insightful discussion on the evolution of the renewable energy index RENIXX.

Jochen Hauff furthermore wishes to thank his colleagues Wolfgang Haag, Horst Dringenberg and Florian Haslauer at A.T. Kearney for many hours of fruitful discussion surrounding renewable energy sources.

The opinions expressed in this paper, however, remain solely those of the authors.

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Marketing & Communications
222 West Adams Street
Chicago, Illinois 60606 U.S.A.
1 312 648 0111
email: insight@atkearney.com
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