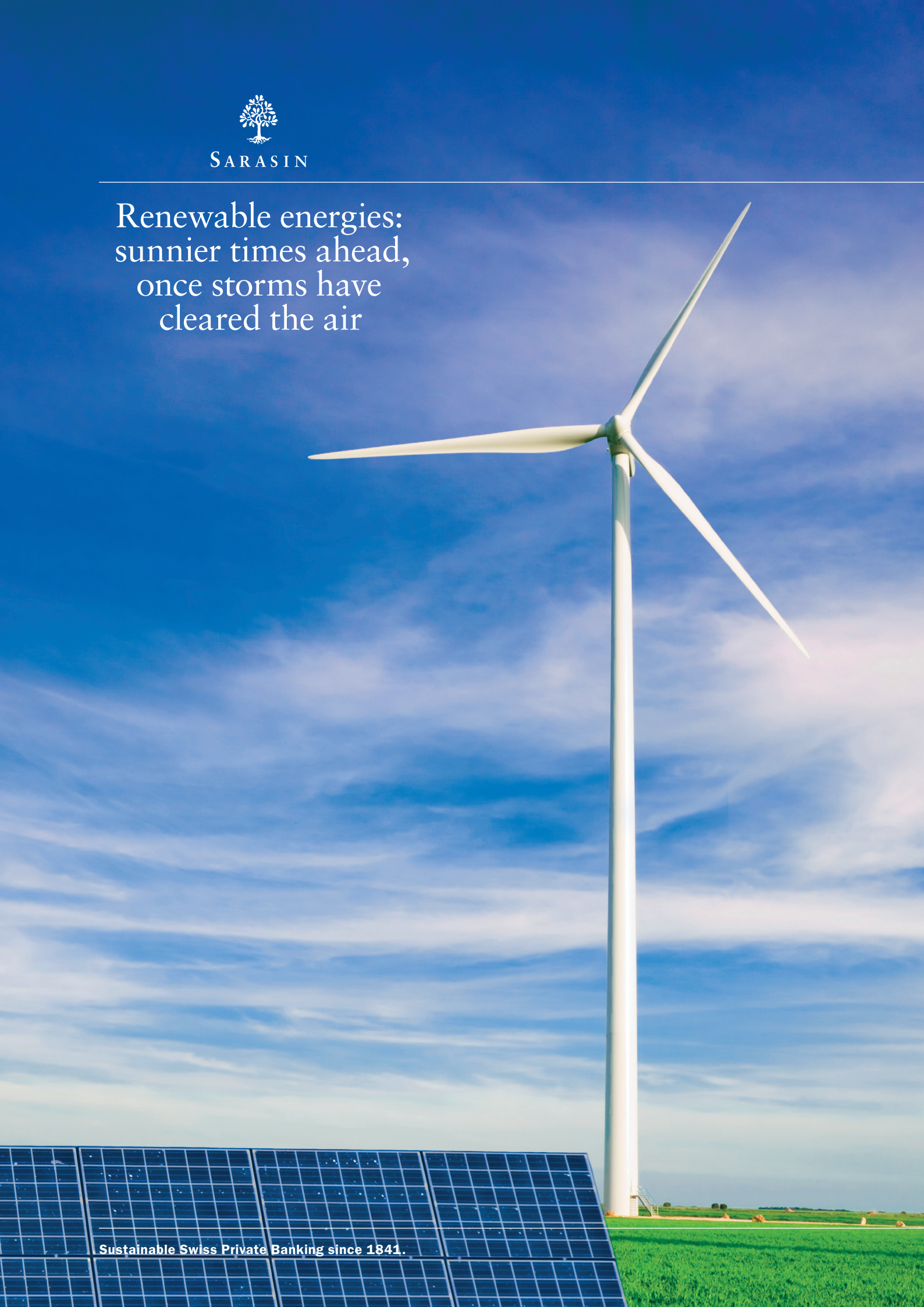
SARASIN

Renewable energies: sunnier times ahead, once storms have cleared the air



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Summary

After a boom year in 2008, 2009 has been a very challenging period for «renewables» so far. Like most sectors, the industry has been severely affected by the credit crunch and global recession. The less established companies are not used to such stormy conditions, and some are running into difficulties. Once the expected market consolidation is over, however, the long-term outlook for renewables should brighten once again. Renewables have two key functions: they help to protect our climate and they reduce dependence on energy imports. Demand for renewable energy should receive a significant boost from government packages to stimulate the economy and from the growing involvement of electricity utilities.

2008 a very mixed year: share prices collapse despite record industry growth

2008 was a boom year for renewable energies, with global electricity capacity soaring to 280 GW. Both in Europe and the USA, more energy from renewable sources was installed than from conventional sources. But as the financial crisis and recession tightened their grip, while the oil price plummeted and surplus capacity continued to build, the share prices of renewable energy companies collapsed in 2008. Since 1Q 2009 demand for solar and wind energy has fallen off dramatically. Firms are having to cope with severe turbulence, and some market consolidation is therefore inevitable.

Positive market signals

Despite the financial crisis and the slump in demand, a number of positive signals can currently be made out for renewables. The first is definitely the globally coordinated economic stimulus packages, with investment programmes for renewables in the region of USD 180 billion. It is however difficult to estimate exactly when they will actually become effective.

Electricity utilities also play an important role in stabilising demand. They have sufficient funds to secure the financing of renewable energy projects.

At the moment renewables is a buyer's, rather than a seller's market, so prices for renewable energy systems have therefore fallen more than average over the course of this year. As a result, certain technologies such as small hydro, wind energy and geothermal power could soon achieve grid parity. But even photovoltaics, which have traditionally been more expensive, have managed to trim their production costs by 20–30% over the last nine months.

Actively tackling problem areas

We see a number of uncertainties regarding national subsidy programs for renewable energies. Criticism is growing in view of rising costs and the shrinking benefit as regards the creation of new jobs in the domestic economy.

Technical solutions can be found to the difficulties affecting the availability and integration of renewable energy in the mains grid. This has been demonstrated in numerous studies as well as in the high percentage of solar and wind power already installed in Denmark, Germany and Spain.

Long-term prospects intact for renewables and for investors

After a subdued 2009, our forecasts for the individual renewable technologies are once again positive for the years ahead, with continuous market growth. The long-term prospects for renewables are excellent when compared with conventional energy sources. With prices falling sharply, renewables will quickly become competitive and can therefore make a greater contribution to the reduction of CO_2 emissions and our dependency on oil and gas.

Star performance from renewables in 2008

2008 was a record year for renewables. Both in Europe and the USA, more energy from renewable sources was installed than from conventional sources. Global installed capacity for all renewable energies has now reached around 280 GW. Photovoltaics gained 125% in 2008, equivalent to newly installed solar power capacity of 5.3 GW. Total global capacity now stands at 13 GW. Last year newly installed wind energy capacity soared 42% to 28 GW, resulting in a cumulative global capacity of 122 GW. Geothermal power also grew, with total installed capacity passing the 10 GW mark.

Capacity from renewable sources at y/e 2008

Renewables experienced a major growth spurt in 2008, finally outgrowing their status as a market niche. Global electricity capacities of all renewables came to around 280 GW at y/e 2008 (see Fig. 1). This is equivalent to an increase of 40 GW (+16%) compared with 240 GW last year, and is almost three times the nuclear power capacity in the USA.[1] Despite the lower capacity utilisation of around 30%, renewables therefore generate roughly the same kilowatt hours as the existing US nuclear power stations.

Fig. 1: Global renwable electricity capacities at y/e 2008

Technology (gigawatt)	Total world	3rd world	EU-27	CN	US	DE	ES	IN	JP
Wind	**122**	24	65	12	25	24	17	10	2
Small hydro	**85**	65	12	60	3	1.7	1.8	2	3.5
Biomass	**52**	25	15	3.6	8.0	3	0.4	1.5	>0.1
Photovoltaics	**13**	0.4	8.8	0.1	1.1	5.3	2.9	0.1	2
Geothermal	**10**	4.8	0.8	~0	3	~0			0.5
CSP plants	**0.5**		0.1		0.4		0.1		
Ocean power	**0.3**		0.3						
Total renewables	**283**	**119**	**96**	**76**	**40**	**34**	**22**	**13**	**8**

Source: REN 21, May 2009

In 2008 more renewable energy capacity was installed than conventional fossil or nuclear power stations – both in the EU and the USA. Around 30% of newly installed energy capacities worldwide are based on renewable sources. By way of comparison: the global capacity of large-scale hydroelectric plants amounts to 860 GW, and total energy generating capacity is 4700 GW.

The 280 GW capacity for renewables still only represents 6.2% of global electricity capacity and 4.4% of effective electricity production. But the various industry associations for renewables set much higher targets for the future. Collectively, renewables could cater for more than 50% of global energy requirements over the next 40 years.

Last year a number of governments introduced new legislation on renewables and set themselves ambitious targets on renewables' future share of the energy mix. Today, at least 73 countries have such targets in place (vs. 66 countries in 2007).

2008 – record growth for the PV industry

For the past eight years the PV industry has achieved average annual growth of 50% in the newly installed modules (see Fig. 2). In 2008 new capacity totalling 5.3 GW was installed worldwide, an increase of 125% on the 2007 figure of 2.4 GW. The biggest markets in 2008 were Spain (40% market share), Germany (28%), USA (7%), Italy (5%), Korea (5%) and Japan (5%). Italy and Spain were the star performers, with growth rates in

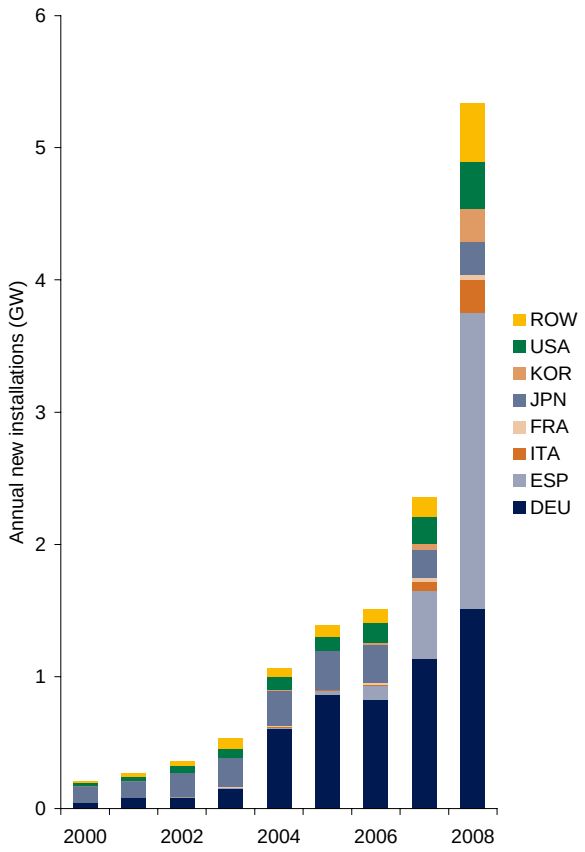
[1] REN 21, May 2009. Renewables Global Status Report: 2009 Update

excess of 200%. In 2008 the global solar energy industry was worth around EUR 30 billion and employed some 170,000 people. At y/e 2008 global production capacity for solar cells was 14 GW, compared with around 7.5 GW at y/e 2007. The expansion plans originally announced have been drastically cut, however, in view of the collapse in demand and accumulation of surplus inventories.

Solid growth for the wind industry in 2008

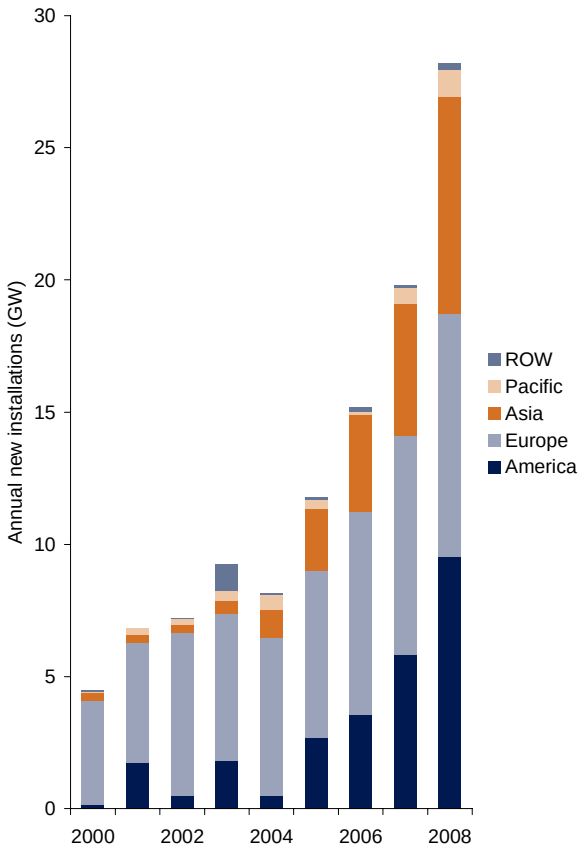
Over the last five years the wind energy sector has grown by 28% p.a. on average (see Fig.3). In 2008 there was 28 GW of new wind capacity installed worldwide (USA 9.5 GW, Europe 9.2 GW, Asia 8.2 GW, RoW 1.3 GW), 42% higher than in 2007. The majority of the plants (99%) were still installed on shore, while just 1% was built off shore.

Fig. 2: New PV capacity installed annually



Source: IEA-PVPS, EPIA, Bank Sarasin, June 2009

Fig. 3: New wind capacity installed annually



Source: BTM Consult, GWEC, Bank Sarasin, June 2009

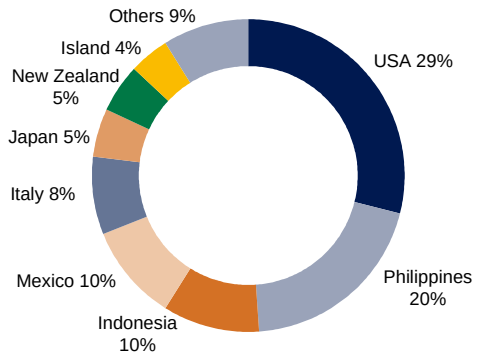
In 2008 the wind turbine market generated sales of around EUR 37 billion and is already relatively well consolidated on the provider side. The ten biggest companies had a combined total of more than 80% of installed wind capacity in 2008. *Vestas* is still clinging on as market leader, with a global market share of 20%, just ahead of the up-and-coming *GE Wind* with a share of 19%. Last year Vestas lost 3% of the market, while GE won another 2%. All the top players are working on a global production and sales strategy. In view of the rapid technological advances and higher quality standards, the barriers to market entry in the wind industry are very high.

Review of geothermal energy in 2008

Geothermal power has been in industrial use since the oil crisis back in the seventies. In 1975 the total geothermal capacity installed worldwide was approximately 1.3 GW. Last year this figure broke through the 10 GW mark, which is equivalent to an average annual growth rate of 6.5% since 1975. Geothermal capacities are most readily available in volcanic regions and in areas where tectonic plates meet. The global potential for geothermal power is estimated at roughly 150 GW.

The USA is currently the biggest producer of geothermal power, at 3 GW (see Fig. 4), followed by the Philippines (2 GW), Indonesia (1 GW), Mexico (1 GW) and Italy (0.8 GW).

Fig. 4: Cumulative geothermal capacity at y/e 2008 (total 10 GW)



Source: New Energy Finance, Bank Sarasin estimates, June 2009

Opportunities and challenges for renewables

The main reasons for the collapse in the share price of «renewables» in 2008 and the beginning of 2009 were the falling oil price, weak demand caused by the global recession, problems with project financing and surplus capacities on the production side. Since March 2009, however, some of these key indicators have significantly improved, and renewables now seem to have ridden out the worst of the storm. Even so, the situation is different now: although the huge price falls help to stimulate demand, they also put pressure on profit margins. Companies are therefore facing major challenges, and we are likely to see some consolidation in the marketplace.

Stock markets anticipated the stormy weather

Despite the dynamic growth enjoyed by the market in 2008, the actual share prices of renewable companies collapsed during this period under the weight of the credit crisis, the plummeting oil price, the emerging recession and rising surplus capacities on the production side. 2008 therefore marked an abrupt end to the four-year bull run in renewables, with increasingly higher levels of investment and continuously rising share prices. The times when there was a steady flow of good news and only talk of growth in all clean energy sectors, as well as in all countries and companies, had passed. During 2008 renewable energy shares underperformed the overall stock market, especially in the last four months of the year. The market capitalisation of the 160 listed renewable energy companies shrank from USD 240 billion to around USD 100 billion at the time of reporting.

The adverse financing conditions and the desolate economic situation triggered a massive collapse in demand for renewable energies in the first three months of 2009 and disappointing first-quarter results for most companies.

Since banks are still reluctant to lend money and require investors to contribute substantial amounts of their own capital, fewer wind and solar parks are being constructed. Smaller companies in particular can no longer finance their projects and have been obliged to abandon or postpone them.

This in turn is forcing even industry heavyweights in the wind and solar businesses to tighten their belts: *Vestas*, *Gamesa*, *Q-Cells*, *Energy Conversion Devices* along with a number of other companies have had to lay off workers and cut back on production.

Less investment in renewables

In 2008 as much as USD 155 billion was still invested in the area of «Clean Energy", about the same amount as in 2007 (USD 148 billion).[2] Around 55% of investments were channelled into the wind sector (USD 52 billion) and solar sector (USD 34 billion) last year. But in 1Q 2009 this fell off sharply (-52%), with just USD 13 billion invested compared with USD 28 billion in the same quarter in the prior year. Experts at New Energy Finance expect global investment to drop by 25–40% in 2009, to USD 95–115 billion.

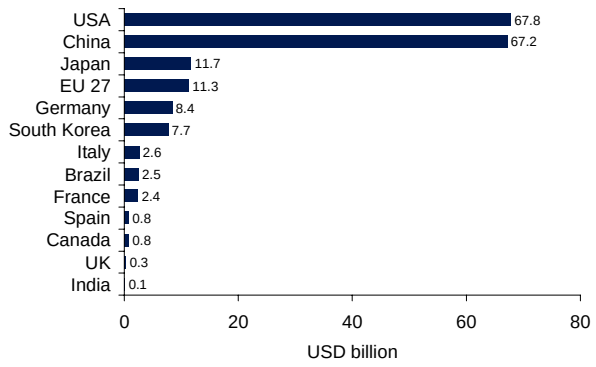
Despite the financial crisis and the collapse in demand, there are a number of positive trends, as well as new challenges for renewable energies.

[2] New Energy Finance, 2009

Demand supported by «green" economic stimulus programmes

Many governments have responded to the crisis by launching programs to stimulate the economy, with high priority given to renewable energies and the expansion of the public infrastructure. By April 2009, 13 nations had already announced «green» stimulus packages worth USD 183 billion (see Fig. 5). This is equivalent to around 6% of the total stimulus packages, although the figure varies significantly from one country to the next.

Fig. 5: «Green» economic stimulus packages (in USD bn, Apr. 2009)



Source: New Energy Finance, 2009

These government support programmes will certainly help to stabilise investment activity in renewables in the short run. They are needed in order to make up for the shortfall in investment predicted for the current year. Thereafter they will act as an additional driver for this sector. However, it is difficult to know when this money will effectively be paid out and start to have an impact. We estimate that only USD 40 billion of the total USD 183 billion pledged will be paid out in 2009. Around USD 75 billion will be spent in 2010 followed by USD 45 billion in 2011, with smaller payments in subsequent years.

Another open question regarding state packages to stimulate the economy is whether they will generate sufficient jobs in the domestic labour market. Apart from the USA and Europe, newly industrialised countries – especially China and India – play an increasingly important role in both the manufacture and installation of renewable energy systems (see the sections on jobs and offshoring of production).

Will investments by utilities help to stabilise the market?

Electricity utilities are potentially important investors for renewable energy projects and could help to stabilise both the market and demand. There are still many companies in this category which only provide sporadic support for renewables, or which like to place side bets on the expansion of nuclear and fossil fuel plants. *EDF* and *E.On*, for example, have advised the British government to cut their targets for renewables and at the same time to increase their subsidies for nuclear energy. In Switzerland, *Rätia Energie*, which has excellent sustainability credentials, plans to take a financial stake in a new coal-fired power station in Brunsbüttel, Germany. The oil giants *Shell* and *BP* also seem to be a little reluctant at present to make major investments in renewables. Both companies share the opinion that wind and solar energy does not make economic sense for them as things stand.

Other utilities have made significant commitments in the field of renewables, especially as wind park operators. Figure 6 shows the world's top 15 power companies or independent producers (IPPs) and the wind park capacity operated by them at the end of 2008. The total wind capacity of these companies is in the region of 44 GW, equivalent to roughly 36% of wind energy installed worldwide. Spanish and American electricity utilities have significant exposure to renewables and they both own four companies. On the other hand only one German, one English, one French and one Japanese company are represented.

The general increase in the involvement of many electric utility companies in the renewables industry should have a stabilising effect on demand in our opinion. On the one hand they have the necessary funds to finance large-scale projects, and also have strong credit ratings. But on the other hand, the new legislation introduced in the form of Renewable Portfolio Standards (RPS) is increasingly forcing them to generate a higher proportion

of electricity from renewable sources. In addition, planned or existing solar and wind parks can be acquired from smaller project developers at knockdown prices.

Fig. 6: World's leading wind park operators

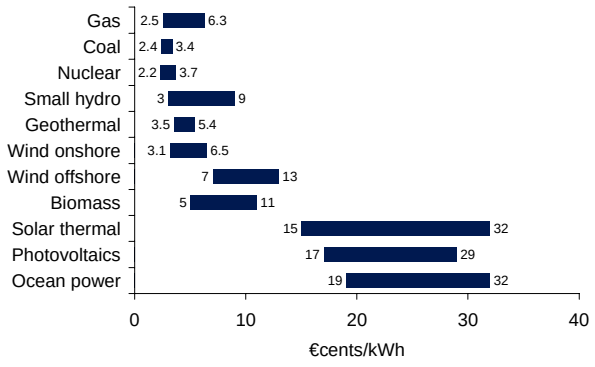
Wind park operator	In service y/e 2008 (GW)
1. Iberdrola Renovables/Scottish Power (ES)	8.9
2. FPL Energy/NextEra (US)	6.4
3. EDP Renovaveis/Horizon (PT)	5.1
4. Acciona Energy (ES)	4.6
5. Long Yuan Electric Power (CN)	2.9
6. Datang Corporation (CN)	2.2
7. EDF Energies Nouvelles (FR)	2.0
8. Endesa (ES)	1.9
9. E.On Climate and Renewables (DE)	1.9
10. Eurus Energy Holding (JP)	1.7
11. Babcock Brown Windpartners (AU)	1.5
12. MidAmerican Energy (US)	1.3
13. International Power (GB)	1.2
14. AES (US)	1.2
15. Cielo Wind Power (US)	1.2
Total for all 15 companies	**44.0**

Source: BTM Consult, March 2009

Dramatic fall in the cost of renewables

The latest estimates for the electricity production costs for the individual renewable technologies show a consistently positive trend: renewables are becoming cheaper and certain technologies, such as small hydro power, geothermal and wind (onshore), are already competitive in many places (see Fig. 7). Even solar power – traditionally one of the more expensive technologies – has been able to trim its production costs by around 15 to 20% since September 2008, thanks to falling prices. Furthermore, as an off-grid form of electricity generation, it is more appropriate to compare photovoltaics in particular with the price of electricity for end customers. If solar energy achieves this price level in any country, the much-vaunted grid parity has been achieved. From the homeowner's viewpoint, every unit of solar power can subsequently save one unit of mains electricity, even without extra feed-in subsidies. This could trigger an enormous boom in demand.

Fig. 7: Comparison of electricity generation costs



Source: Solar Century, Bank Sarasin estimates, June 2009

IRENA and «Copenhagen conference»: long-term drivers for renewables

In January 2009 the International Renewable Energy Agency (IRENA) was founded in Bonn. IRENA is the first international organisation to concentrate exclusively on renewable energies. Its role is to provide practical advice and support for both industrialised nations and developing economies. The main focus of its work is to create the right conditions, build up the necessary expertise and also improve the financing and transfer of technology and know-how in the field of renewable energies.

The Kyoto Protocol's first period of legally binding commitments comes to an end in 2012. At the UN Climate Conference in Bali in December 2007, a roadmap was therefore drawn up for a follow-on agreement. This is due to be put into practice at the forthcoming Copenhagen Conference in December 2009. The long-term goal is to cut global CO_2 emissions by at least 50% up to 2050. Such a far-sighted global climate agreement would certainly act as an important long-term driver for renewable energies. With the new US administration under President Obama, there is also a chance of getting the USA to sign up to a global climate agreement, which would be a major step forward. This might also persuade China and India, the two most important emerging nations, to make concessions as well by reducing their own CO_2 emissions. Such an agreement would provide an additional boost to the

growth of carbon-neutral renewables, which would also benefit from higher fossil fuel prices and government packages to stimulate the economy.

Subsidy programmes for renewables under threat?

Despite all these positive aspects, the fact remains that renewables are still dependent on state subsidies, such as a set scale of fees for energy fed into the mains grid. Their electricity generation costs are still not competitive, especially in the case of solar energy. This carries the risk of such programmes being cut or restricted, weakening demand in the process – as happened in Spain in 2008. The subsidies are the subject of public and political discussions centred on the cost/benefit relationship with respect to the creation of new jobs and the contribution renewables make to energy production.

Impact on employment

Despite the current adjustments, the renewables industry has created around 2.3 million jobs worldwide in recent years, according to a UNEP/ILO study[3] (see Fig. 8). By 2030 the sector could reach a market value of USD 630 billion and create at least another 20 million direct and indirect jobs. A current EU report published equally upbeat figures, estimating that the expansion of renewable energies in Europe could double the current 1.4 million people working in the industry by 2020.[4]

Fig. 8: Global jobs in the renewable energy sector 2008

Technology	Global (2008)
Wind	300,000
Photovoltaics	170,000
CSP	624,000
Biomass	1,174,000
Hydro	39,000
Geothermal	25,000
Total renewable energies	**2,332,000**

Source: UNEP, ILO, WorldWatch Institute, 2008

Critics claim that the generous subsidies for renewable energies result in inflated electricity prices and thus destroy jobs in other industries.[5] We do not think this argument holds water. Firstly, the effect of renewables on the electricity price is minimal, and secondly the offshoring of heavy industry from developed economies is not solely attributable to the high price of electricity, but actually reflects a global economic adjustment process.

Offshoring of production

Another argument raised by critics is that the subsidy programmes tend to create jobs mainly abroad, but have far too little effect on the domestic labour market. German politicians, for example, are worried that their electricity consumers are having to subsidise increasing foreign production. The fact is that Europe is steadily losing its position as the world's leading manufacture of systems and components for renewable energies to the USA and China. According to be UNEP/ILO study cited previously, the job creation potential in developing countries is greater in the longer term than in western industrialised nations, mainly because of lower wage costs. It is therefore only a matter of time before local politicians decide to reduce subsidy programmes or limit the feed-in tariffs to domestic products.

[3] Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World, September 2008: New York: United Nations Environment Programme.

[4] The impact of renewable energy policy on economic growth and employment in the European Union. Employ-RES research project conducted on behalf of the European Commission DG Energy and Transport. June 2009. http://ec.europa.eu/energy/renewables/studies/index_en.htm

[5] Study of the effects on employment of public aid to renewable energy sources; Gabriel Calzada Álvarez, University Rey Juan Carlos, March 2009

The situation could be even more difficult for the USA: the know-how and patents for renewables are concentrated in Europe, while cheap labour is more readily available in China. We therefore believe there are not enough new jobs left for the Americans to make up for the jobs lost in traditional industries.

The latest example of *Sunpower* clearly illustrates this problem. This company, together with *Jabil Circuit,* announced the construction of a new module production facility for the North American market in June 2009. However, the factory is actually being built in Mexico. Like every other manufacturer in a globalised economy, *Sunpower* is keen to choose a location with low production costs. In view of this, *Sunpower* will certainly not be the last renewables company to offshore its production from the USA. This is an awkward situation for President Obama, who sees himself as a champion of renewables and «green" jobs.

Renewables have a short energy payback time

Another criticism for the promotion of renewable energies concerns their allegedly low level of useful energy. In the past, a number of concerns have been raised as to whether renewable technologies – and once again photovoltaics in particular – can actually generate more energy than was used during their manufacture.

In practice, however, the energy payback time (EPT)[6] for each renewable technology has been significantly reduced in recent years thanks to technological advances and improved efficiency. With the more modern solar energy systems, it only takes just under two years until the energy used in their manufacture is recuperated. After that, the PV system continues to generate electricity for another 20–25 years. In particular the manufacture of the raw material polysilicon has been optimised and now requires five times less energy than in the past. A wind turbine is energy neutral after just 7 months of operation and produces another 35 times more energy during its service life. The EPT of a solar thermal power plant (concentrating solar power, CSP) based on parabolic trough technology is in the region of 5–12 months.

The latest publications providing an overall environmental picture of the various energy systems based on life cycle analysis (LCA) also show a vast improvement in all renewable technologies. A re-rating on the basis of the Ecoinvent database[7], on the other hand, shows that nuclear energy's environmental impact is 2.5 times greater than previously assumed. This is because consideration is also given to the impact of the environmental pollutants associated with the waste generated by uranium extraction, known as «tailings"[8].

Availability is key issue

Another argument repeatedly raised against the use of renewable energy systems is the unreliability of supply. These technologies may, for example, be affected by weather conditions, which makes it more difficult to predict and plan the expected energy yields and at the same time makes it virtually impossible to control the individual systems. Because of this, an energy provider with a high proportion of renewables could find it impossible to meet demand at all times, i.e. to assure a secure supply of electricity.

However, the EU already has around 100 GW of back-up capacity stored in water reservoirs to bridge any gaps should the wind or the sun be too weak to produce enough electricity. Switzerland especially has a comparatively high number of reservoirs for pumping water, an area which presents attractive business opportunities for electricity providers.

[6] Energy payback time: time taken for an energy system to generate the same amount of electricity that was used during its manufacture (energy amortisation)

[7] www.ecoinvent.org

[8] To extract uranium, the ore has to be separated from the rest of the rock. This bedrock contains highly toxic substances such as arsenic, mercury and lead. This leaves the «tailings", which are ground up with water to produce a slurry which is then stored in collection ponds. In this state it is possible for toxins to be released into the environment through rainwater.

Several ingenious solutions have been put forward to improve the availability or to increase the capacity of renewable energies. One idea, for example, is to connect the European electricity grid with huge new solar energy installations located in the Sahara. The amount of land needed to meet total European energy demand would be equivalent to a square area of 200 km.[9] Together with the offshore wind parks in the North Sea, this would provide sufficient renewable energy capacity to cover fluctuating electricity requirements.

One very interesting development in this respect is the «Regenerative combined cycle power plant» project financed by Germany's Ministry of Finance in 2007.[10] This project is part of a joint initiative by the companies *Schmack Biogas, SolarWorld* and *Enercon*, in an attempt to show that renewables can perform well and can also be effectively controlled. The project links together 36 wind, solar, biogas and hydro plants to form one network controlled by a central computer. The system is capable of providing enough electricity for around 12,000 homes. The output from the individual power stations is controlled on the basis of detailed meteorological data. The biogas and pumped storage stations provide reserve capacity if there is not enough wind and solar energy. This regenerative combined cycle power plant functioned very smoothly and consistently met both the baseload and peakload power requirements. Over the entire trial period, 61% of the electricity came from wind turbines, 25% from biogas power plants and 14% from PV systems. The results showed that around 40% of Germany's electricity requirement could come from wind, solar and biomass energy by 2020, and as much as 100% by 2050.

Smart grids – a visionary approach for a new supply network

Renewables can be incorporated on the supply side most effectively with the «smart grid" concept. This is the best response to the challenges of the future such as protecting our climate, increasing the proportion of renewable energy sources and safeguarding the security of supply. The underlying principle of these intelligent networks is the transparent exchange of information across the entire network, from the producer to the end consumer. This makes it possible to control the electricity grids and also to manage demand more efficiently (capping peak load by regulating demand from end users). Using innovative technologies that are already available, it is possible to improve efficiency by around 30%, with no compromise in performance.

At the same time, these options reduce dependence on energy imports, which are becoming increasingly expensive. This makes it easier to realise local projects using biomass, biogas, solar or wind power systems, thereby increasing employment levels in innovative areas of technology such as off-grid energy supply.

Conclusion: time to capitalise on sustainable opportunities

There are consequently several positive signals on the macro level for renewable energies for the months ahead which indicate a stabilisation, and possibly even recovery of the market. These include government packages to stimulate the economy, as well as the greater involvement of electricity utilities. At the same time the cost of generating electricity from renewable sources is steadily falling, reducing dependency on additional subsidies for feeding energy into the grid.

Existing problem areas, such as subsidy programmes and the creation of jobs, are causing certain regional shifts but cannot prevent the global growth of renewables. The long-term challenges concerning the availability of supply and grid integration can be overcome, but need to be tackled collectively with the involvement of electricity utilities and national grid operators.

Surprisingly, the global recession has not prompted governments to abandon or reduce the targets they have formulated for environmental protection. Politicians of all hues view the energy and climate debate not merely as a fair-weather topic, but as a vital tool for improving living

[9] The Solar Century, edited by Jeremy Leggett, 2008
[10] www.kombikraftwerk.de

standards over the long run. We therefore think the long-term prospects still look very positive.

As far as individual companies are concerned, however, in-depth understanding of the way markets work is crucial if they are to act more effectively and master the current challenges. Companies need to be much closer to the rapidly growing markets of Asia, southern Europe and North America.

Market outlook for the individual technologies

Demand for renewable energies has stabilised in the second quarter of 2009 in response to government packages to stimulate the economy and the normalisation of finance facilities. The structural adjustments have actually helped to strengthen the position of the remaining market players. In 2009 the photovoltaics industry is likely to record zero growth, but next year it should once again post average growth rates of 35% p.a. from 2010 onwards. Wind energy will grow by around 10% in 2009. In the period up to 2020, total wind power capacity will expand from its current level of 122 GW to a cumulative figure of 1000 GW. Geothermal power will at least double its current installed capacity of 10 GW over the next 10 years. Thanks to massive savings, the electricity production costs for renewables could gradually reach grid parity. This opens up unprecedented market potential for all types of renewable technology.

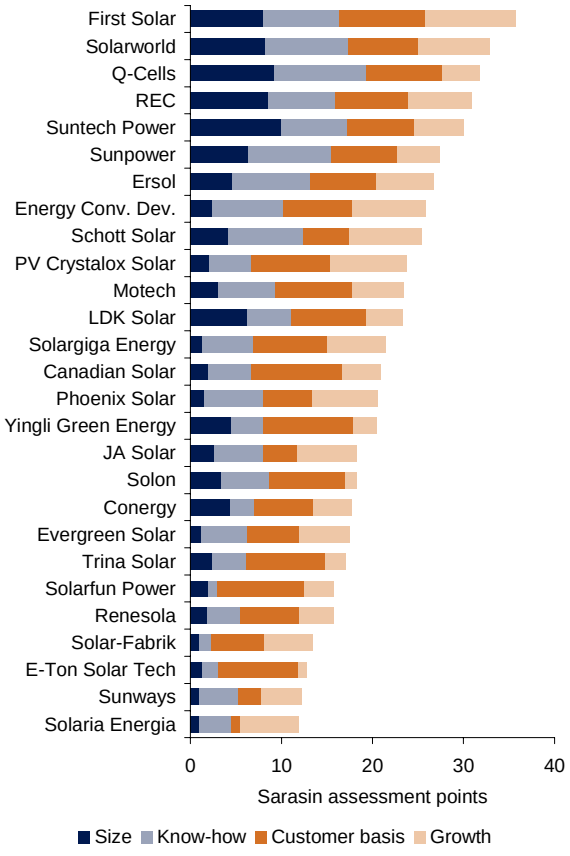
First positive signals

Since the start of March, many renewable company shares staged a surprisingly strong rally on stock markets, advancing by 90–150%. During Q2 2009 there have been increasing signs of an improvement in project financing facilities. In Germany especially, there no longer seems to be a bottleneck. Even large-scale, open-space installations are managing to raise capital, although they do require a long due diligence process and a bank consortium to secure their financing. Growth is still noticeably restricted in other countries such as Italy, Greece and Eastern Europe, where there are still tight constraints on lending.

How are PV companies positioned?

The balance of power within the PV value chain has shifted dramatically during the course of the past few months. The focus is no longer on procuring raw materials and expanding capacity, but increasingly on cutting costs and stepping up marketing activities. In view of this, raw material has now been scrapped as a criterion for our sustainability rating. PV module producers – especially in China – some of whom had to do business last year without the support of the much sought after long-term supply agreements for polysilicon, can now go to the spot market to procure this important raw material at USD 60–85/kg.

Fig. 9: Strategic positioning June 2009



Source: Bank Sarasin, June 2009

Our current assessment of the strategic positioning of 27 PV companies is based on four criteria: critical mass, know-how, customer base and growth/balance sheet (see Fig. 9). The American thin-film technology producer *First Solar* tops the rankings for the first time, mainly due to its solid balance sheet and superior cost base. The Asian PV companies recorded enormous growth during 2008 and already produced 65% of the world's solar cells. By contrast, certain Chinese companies are heavily in debt. But even companies such as *Q-Cells*, *REC* and *Sunpower* had to raise new capital in the first quarter.

In general, the industry consolidation and the formation of joint ventures are continuing (*Sunfilm / Sontor*; *Manz / Roth&Rau; Q-Cells / LDK*). In addition, acquisitions by industrial conglomerates not usually associated with the renewables sector are becoming increasingly common.

Price pressure in photovoltaics boosts demand but shrinks margins

At the end of 2008, the solar energy industry changed very quickly from a seller's market to a buyer's market. This was down to the steady increase in surplus capacities and an unexpectedly rapid slowdown in the solar boom. Since October, prices for solar modules have dropped by 20–30%. Last year, a polycrystalline module could still fetch more than EUR 3.0/W. By mid-July the prices had already dropped to between EUR 1.9 and 2.4/W. Chinese models in particular are becoming much cheaper and the price gap compared with European/US modules seems to be widening. Furthermore, solar projects based on specific Chinese modules (*Suntech Power*, *Yingli*) are now attracting bank finance more easily. The overall cost of buying modules for large-scale projects is now up to EUR 0.5/W cheaper than for smaller roof-mounted systems.

The end user is obviously delighted with this drop in price, but the PV industry is feeling the margin pressure and is facing major business challenges.

After a short pause, growth will accelerate again from 2010 onwards

The PV industry had a very sluggish start to the current year, mainly because of the collapse of the Spanish market and the global financial crisis. Another factor was the exceptionally long winter, which caused a dip in business performance during the first quarter. But not all companies were equally affected by this trend: Germany's *SolarWorld*, for example, even managed to significantly increase its trading business. *Solon*, on the other hand, saw sales slump by 76% compared to 1Q 2008.

We therefore expect zero global growth for the full year (see Fig. 10). However, the trend may vary enormously from one country to the next. The biggest market, Germany, could achieve growth of around 20–30% this year. The biggest driver here is roof-mounted PV systems, which command a market share of more than 75%. Apart from Spain, other Mediterranean companies should see demand pick up in the second half of the year, so that overall growth of these countries for the full year is expected to exceed 50%.

Fig. 10: Sarasin PV market forecast

	Newly installed PV capacity [MW]						CAGR*
	2007	2008	2009	2010	2011	2012	08 – 12
Germany	1,135	1,510	1,993	2,292	2,751	3,163	20%
Italy	70	246	455	819	1,311	2,032	70%
Spain	512	2,245	550	500	500	500	-31%
Greece	2	11	44	110	242	520	162%
France	31	44	72	123	197	305	62%
Portugal	15	50	60	102	163	253	50%
Rest of Europe	15	18	32	55	88	138	67%
Europe	**1,780**	**4,124**	**3,207**	**4,001**	**5,251**	**6,911**	**14%**
USA	**207**	**350**	**840**	**1,680**	**3,360**	**6,048**	**104%**
China	20	50	115	293	660	1,320	127%
India	10	40	80	180	342	616	98%
Japan	210	244	402	523	705	952	41%
South Korea	43	250	150	225	304	395	12%
Rest of Asia	31	93	186	326	456	592	59%
Asia	**314**	**677**	**933**	**1,546**	**2,467**	**3,875**	**55%**
Rest of World	**56**	**185**	**370**	**647**	**1,035**	**1,759**	**76%**
Total newly installed capacity	**2,357**	**5,335**	**5,349**	**7,874**	**12,112**	**18,593**	**37%**
Annual growth rate	56%	126%	0%	47%	54%	54%	

Source: Bank Sarasin, June 2009; * CAGR: compound annual growth rate

The PV industry is placing great hopes in the US market. We expect growth for 2009 to exceed 100%, supported by very active electricity utilities and the government package to stimulate the US economy.
Similar growth rates are expected in China and India, although this is still associated with more modest volumes in these countries at present.
The sudden halt in global growth, coupled with significant surplus capacities and inventory levels, will cause a steady price fall of 25–35% over the entire year. Apart from criteria such as critical mass, know-how and financial strength, proximity to end customers plays an increasingly important role for the competitiveness of individual companies.
Growth rates are not expected to pick up again until 2010, and should exceed 45% thereafter. In 2012 the total amount of newly installed PV capacity could therefore be in the region of 18.6 GW.

Stormy conditions for the wind energy sector

Prospects for the wind energy industry have deteriorated primarily as a result of the current financial crisis. The collapse came on the heels of the failure of *Lehman Brothers* in September 2008, which was one of the world's most important sources of finance for wind parks. Nowadays there are far fewer credit institutions, and most of these now require borrowers to put up 30–40% of their own equity, rather than the 10–20% asked for previously.

The prospects for government subsidies in the highly promising US market are actually intact, and in fact are better than ever before. In other words, demand is only being reined in by the difficulty in raising finance. As a result, wind energy projects are being postponed or even scrapped. The situation is particularly difficult for the smaller project developers, as illustrated by the failure of the Dutch company *Econcern* and the problems experienced by Denmark's *GreenTech Energy*. The risk involved in the financing of offshore wind parks is even greater, which is leading to delays in this type of project.

A bright outlook for the wind energy industry

The wind power industry is predicted to achieve growth of around 10% in 2009. Over the next five years we anticipate average annual growth of 16%. In 2013 newly installed wind turbine capacity will reach 60 GW, which will result in a cumulative capacity of more than 340 GW (see Fig. 11). The most important markets driving this growth will be the USA, Canada, the UK, China and Eastern Europe. Wind energy could grow from the current 122 GW to around 1,000 GW by 2020, which would create 3,000 TWh of clean energy. This would be equivalent to the electricity produced by 300 nuclear power stations.

Fig. 11: Forecast for the wind energy market

	Newly installed wind energy capacity [GW]						CAGR*
	2008	2009	2010	2011	2012	2013	08 – 13
America	9.5	7.7	10.5	12.5	16.2	18.3	14%
Europe	9.2	11.6	13.5	15.9	18.1	20.2	17%
Asia	8.2	9.7	10.3	12.4	13.4	15.3	13%
Pacific	1.1	1.1	1.4	1.6	1.9	2.3	16%
RoW	0.2	0.6	1.0	1.5	1.8	2.5	62%
Total newly installed capacity	**28.2**	**30.6**	**36.6**	**43.8**	**51.4**	**58.5**	**16%**

Source: BTM Consult, GWEC, Bank Sarasin, June 2009; * CAGR: compound annual growth rate

Geothermal – less affected by the crisis

The annual growth rates in geothermal power have traditionally been on the low side, at around 6.5%, despite the very competitive electricity generation costs. The reasons for this are:

a) Distance from suitable locations;
b) Competition from the oil sector for drilling materials and know-how;
c) Lengthy planning and construction phase (around six years);
d) Difficulties raising the finance for the initial investments.

As their numbers are more manageable, geothermal projects seem to have been less badly affected by the financial crisis than the solar and wind energy. Even before the crisis hit, the relatively high investments

involved required an extensive due diligence process and solid financial backers.

At the moment there are currently 215 geothermal power stations operating in 24 countries worldwide, ranging from a large number of smaller development companies such as *Ormat Technologies* (US), *Western Geopower* (CA) and *Geodynamics* (AU), as well as larger utilities like *RWE* (DE), *Enel* (IT), *Calpine* (US), *Tata Power* (IN), *J-Power* (JP) and *Contact Energy* (NZ).

The American oil multinational Chevron is the world's biggest producer of geothermal energy, with a total capacity of 1.27 GW (plants in the Philippines and Indonesia). It is also involved in the development of other large-scale projects in Russia, Latin America and Eastern Africa.

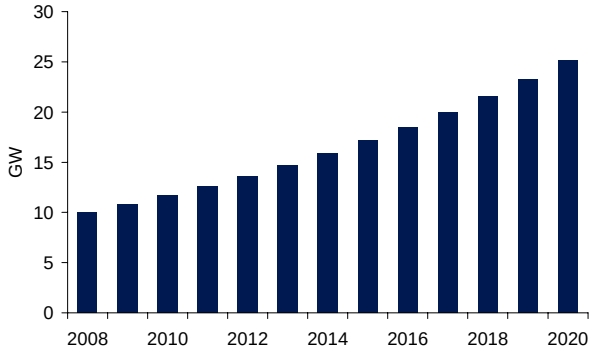
Reliable energy source with enormous potential

Prospects for this industry are bright, and geothermal is expected to enjoy a boom over the next few years. It is one of the most reliable sources of renewable energy, and can be used very effectively to generate base-load electricity. The US Department of Energy (DoE) estimates that around 40 countries have sufficient geothermal resources for meeting 100% of their electricity needs.

The investment costs for exploring, drilling, constructing and connecting a geothermal plant are relatively high, in the region of EUR 1.4 to 2.8 million per MW. On the other hand the availability is excellent, at around 93–97%, or peak-load power of 8,150 to 8,500 hours per year. By contrast, the efficiency of a wind turbine is relatively low, at 30–35%, depending on the location. In other words, the 10 GW output from a geothermal plant can generate the same amount of electricity as 30 GW of installed wind energy.

Additional geothermal power plants with a total capacity of 9 GW are currently being built worldwide. The Italian energy group *Enel* expects total electricity production to reach 19 GW by 2020, but our estimate is in the region of 25 GW (see Fig. 12). The USA is the clear world leader, with over 100 new projects and a total capacity of more than 4 GW. But Germany also plans to install around 280 MW of geothermal capacity by 2020, forty times higher than the current level. With an output of around 5 MW per facility, this corresponds to more than 50 power stations.

Fig. 12: Forecast for the geothermal market (cumulative data)



Source: Enel, Bank Sarasin, June 2009

Conclusion for the investor – a long-term stance will be rewarded

The current economic situation presents entirely new challenges to companies involved in renewable energy. Not all of them will succeed in mastering these challenges, so the entire industry is likely to experience some consolidation.

Despite the current recession, none of the energy or climate protection goals announced by governments have so far been postponed or abandoned. On the contrary, renewable energies and energy efficiency seem to play an important supportive role in combating recession.

The outlook for all renewables still seems to be intact. At the same time the individual technologies are being continuously refined and as a result are becoming cheaper. Some of them could become competitive in just two or three years' time. Investors prepared to commit to the longer term can therefore benefit from some very attractive investment opportunities.

Emerging from the crisis stronger and leaner

The long-term growth prospects for renewable energies are still much better than average. This theme is also attracting a lot more attention from international politics, which is why our forecasts for the individual technologies are so upbeat from 2010 onwards, when we anticipate steady growth again. After a period of market consolidation, coupled with cost savings and price adjustments, renewable technologies should soon be able to compete with conventional electricity generation. As a result, renewables will in future definitely see a bigger increase in capacity than their fossil and nuclear rivals, and their market share should steadily grow.

Renewable energies – making a valuable contribution to sustainable development

When making our market forecasts, we assume that most decision-makers agree on the need for more renewable energies in future. The world's population continues to grow, and more and more people require energy. Fossil fuels are running out and the effects of climate change are making themselves felt everywhere. Despite numerous agreements on climate protection, CO_2 emissions have continued to rise in recent years. Renewable energies are the ideal solution to this problem. On many levels – from local to global – they make a vital contribution to sustainable development. Together with more efficient use of energy, they should help to prevent the worst effects of climate change and reduce our dependence on oil, gas, coal and uranium imports.

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