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Feed-in Tariff for Renewable Energy: an effective recovery package without new public borrowing

Updated version, March 2011

Significance of renewable energy in the economic crisis

The financial crisis of 2008 had a devastating impact on the global economy, an impact from which many nations have yet to recover. It is noticeable that two nations in particular – Germany and China – were able to overcome the financial crisis relatively quickly. Both countries place strong emphasis on the development of renewable energy sources. There are two reasons for this: on the one hand, investments in renewables have significant employment effects; on the other, the use of energy from renewable sources reduces the high and ever more sharply rising cost of purchasing fossil and nuclear fuels.

Practically all the world's governments are still attempting to support their economies with recovery packages in order to avert high levels of unemployment and the social disruption that would accompany them. Almost everywhere, these recovery packages are being financed from tax revenues. In the majority of cases, the financial resources required are greater than the receipts flowing into the public coffers, with the result that public borrowing is rising rapidly. This dangerous development will impose a heavy burden on future generations, because they will have to pay back the debts that are being run up today.

Recovery packages that do not require the commitment of public financial resources receive scarcely any attention in the public debate or even the policymaking process, yet measures of this kind provide an incentive for investment from the private sector. Private capital can come either from financial funds or from the general public – through cooperatives, for example. Both sources of funding can provide large volumes of finance and help ensure that necessary investments are made in a difficult economic situation. By taking targeted regulatory measures in the markets, governments and parliaments can encourage private investments and so put in place recovery packages to invigorate the economy without incurring new debts.

If these regulatory measures are seen in connection with the need to tackle other crises, they can simultaneously be used to address a range of problems with which society is confronted. Important objectives that could be pursued include curbing cli-

mate change and securing energy supplies, which will both be practicable only if we make the transition to renewable energy. It would also be possible to take action in other fields, such as preventive health care, which could be decisively promoted with clean food from organic farming and the production of non-toxic chemicals.

Since 2000, the Renewable Energy Sources Act (*EEG*) has made it possible for a new sector of the economy to be built up in Germany, namely a renewables industry that is heavily dominated by small and medium-sized enterprises. And this has been done largely without public financial support. Statutory regulation has created hundreds of thousands of jobs without any new debt being incurred, as well as actively combating climate change and laying foundations for the provision of independent, clean energy supplies from domestic sources without fuel costs. The statutory regulatory measures that have been implemented are centred on the principle of a feed-in tariff. Similar forms of statutory regulation are also conceivable to encourage organic farming, zero-emissions mobility or a chemicals industry that is no longer dependent on fossil raw materials such as petroleum.

This brochure describes the basic principles of the Renewable Energy Sources Act, with its feed-in tariffs, and seeks, above all, to place them in the context of the current political debate. It will demonstrate that many of the arguments often used against feed-in tariffs do not hold water. In particular, the economic arguments rooted in free-market theory that are frequently advanced fail to stand up to closer examination. Consequently, compared with subsidies from tax revenue, tendering models or quota arrangements, the feed-in tariff model has been proving itself the superior model for the market introduction of renewable energy in a free competitive market for a number of years.

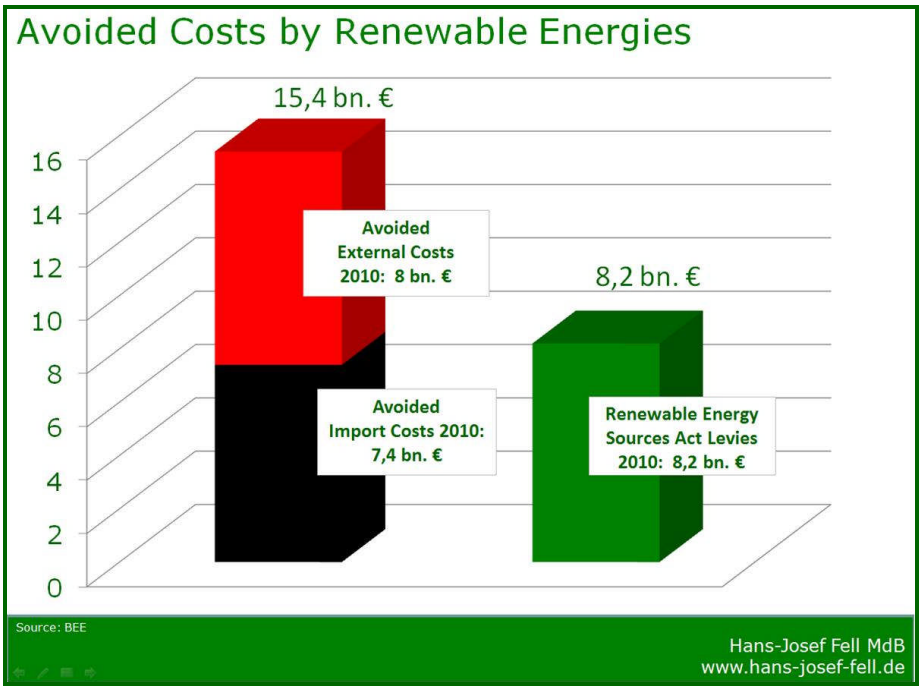
The success of the German Renewable Energy Sources Act

The German Renewable Energy Sources Act is regarded as the world‘s most successful law for the introduction of energy from renewable sources in the power sector. Apart from the power sector, the Act also applies to the heating sector, by virtue of its use of waste heat emitted during the generation of power from bioenergy and geothermal energy. The Renewable Energy Sources Act has given Germany large domestic markets and brought about a dramatic development in innovations in wind energy, solar power, biogas, wood-generated electricity and vegetable-oil-fired district heating plants. In the years to come, similar successes are to be expected in the generation of power from deep geothermal energy, while marine energy will also have a limited impact at a later date. Traditional hydropower has also benefited from the Renewable Energy Sources Act.

By the end of 2010, the Renewable Energy Sources Act had created more than 200,000 jobs without recourse to tax revenue. In total, more than 340,000 jobs have

been created in the renewables industry. This is particularly significant at a time when recovery packages are being adopted in response to the world recession. The Renewable Energy Sources Act is a recovery package that does not involve new public borrowing. It creates incentives for private investment, chiefly with money from the general public, but also with money from financial investors.

The costs for the market introduction of energy from renewables have been considerably lower than in other countries. For instance, the average cost for the generation of power from wind energy in Germany is approximately 7 cents per kilowatt- hour, compared with about 13 cents per kilowatt-hour in the UK, which has far more wind. At the same time, the expenditure avoided in 2010 thanks to the reduced quantities of fossil and nuclear fuels that had to be purchased and the external costs which were avoided amounted to a total of 15.4 billion euros – almost double the additional cost of approximately 8.2 billion euros for the generation of power from renewable energy sources, according to figures from the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. This makes it clear that the financial advantages to the national economy already far outweigh the additional costs arising from the use of renewable energy (renewables levy) in Germany. In the coming years, these extra costs will actually fall, while the savings resulting from the avoidance of fuel expenditure will continue to rise. The significance of these savings is particularly evident in the light of current oil prices.



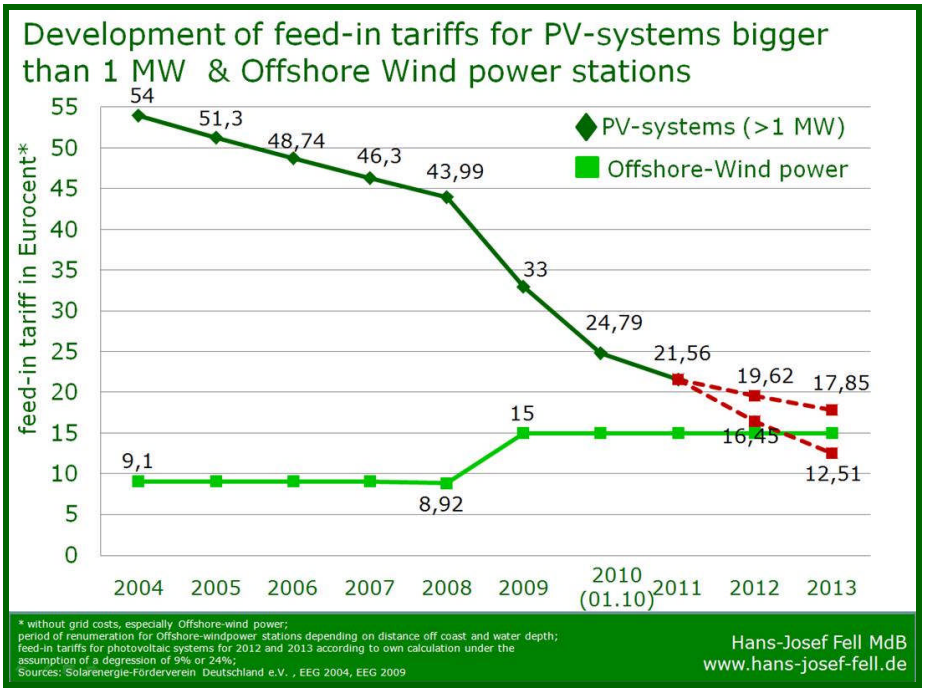
Many observers have been astonished by this development, which has become possible thanks to the principle of a cost-covering feed-in tariff. The feed-in tariffs provided for in the Renewable Energy Sources Act are oriented consistently towards the minimum economic requirements of investors in the generation of power from renewable sources. As a rule, calculations are based on a 7 percent return. It is true that

there are now a great many copies of the successful German legislation, but only a very few have enjoyed long-term success. The basic fact that a certain feed-in tariff is fixed by law is not by any means a guarantee for the functioning market introduction of energy from renewable sources. There are a great many details that have to be right if the desired momentum towards the industrial development of renewable energy is to be generated.

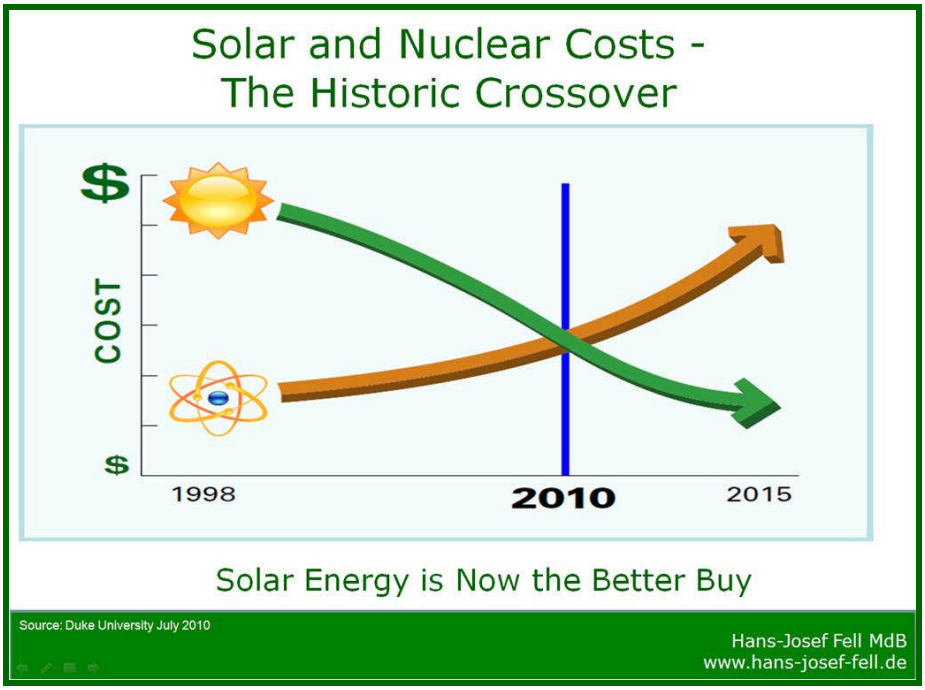
Of course, as well as functioning legislation on feed-in tariffs, further statutory parameters have to be laid down. They should relate, above all, to the way in which the approval of plants for the generation of power from renewable sources is administered. All over the world, there are barriers of various heights to the approval of renewables. Lowering these barriers to approval is just as indispensable for the successful development of renewable energy as a functioning feed-in law.

Rapid cuts in German feed-in tariffs for solar power

Numerous critical headlines have been written by the world's press about the German legislation reducing feed-in tariffs for solar installations. The allegedly excessive cost of these payments has been presented as an unduly heavy burden on electricity customers which necessitated deep cuts in subsidisation rates. These assertions are being made by electricity companies, which continue to pursue their active opposition to the Renewable Energy Sources Act. Such assertions, however, are completely divorced from reality. The legislature has indeed enacted a sharp reduction in photovoltaic subsidies, which will take effect in the middle of this year. The real reason for this reduction, however, is the spectacular rapid fall in production costs in the field of photovoltaics.



The chart shows the feed-in tariffs set by the legislature for large solar roof installations over the past few years. If the market continues its rapid development, the solar feed-in tariff will be down to 12.51 cents per kWh by 2013 and so will already have fallen below the tariff for offshore wind farms in Germany. The plummeting payment rates in Germany for solar energy reflect outstanding success in cutting production costs, which scarcely anyone would have believed possible only a few years ago. In the coming years, the cost of generating electricity from solar power will continue to decline rapidly and will fall well below the generation costs for new nuclear plants. A study conducted by Duke University in the United States has illustrated this point very convincingly.



Unwarranted increases in electricity prices

In the last few weeks of 2010, some 400 of the 1,000 or so energy companies operating in Germany announced an increase in electricity prices for the turn of the year. In most cases, the reason given for this increase was the rise in the additional cost of renewable energy in the form of an increase in the renewables levy, which would see the levy rise in 2011 by 1.48 cents from 2.05 cents to 3.53 cents per kilowatt-hour (kWh).

This means, however, that households' electricity prices are rising even though electricity providers' purchase prices are falling.

More and more electricity is being generated from renewables, which accounted for about 17.4 percent of all grid inputs in 2010. As the President of the Federal Network Agency (*Bundesnetzagentur*) and others have pointed out, this is forcing increasing

numbers of expensive power stations out of the market, which in turn drives down wholesale prices.
Between 2008 and 2010, the Federal Statistical Office's producer price index for electricity, which shows the development of input prices, revealed a decrease from an index number of 163.8 to 130.5. This represents a price decrease of about 20 percent over the last two years.
By contrast, electricity prices have continued to rise. In 2008, an average household consuming 4,000 kWh was paying about 850 euros. By 2010 the bill for the same consumption had already risen to 920 euros. That is an average increase of eight per cent.

Purchase prices on the energy exchange have even fallen.

Since 2008, according to Phelix Baseload Year Futures for 2011, electricity prices on the energy exchange have fallen from an average of 7.1 cents per kWh to the present level of 5.1 cents per kWh. Shrewd energy suppliers buy in electricity when it is cheap rather than when the purchase price is high, which gives them a margin of up to two cents per kilowatt-hour for price cuts. Set against an increase of 1.5 cents per kWh in the renewables levy, this leaves them with a net price-cutting potential of up to 0.5 cents per kilowatt-hour of electricity.

When power providers cite the renewables levy as reason for increasing their electricity prices, this indicates either that they bought their supplies when the price was too high or that they want to make extra profits. In either event the rise in the renewables levy provides a welcome excuse for price increases.

Since the profits of the big three electricity companies in Germany rose last year from 23 billion to about 30 billion euros, it is obvious that the increases in electricity prices are not due to the higher cost of energy from renewables but to the higher profit expectations of the nuclear and coal conglomerates.

Demand-side innovation policy breaking the vicious circle of obstacles to innovation

Innovations are accurately regarded as providing opportunities to take up new economic activities and create new jobs. They therefore make an indispensable contribution to economic development.

Normally, the translation of promising research results into marketable products cannot succeed of its own accord but requires the right statutory conditions. During the 1980s and 1990s, research delivered many promising innovations in the field of renewable energy. However, support for research alone, even with generous research budgets, is not enough to translate researchers' initial successes into marketable products. There is usually a need for very large volumes of investment in order to finance the first factories and continually improve products by optimising them techni-

cally. Ongoing high levels of capital investment are also required once market introduction has begun in order to expand the diversity of products on offer and increase the output of those products. As further investments are made, the initially high unit costs begin to fall. Every expansion of large-scale manufacturing helps to bring down the cost of generating power.

However, financial investors will only provide these large quantities of capital if they can be reasonably sure that the products from the factories manufacturing renewable-energy systems will actually find a market as well. Only then will they be able to recoup their investments.

Strong, adequate support for research is needed so that initial developments and pilot projects can be carried out. Research support alone, however, does not go far enough. What is decisive is the transfer of laboratory results to production. But this is only possible if the product is actually produced in large quantities too. Nevertheless, production requires demand, and demand needs a market. It is imperative, and therefore a matter for politicians, to create the right basic conditions for the introduction of these products into the market. Only then innovations will actually be translated into products, and only then can research results also invigorate the economy and create new jobs.

What is more, active measures to introduce renewables into the market help to boost research. If firms begin to make profits with innovations, they will then reinvest some of these profits in research as they seek to establish a lead in the competition to supply the best products. For instance, German companies are now ploughing twice as much money into photovoltaics research as the public sector is making available. In consequence, the whole research budget for solar power would be significantly smaller if research were solely financed by public funding. It was only when solar power was introduced into the market with the aid of the Renewable Energy Sources Act that research in this area really started to take off in Germany. A prime example is the Institute for Solar Energy Systems (*ISE*) in Freiburg, a world leader in a field that has been experiencing constant growth. It depends far more on commercial research commissions than public research funding. The extraordinarily successful growth of the ISE and other research institutions that are working on renewable energy sources is also a success for the Renewable Energy Sources Act.
The Renewable Energy Sources Act is therefore a very successful piece of legislation, not just for the effective introduction of renewables into the market but also for the promotion of research and development in the field of renewable energy, inseparably connected as these activities are with market processes.

A vicious circle had developed over a number of decades, in that it was possible for the promising research results from the first wind turbines, solar installations and biogas plants to be applied at a few pilot plants, but the cost of generating power at these facilities was far too high in comparison with the conventional generation of power. Renewables have one great advantage – the avoidance of external costs

arising from damage to the environment – but they were unable to exploit this advantage in the marketplace, because the external costs arising from the conventional generation of power were not actually included in the price of power but were met from tax revenues – if at all. This meant that a buyers' market could not develop, and the absence of a buyers' market was the reason for the lack of investment in factories. So the investment costs for renewable energy did not fall. The result of this vicious circle was that energy from renewable sources was not reaching the market.

The most successful approaches used to overcome vicious circles of this kind within a market economy can be summed up as demand-side innovation policies. These are understood as policy measures that create incentives for customers to purchase products which are innovative but initially too expensive. This is most frequently done using state subsidies. However, subsidies have many disadvantages, which are described in greater detail elsewhere in this brochure. The introduction of cost-covering compensation resolves the problem. The law guarantees anyone who invests in the generation of power from renewable sources a feed-in tariff, which is set at a high enough level to ensure that the investment can be recouped at a good rate of interest within a few years or decades.

As a result, the demand for the technologies in question rises by leaps and bounds. To the extent that the statutory parameters allow the development of a dependable buyers' market over many years, money now flows into the construction of factories as well. Consequently, the potential for cost reductions offered by large-scale manufacturing and product improvements may be continuously exploited to the full. Whenever costs fall, state support can be cut, while customer numbers increase at the same time.

The goal is to make government price regulation superfluous. As soon as their technical costs are so low that renewable-energy technologies are able to hold their own unaided in the energy market, the regulation of prices by the state is no longer necessary. This can be done all the more rapidly the more external costs are factored into the price of conventionally generated power as well. The process can be accelerated with an ecotax on conventional power, from which eco power has to be exempted.

Since not all types of renewable energy have seen the same amounts of innovation, there must be variations in the levels of feed-in tariffs. It is also likely that the legislation will have to apply to different parts of the market for varying lengths of time. Today, solar power requires higher levels of compensation than wind power, which entered the German market about ten years earlier, and statutory compensation will probably have to be paid for solar installations longer than for other kinds of facility.

First tentative beginnings of feed-in tariffs in Germany

Application of the principle that the feed-in tariff should cover investors' costs first became possible in Germany in 1990, when the Electricity Feed-In Act (*Stromeinspeisungsgesetz*) made such a provision for coastal wind power. Together with the tax subsidies available under the 500-MW Wind Programme, the payment, under the Electricity Feed-In Act, of compensation amounting to 90 percent of the average price of power allowed profits to be made from coastal wind power as well as small-scale hydropower plants. Inland wind power and solar power also received the same compensation, but it was too low for economic investment, which was why the Electricity Feed-In Act of 1990 was unable to build any momentum in these fields. The same applied for biogas, which actually received just 65 percent of the average price of power as compensation. Geothermal heat was not even mentioned in the Electricity Feed-In Act.

Cost-covering compensation for solar power was offered for the first time in 1993 as a result of local decisions in Hammelburg, Freising and Aachen. In the years that followed, the brave example of these three local authorities was copied by many German towns and cities and led to the evolution of a successful model for the market introduction of solar power. In Germany, initiatives for feed-in models therefore sprang up first at the municipal and regional levels before the corresponding legislation – the Renewable Energy Sources Act – was ultimately enacted at the federal level in 2000.

Then, in 2001, the European Renewables Directive opened up a free choice of funding instruments, making it possible for the fundamental principle of feed-in tariffs to be applied within the framework of European legislation.

In 1999, the Bundestag office of Hans-Josef Fell moulded the successful model of cost-covering compensation for solar power that had been implemented at the municipal level into a draft bill intended to cover all the renewable energy sources used to generate power. The successful negotiations between the Social Democratic Party of Germany (SPD) and Alliance 90/The Greens parliamentary groups were led by four Members of the German Bundestag – Hermann Scheer and Dietmar Schütz for the SPD and Michaele Hustedt and Hans-Josef Fell for the Greens. In April 2000, the Renewable Energy Sources Act was then passed by the German Bundestag with a majority by the SPD and Alliance 90/The Greens.

What is provided for in the Renewable Energy Sources Act?

Regulation of the interactions between private market participants

With the Renewable Energy Sources Act, the legislature regulates business relations between the generators of power from renewable sources, the operators of the power grid and power customers. The Renewable Energy Sources Act creates a basis for generators of eco power to achieve economic profitability in the power 'market' and actually gain access to the grid in the first place.
The Renewable Energy Sources Act is therefore a regulatory measure that gives generators of eco power an opportunity to make investments. It is neither a guarantee of profits from eco power nor an inadmissible intervention in a competitive market.

The power market, as it is constituted in Germany and many other countries, is not really a market, but a monopolistic industry dominated by a few energy companies with identical interests. At the same time, in many countries, including Germany until 2009, the grid operators also possess almost 90 percent of total power-generation capacity, at least at the ultra-high voltage level. The energy companies have no interest in seeing competition from other generators grow. In many cases, they are using their dominance of the market to block access to the grid for other power generators, while themselves hardly investing in new ways of generating power from renewable energy sources. It is certainly the case that only a very small percentage of investment in renewables in Germany is made by the established energy companies. On the contrary, capital is mostly provided by private individuals through community schemes, cooperatives and small-scale energy suppliers.

The grid operators' attempts to block new power generators may be understandable from their point of view as private businesses but are not acceptable from the perspective of the economy as a whole. Viewed with the interests of society in mind, functioning competition and the expansion of renewables for reasons of climate protection are essential to the provision of services of general interest. This is why the legislature must act in order to prevent the grid operators from blocking feed-in arrangements.

The privileged grid access for which the Renewable Energy Sources Act provides has been successful in breaking down barriers to grid access. Nevertheless, despite the privileged grid access for eco-power generators under the Act, many grid operators continue to find plenty of bogus or real arguments to obstruct access to the grid. The clearing centre established under the Renewable Energy Sources Act therefore has the task of mediating disputes that arise between grid operators and eco-power generators.

As mentioned above, the big energy companies have no interest in generating large volumes of power from renewable sources themselves. Firstly, the generation of power from conventional power plants would rapidly become uneconomical for them, because the new power-generation capacities would cause old, fully amortised plants to cut output or even be decommissioned. This might serve the climate and the environment but not the economic interests of the big power generators.

Secondly, if they were to support an increasingly decentralised expansion of the generation of eco power, they would run the risk of destroying their own natural monopolistic structure, in which power is produced solely by large generating units. Both considerations have led the big energy companies to only make marginal investments in renewable energy sources.

In order to remove these barriers, the state has to intervene with regulatory measures, for otherwise it will not be possible to meet climate-protection targets or implement the phasing-out of nuclear energy, an aim that is desired by German society and has been enshrined in legislation. State regulation of eco power – as established by the Renewable Energy Sources Act – is therefore indispensable to the achievement of socially desirable objectives and the provision of services of general interest.

Superiority of the Renewable Energy Sources Act in the power market

State regulation versus the ‘free market’

One argument frequently put forward against feed-in tariffs is that guaranteed feed-in tariffs are incompatible with the workings of a competitive market. This point of view is frequently articulated by economists, who often give the fundamental concepts of the free market precedence over all other necessities, such as climate protection. In this respect, these economists overlook the point that the power market is usually not a free market at all but, as in Germany, a quasi-monopoly which essentially benefits the interests of the major energy companies. In other countries too, the power sector is mostly dominated by a few conglomerates or even state monopolies. Generally, as indicated above, feed-in tariffs merely help to ensure that new actors get the opportunity to find their feet in the power market. A functioning competitive market thrives on a diversity of suppliers. In practice, this diversity does not exist anywhere in the world. The Renewable Energy Sources Act has created conditions that are enabling new actors in the generation business to actually establish themselves in the face of the economic power of the oligopoly. Furthermore, elements of price regulation have a long tradition in various power markets and do not, in principle, conflict with competition. It makes no difference whether the legislature sets the price and the market regulates the volume (feed-in model), or the legislature sets the volume and the mar-

ket regulates the price (quota model). In both cases, there is an intervention in the market, and in both cases this is compatible with market principles. However, there are considerable differences in the effectiveness of these instruments. Feed-in models have proved their superiority to quota models.

So anyone who is striving to achieve the aim of a competitive market in the power sector must start by creating new actors in order to break the anti-competitive dominance of the market by the major groups. State regulation of the kind provided for by the Renewable Energy Sources Act is laying the foundations for the competitive market of the future. Most people who reject state regulation of this kind today because it interferes with a supposedly free power market are not really concerned with competition but with protecting the position of energy companies that act as monopolists.

Exclusion of external costs from the price of conventional power

There are also other reasons why the current 'power market' is not a functioning market. The external costs in terms of damage done to the environment by the conventional generation of power are not reflected in the price of power but are met from general tax revenues, if at all. Many of these external costs are not even quantifiable and therefore cannot be met as such. Examples include the potential damage that would be caused by the accidental meltdown of a nuclear reactor core or the huge amounts of damage that are to be expected or are already occurring as a result of global warming, driven as it is by the use of fossil fuels. The 40 billion euros of research subsidies for nuclear energy paid in Germany from tax revenues in the last few decades have also been subsidising the price of nuclear power.

Direct subsidies for conventional energy sources also distort the market balance by using tax revenue to lower electricity prices artificially for consumers. Electricity consumers, however, do not really benefit, because they themselves fund the apparent reduction in electricity and energy prices with the tax they pay. Throughout the world, subsidies for renewables tend to be considerably lower than subsidies for fossil fuels and nuclear energy. The International Energy Agency (IEA) in Paris, for example, estimated global subsidies for fossil fuels in 2009 at 312 billion US dollars, whereas renewables were subsidised to the tune of only $57bn. This clearly refutes the widely expressed view that renewables are highly subsidised. On the contrary, if subsidies for fossil fuels and nuclear energy were scrapped, most renewables would immediately become competitive.

The additional costs imposed on power customers by the feed-in tariff for renewable energy are far below the external costs arising from the conventional generation of power. They are necessary simply to balance these external costs in the national accounts. It is therefore essential for the additional costs arising from the use of renewables to be passed on to end customers if a functioning market is to be established.

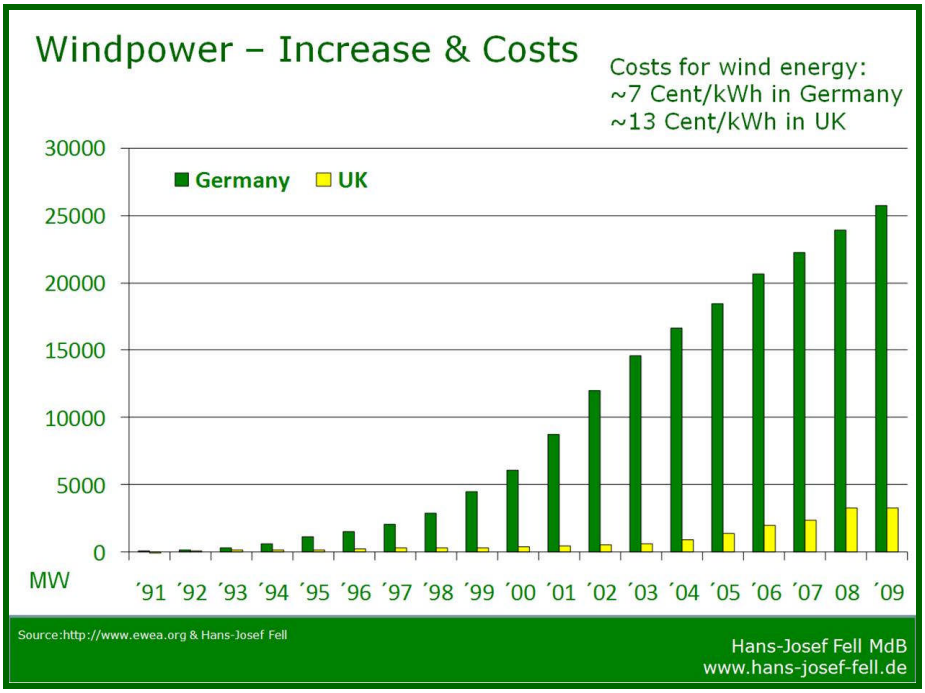
Originally, the idea of a system in which costs would be passed on to customers was motivated by the need to comply with the state-aid requirements of the EU, as funding from taxation could have led to conflicts with the relevant EU legislation. Furthermore, in a landmark judgment delivered in 2001, the European Court of Justice ruled that well-structured feed-in tariffs do not represent state aid but are justified as a counterweight to the external costs that are not factored into pricing. A feed-in tariff is therefore not a subsidy.

Nicholas Stern has described climate change as a result of the greatest market failure the world has seen. The compensation rates for renewables offer an unmissable opportunity to rectify this very market failure. They therefore also form the basis for a transition to a functioning competitive power market.

Quota and tendering models

Advocates of markets driven by competition frequently reject feed-in tariffs with the argument that it is better to define precisely the volumes of green electricity that should be generated by means of tendering or quota models. In tendering processes, the providers with the lowest costs win contracts to produce power. Under quota models, the level of compensation depends on the price of power and the price of the certificates producers have to purchase. This very dependence, however, creates a great deal of economic insecurity for the generators. Quota and tendering models are mostly introduced when the state sets an upper limit on the expansion of renewable energy sources. It is then a question of how these volumes are to be produced at the lowest possible cost.

Experience shows that such models achieve the complete opposite. For instance, the UK has been operating a quota model since 2002, with the result that a kilowatt-hour of wind power costs roughly 0.13 Euros in the UK, whereas in Germany it only costs about 0.07 Euros per kilowatt hour. Despite its fundamentally better wind conditions, the UK has only succeeded in expanding its production of wind energy by approximately one tenth of the amount achieved by the German wind-power industry. The British quota model is therefore less efficient, more expensive and less successful than the German Renewable Energy Sources Act.
The failure of the British model indicates that feed-in tariffs are not just more successful and more cost-effective but also make for more market activity than quota systems.



Tendering processes, state decisions

Tendering processes are regarded as good methods of reducing costs through competition. This was the rationale behind the tendering processes organised by the UK Government until 2002 in order to lower the cost of investing in renewable energy. Such state tendering processes are frequently described as more in keeping with market requirements and more efficient than guaranteed feed-in tariffs. But the complete opposite is the case.

The fact that tendering processes also take place under the Renewable Energy Sources Act in Germany is often overlooked – although they are not administered by the public sector, but by the project operators responsible for eco-power plants. Feed-in tariffs only limit the pressure of competition between electricity sellers. Competition continues to take place at all other levels, for instance between planners and between plant manufacturers. Unlike civil servants, they bear commercial risk, which is why they generally issue calls for tenders and select bids with greater care. They use their tendering processes and purchasing decisions to find the provider that offers the best cost-benefit ratio. This is therefore a decisive factor in innovation. It fosters competition between the suppliers of eco-power systems as they seek to offer the best technologies. Poor suppliers fall by the wayside, whereas innovative technology manufacturers enjoy business success.

The large number of tendering processes conducted in a competition-driven market based on a feed-in tariff underlies the success of the Renewable Energy Sources Act and explains the high degree of innovativeness this legislation has inspired.

By contrast, the monopolistic tendering process administered by state actors and monopolistic corporations in a quota or tendering system is anti-competitive. The results are bureaucratic nannying and criteria decided by the state instead of the free play of market forces.

Diversity of actors and not just conventional groups

It is typical that only a few companies were able to take part in the state tendering processes in the UK – and what is more that they were mostly large conglomerates. Consequently, it has not been possible for the UK to develop a diverse structure of small and medium-sized enterprises of the kind that is the driving force for the development of innovations in Germany. As a result, the Renewable Energy Sources Act has also brought about the development of a highly diverse set of actors. Many new businesses have been founded. This is due, in particular, to the fact that all the participants in the market have been able to obtain the loans needed to finance their projects on account of the high degree of security for investors offered by rates of compensation that are set for 20 years. The catalyst has often been an exciting technological idea, which has then prompted more and more new innovations. It is indicative that hardly any of these innovations have come from the groups of companies involved in established energy technologies, but from a large number of newly established small and medium-sized enterprises. Since 2000, Siemens, a leading player in energy technologies, has contributed almost nothing to the development of innovations in the field of renewables off its own bat.

A functioning, innovative competitive market for technology providers can therefore develop best where there is functioning feed-in tariff and not under tendering or quota models.

Red tape

Quota and tendering models are associated with a great deal of red tape. If funding comes from state subsidies, it has to be demonstrated to taxpayers that their money is being spent sensibly and effectively. This results in the imposition of a large number of technical and economic conditions, which have to be first specified then checked once the construction work is complete. In consequence, voluminous ring binders fill up with documents on the requirements to be met and the checks that are carried out to verify compliance. In addition, there is the bureaucracy of planning permission.

Under the Renewable Energy Sources Act, the state leaves the action taken up to the participants in the market, thus reducing bureaucracy to the requirements of planning permission and technical safety. In order to ensure that the grid operators do not generate too much red tape of their own, the legislature has even laid down in the Renewable Energy Sources Act that a feed-in contract is not a compulsory requirement. The grid operators must pay the compensation that is due as soon as

power from renewable sources is fed into the power grid. The removal of the need for a feed-in contract has ensured that grid operators cannot erect unduly high bureaucratic hurdles. Since the German grid operators and power generators belong to the same corporations, many grid operators had been trying to prevent investment in renewable energy by wrapping up feed-in contracts in masses of red tape. In this respect too, the lean bureaucracy of the Renewable Energy Sources Act has been an important driving force for the rapid expansion of renewables in Germany.

Compensation secures non-bureaucratic CO_2-free power production over 20 years

Anyone who builds a plant to generate power under the Renewable Energy Sources Act will always be anxious to make sure that power is being produced optimally. An operator that fails to feed in power or only supplies small quantities from poorly running systems will either have no compensation paid out to it at all or only receive a reduced level of revenue. This curtails or wipes out the return on investment. Plant operators themselves are therefore keen to ensure that their system is in excellent condition and produces power.

Where plants have been subsidised with public tax revenues, the state has to go to great bureaucratic lengths to check that these plants actually produce CO_2-free power in subsequent years. Once the subsidy has been received, plant operators no longer have any economic incentive to maintain and constantly optimise their facility. There are enough examples of solar installations or wind farms that had been built with large amounts of public money but were no longer producing any power a few years later. Once the subsidy had been received, no one devoted enough attention to these facilities. Only a statutorily guaranteed feed-in tariff offers any assurance that a plant will be operated for many years. This means that feed-in models are usually superior to other price-based funding mechanisms, such as investment grants.

Apart from this, statutorily guaranteed feed-in tariffs are not automatically to be equated with guaranteed returns, as is often mistakenly claimed. A return is only assured if a sufficient commitment is made to the business.
In spite of the guaranteed feed-in tariff, it is still necessary to manage normal commercial risks. Anyone who purchases a poor-quality plant at too high a price will hardly be able to expect a return, and the same goes for any operators who do not maintain their own plant properly.
The statutorily guaranteed feed-in tariff offers only the basis for a return on investment but not by any means a guarantee.

Maximum targets and quotas as brakes on expansion

The setting of quotas or maximum targets for a particular period is a popular policy instrument that is supposed to promote activities in the renewables sector.

However, maximum targets are usually set in order to restrict the expansion of renewables and ensure that the prospects for investments in conventional energy sources remain bright. In reality, maximum targets, especially if they are set at low levels, are mechanisms that protect investments in fossil and nuclear energy generation and are certainly not an effective instrument for the expansion of renewable energy.

The situation appears more complex when it comes to minimum targets. At present, the most significant and familiar target is probably that of producing 20 percent of the EU's power from renewable sources by 2020. This target is praised as ambitious in all official statements. Yet hardly anyone has examined whether it really is ambitious, e.g. in comparison with what could be done by a renewables industry that was able to develop under optimal, rather than restrictive, policy conditions. There is much to suggest that considerably more than 20 percent of the EU's power demand will be met from renewables by 2020, firstly because the rising prices and increasingly short supplies of conventional energy resources will accelerate the expansion of renewable energy. Secondly, the cost of renewable energy technologies is falling, which is also boosting their expansion. Anyone who has ever looked at the speed with which sales of personal computers, mobile telephones and flat-screen televisions have grown will not find it difficult to recognise that 20 percent renewables by 2020 is a very unambitious target. Why should manufacturers of solar installations, wind turbines or biogas plants not be able to write success stories similar to those of Nokia and Dell? Examples from other branches of industry suggest it is not very ambitious to aim at a 20 percent market share for renewable energy in the EU by 2020. This target will be exceeded with ease.

However, since most political office-holders in the EU regard 20 percent renewables by 2020 as very ambitious, their work in the energy sector is focused, above all, on securing energy supplies from conventional sources, and they are consequently neglecting the political options for the expansion of renewable energy. This being the case, the EU target is acting as an obstacle to expansion, although it is, of course, a target that could actually be exceeded. If targets are not to inhibit, they must be very ambitious minimum targets. The most ambitious target would be 100 percent energy supply from renewable sources. The EU's 20 percent target is not an ambitious target and consequently supports investment in power generation from fossil fuels and nuclear energy more than investment in renewables.

It is well known that there are only a few countries in the EU that have created good political conditions for the expansion of renewables. Even if many EU countries have feed-in laws, this does not mean that such laws are effective – not by a long way. Individual details of the laws can be drafted in such a way as to make them ineffective. There are also many problems in the legislation on approval procedures that hinder the expansion of renewable energy. If we continue to accept these obstacles, it may indeed appear ambitious to achieve 20 percent renewables by 2020. In particular, such targets will be branded ambitious by those who do not want to eliminate

the political restrictions on renewable energy because they wish to protect the position of conventional energy sources.

Furthermore, in this respect emphasis is often placed on the argument that, if just 20 percent of our power consumption comes from renewables, we shall still need to meet 80 percent of our needs with fossil fuels and nuclear power, which then helps to legitimise decisions that leave the focus of energy policy on conventional sources. The numerous forms of support for nuclear energy provided through Euratom, for the oil and gas industries and for new pipelines and diversification schemes are proof of this, just as much as the sudden upsurges in support for new coal-fired power stations.

Quotas set in legislation and tendering processes act as brakes on expansion even more than inadequate political targets. Since the supports for investment only apply to the volume of power produced from renewable sources below the quota, it is clear that no momentum can be built up to exceed the quota once the target associated with the quota is achieved, the price of certificates falls to zero, and any investment is halted. Setting a low quota is therefore a perfect way of protecting the position of the old energy sources, even though the quota is actually intended to promote the development of renewable energy.

The advantages of independence from tax revenues

Freedom from subsidies

One decisive factor in the success of the German Renewable Energy Sources Act is the fact that no taxpayers' money of any kind is spent to finance investments. The compensation provided for in the Renewable Energy Sources Act therefore does not represent a form of subsidy, even if this is often mistakenly claimed. The feed-in tariffs are funded by a modest increase in the power tariffs for all power customers. In exchange, as a *quid pro quo*, power customers know that a proportion of the power they purchase, equivalent to the average share of production under the Federal German Renewable Energy Sources Act, comes from CO_2-free renewables. Since no taxpayers' money is involved, this avoids the risk of changes being made to funding conditions in times of economic hardship for purposes such as easing pressure on the public budget.

In a widely publicised judgment, the European Court of Justice ruled in 2001 that feed-in tariffs do not constitute state aid within the meaning of the European state-aid directives. At the European level, subsidies funded by taxpayers' money are deemed to be state aid. This ruling made it clear that the feed-in tariffs paid in Germany under the Renewable Energy Sources Act are not a form of subsidy, even though the legislature has made it a compulsory requirement. Furthermore, the definition of *Subven-*

tion (‘subsidy’) in *Duden* (the most authoritative German dictionary) makes it clear that feed-in models are not subsidies: according to *Duden*, a subsidy is ‘(financial) support from public funds provided for a specific purpose; state grant’. Nor does the Subsidies Report of the Federal Government mention the statutory renewables levy – further evidence that it is not actually a subsidy.

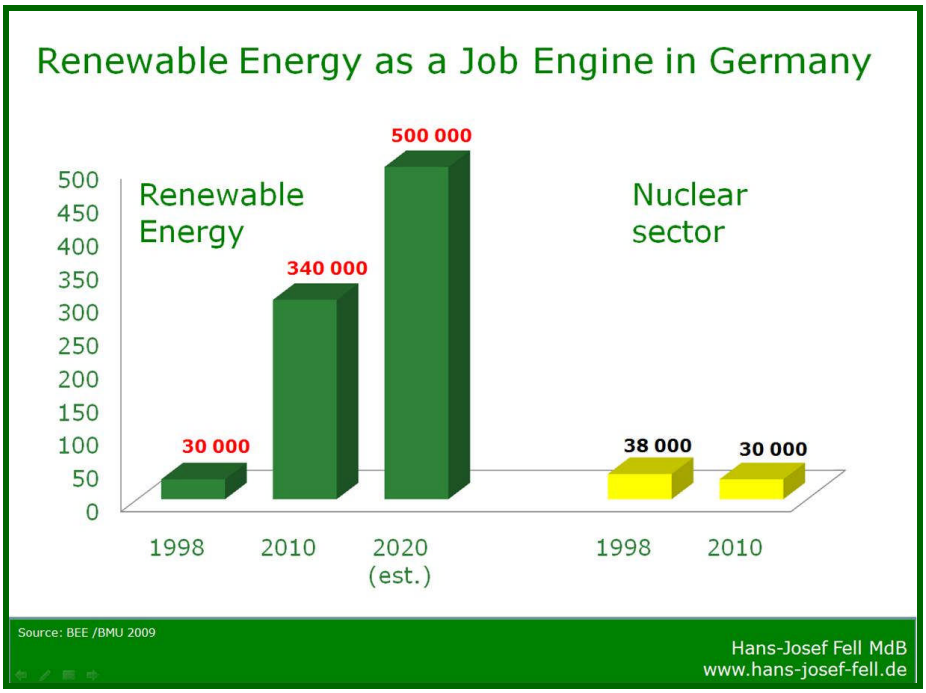
Independence from annual budgetary decisions

Independence from tax revenues is indispensable to the success of a feed-in law. Feed-in tariffs that are funded by taxpayers’ money are subject to annual budgetary decisions. Above all, if the feed-in law is successful, the financial resources it requires will increase. Every finance minister will then attempt to curb the rise in expenditure, either by reducing the feed-in tariffs or by setting an upper limit on the number of plants to be installed. This means that manufacturers will be unable to make any reliable calculations about their sales markets over a period of several years. They will have to reckon with ‘stop-and-go’ changes in demand every year, which will drastically diminish their willingness to invest in new manufacturing facilities.

This has just happened in Spain, where the feed-in tariffs have been partially financed from tax revenues and, moreover, excessively high feed-in tariffs have been paid out. The great success of the Spanish solar market in 2008 led to high public expenditure and a change in the law at the end of 2008 that drastically restricted the volume of the market. The Spanish photovoltaic market has collapsed dramatically as a result, and 20,000 jobs were lost in the course of a single year. It has not been possible for any large-scale industrial production of photovoltaic systems to develop in Spain on account of the fear and expectation that precisely this would happen. The situation has been quite different in Germany, where a feed-in tariff that does not require payments from tax revenue has facilitated the steady development of the market over the years and therefore fostered the expansion of industrial manufacturing facilities.

The Renewable Energy Sources Act: a recovery package without new public borrowing

The global economic crisis is prompting the adoption of recovery packages in countries all over the world. Wherever one looks, these packages are associated with high government spending, which is driving up levels of public borrowing alarmingly. Laws on feed-in tariffs that do not require the commitment of tax revenues are the best recovery packages and can be implemented without new public borrowing. They are financed with private capital rather than taxpayers’ money. In Germany, the Renewable Energy Sources Act has created more than 250,000 jobs in just a few years. In 1998, only about 30,000 people were employed in the whole German renewables industry, but at the beginning of 2011 the country had about 340,000 people earning their livelihoods producing and operating renewable-energy systems. By way of comparison, 80,000 people were working in German coal mining in 2010.



Keys to effective legislation for the introduction of renewables into the power market with the aid of feed-in tariffs

Functioning renewables legislation must be acceptable to the most diverse interest groups in society and offer investors dependable conditions for investment. We shall now discuss these fundamental preconditions as they relate to the various interest groups that have to be considered:

Investors in the production of eco power

Private capital is available in large quantities, but investors can be reluctant to commit themselves. Private capital is only invested if a return is to be expected. For this reason, the legislature must choose the parameters to be laid down by feed-in legislation in such a way that returns can be earned. The return does not have to be extremely high, but merely comparable with conventional, safe bank deposits. In the Renewable Energy Sources Act, the legislature allows for a target return of approximately 5 percent to 7 percent . Significantly higher returns were not desired because the extra costs to be passed on would push up the price of power too far. If returns were too low, this would lead to investments hardly being made any more. Given a fair regulatory framework, i.e. identical levels of compensation for all, astute businesses can certainly increase their returns above the average as well. This, too, is a driving force for competition and innovative developments.

Unduly high compensation rates also encourage the legislature to tinker with the law in such a way that might render it ineffectual. Such a risk is particularly high if the old electricity conglomerates with their interest in nuclear and coal-fired power generation are able to exert a great deal of influence on politicians. This can occur quite often after a change of government. One such example is the Czech Republic, where a very successful law with slightly overgenerous compensation rates was revised at the end of 2010 after a change of government, resulting in a sharp dip in the development curve. Excessively high compensation rates were also a factor in Spain, where the market in solar power came close to collapse following the amendment of the relevant legislation.

The following marginal conditions must be adjusted correctly in order for private capital to be invested: the level of compensation, the length of the compensation period, privileged grid access and provisions concerning grid-connection conditions and grid expansion.

Level of compensation

In view of the fact that there are variations between the individual renewables technologies as far as the costs of generating power are concerned, differentiated compensation rates must also be set by a feed-in law. They should depend on the way in which green electricity is generated, the capacity of the plant in kW and meteorological conditions. The legislature in each country should examine precisely what levels of compensation are appropriate in that part of the world. Rates may vary a great deal according to wage costs and meteorological conditions. What is important, more than anything else, is that they do not slip below the threshold at which investors start to receive a return. At the same time, the compensation rates should not be set too high, otherwise windfall gains would be earned, and the legislation would be endangered by excessively high costs.
The compensation rates are calculated using microeconomic computational models that essentially factor in the following parameters: investment costs, including the costs for the grid connection that is required, operating costs, capital costs such as interest and redemption payments, tax write-offs and certain other outgoings.

The compensation for the power fed into the public grid from renewable-energy plants is described as cost-covering if such plants earn an appropriate return on the invested capital after, for example, 20 years, assuming that they are operated rationally and efficiently from a technical point of view. It must be possible for this return to be earned after the following costs have been paid:

- costs for the plant, its installation and its connection to the grid;
- all operating costs, including metering costs, maintenance costs, repair costs, insurance costs, wage costs and the cost of raw materials where biomass is used;
- capital-procurement costs (interest charges).

The return should correspond to the return that can be obtained from other forms of investment, so that investment in plants that generate power from renewable sources is worthwhile from a financial point of view.

A component known as a bonus is added to the compensation rate in order to offer special incentives, for example for innovations or the use of agricultural raw materials.

As far as certain renewable energy sources, such as bioenergy or geothermal energy, are concerned, it makes sense to pay a higher level of compensation for smaller plants than for large plants. This is expedient, on the one hand, where the cost of generating power is higher at small plants and, on the other hand, when there are good reasons for building smaller plants as well as larger ones.
In this case, it is important to draft the law in such a way that the larger plant also profits from the better compensation for the smaller plant – up to the limit set for the higher feed-in tariff. For example, if a one-megawatt plant receives compensation of 8 euro cents under the Act while a smaller plant of up to 500 kW receives 10 cents in compensation, the *de facto* result is a combined compensation rate for the larger plant of 50 percent at 8 cents and 50 percent at 10 cents. This gives an overall compensation rate of 9 cents at that specific plant. If the Act were not structured in this way, the differentials between the facilities would be too great, and plant operators would become very inventive at building only small plants, which would unnecessarily drive up the cost of compensation.

A number of examples of feed-in tariffs paid in Germany in 2009 under the current Renewable Energy Sources Act are given below. These levels of compensation are broken down by method of power generation, although only a few sample compensation rates are picked out. The actual figures are considerably more complicated.

Wind

The following levels of compensation apply for onshore wind:
As of 2011, an amount of 9.11 cents per kWh is payable for at least five years. After five to 20 years, the compensation is reduced to a basic rate of 4.97 cents per kWh, depending on the wind potential at the location of the wind farm. At poor locations, the period of time for which the higher initial compensation applies is extended.
A considerably higher compensation rate of 13 cents applies for offshore wind farms; it is paid for 12 years and then falls to a basic compensation rate of 3.5 cents. Wind farms connected to the grid by 31 December 2015 will receive a ‘sprinter bonus’ of two cents per kWh.

Solar energy

The compensation levels are differentiated by the size of the plant and range from 21.11 cents per kWh for ground-mounted installations to 28.74 cents per kWh for smaller rooftop installations.

The tariffs paid in Germany are not differentiated on the basis of solar-radiation levels or technology.

Bioenergy

The compensation rates set for bioenergy in the Renewable Energy Sources Act are highly complex. For instance, various bonuses are paid for renewable raw materials and for innovative technologies such as Sterling engines or microgas turbines but also for the use of particular waste materials such as agricultural slurry. Biogas, wood and vegetable oil are the main sources of bioenergy used in power generation.
The basic compensation ranges from 7.71 cents per kWh at plants with a capacity of more than five megawatts to 11.55 euro cents per kWh for small plants up to 150 kW. In addition to this, bonuses are paid, where applicable, for the use of renewable raw materials, the use of waste heat and the deployment of particularly innovative technologies. However, the bonus for renewable raw materials has led to particular problems of definition.

Small-scale hydropower

- Up to 500 kW: 12.67 cents per kWh
- 500 kW to 2 MW: 8.65 cents per kWh
- 2 MW to 5 MW: 7.65 cents per /kWh

Considerably lower compensation rates apply for large-scale hydropower plants over 5 MW.

Geothermal energy

The basic compensation is 10.4 cents per kWh for plants up to 10 MW and 15.84 cents per kWh for larger plants.

Compensation period

Setting compensation levels alone is not enough to facilitate investments of private capital. In some legislative provisions, levels of compensation may be set at an adequate level, but the legislature leaves it open whether this level of compensation will be paid for one or several years. Investors who do not know what level of compensation their wind farm will attract in three years' time are unlikely to invest. The risk would be too great that they would end up being paid too little compensation or possibly even cease to receive compensation altogether. Their investment would then become a loss-making operation. In order to avoid this risk, the legislature must ensure that the periods of time for which compensation is paid are sufficiently long.

In Germany, the legislation stipulates that compensation be paid for most technologies over a compensation period of 20 years. Shorter compensation periods are also conceivable, but the compensation rates would then have to be higher. Otherwise, there would be a possibility of investors ceasing to gain any returns at all.

However, the guaranteed 20-year compensation rate is payable only for plants constructed in the year for which that rate is set in the Act. Plants that are commissioned in subsequent years receive lower compensation rates, which the legislature can set for years in advance with a clearly defined degression curve.

Degression

The reduction of the compensation rate for newly constructed plants is necessary and possible because the growth of the market is accompanied by a reduction in the cost of producing the systems with which power is generated. The faster the market is growing, the more sharply the compensation for new plants can be reduced. Under the current German Renewable Energy Sources Act, the annual degression rates for geothermal energy and onshore wind are a nominal one per cent. This means that the compensation rates for wind farms built in 2010 will be one per cent lower than for wind farms built in 2009. However, the applicable compensation rate then remains stable for these installations over 20 years. The degression for solar energy varies from 8 percent to 15 percent a year, depending on the growth of the market. No degression has been set for hydropower, because a great deal of technological progress has already been made in this area, and it is no longer possible to expect any significant falls in technology costs.

What is decisive is that the degression curve to be applied is not too steep, so that the compensation rates do not fall below the threshold at which a return starts to be earned in later years. Otherwise, investors in new manufacturing facilities would fear for the future of the sales markets they intended to target, which would reduce their readiness to invest.

Incidentally, degression takes place in real terms even if no nominal degression rate is set. The rate of degression is then equivalent in practice to the inflation rate.

Consequently, the real rate of degression comprises the nominal degression rate plus the current inflation rate. This is most significant in countries with higher levels of inflation. This effect needs to be taken into consideration when nominal degression rates are being set. This can be done either by assuming a certain average inflation figure for the next few years or by incorporating adjustments to take account of inflation into the nominal degression rate.

Privileged grid access

Investors in the generation of green electricity can only be paid a statutorily guaranteed feed-in tariff if they actually obtain a connection to the power grid. This statement may sound obvious, but it has to be emphasised, because there are certainly actors who want to hinder the connection of eco-power plants to the power grid. Resistance is coming from the companies that produce power at conventional power plants, such as coal-fired or nuclear power plants. In countries where nothing has

been done to split the operation of the grid from the generation of power, the electricity generators can exploit their ownership of the grids to exercise market power and obstruct new eco-power plants. It is therefore indispensable for there to be statutorily guaranteed privileged grid access for eco-power generators. The German Renewable Energy Sources Act stipulates that grid operators must accept eco power until the capacity of the grid is completely taken up with eco power. This means that conventional generation plants would have to be decommissioned if they found themselves in competition with eco-power plants. This provision is a very sensible way of promoting climate protection and forging ahead with the phasing-out of nuclear power. Were there to be no privileged treatment of eco power, the generators of coal-fired power could insist on measures that protected their position and consequently maintain their current levels of CO_2 emissions for years. Effective climate protection would be impossible. Privileged grid connection means that grid operators always have to connect new renewable energy plants before conventional power stations.

Grid connection conditions, clearing centre

Connecting a new plant to the power grid generates costs, as does any consolidation of the grids that may be necessary if the existing grid does not have sufficient capacity to transport the green electricity that will be fed into it. The Renewable Energy Sources Act enshrines in law the principle that the grid connection is to be paid for by the producer of eco power, while the upgrading of the grid is to be paid for by the grid operator. Grid operators can pass on their additional costs by adding them to grid charges. Frequently, however, circumstances are complicated, provoking disputes between investors and operators about what are actually grid-connection costs and what are grid-upgrade costs. In order to settle these disputes, the legislature has introduced what is known as a clearing centre. This has been established by the German Federal Government and draws up clear arrangements for disputed cases to ensure that future disputes can also be settled before they even begin.

Secure environment for the planning of investments in factories

The investment required in a factory that manufactures renewable-energy systems is no small thing. Such investments often amount to hundreds of millions of euros. These investments will only be made if the market for the products from the factory is likely to develop dependably for years ahead. Important parameters have to be secured in order to make such a market possible: political stability, the length of time for which the compensation rates will apply, no limitations on the volume of the market and no funding of compensation out of taxation.

Political stability

No legislature can guarantee political stability. In a democracy, political majorities keep shifting as new parliaments are elected. Every parliament can revoke, redraft or amend any law, which is, after all, the primary function of a parliament. In so far as this is the case, of course, no one can give a guarantee that a feed-in law will stay on the statute book for many years. This is why political statements are particularly important. Declarations of political intent and election promises concerning the retention of a feed-in law and the adoption of improvements which become necessary over time are important foundations for investment in facilities that manufacture renewable energy systems.

In Germany, the Renewable Energy Sources Act was passed by the German Bundestag in 2000 with a majority made up of Social Democrats and Greens, who outvoted the conservative Christian Democratic Union (CDU) and Christian Social Union (CSU) and the liberal Free Democrats. Before the 2005 Bundestag elections, the conservatives and liberals were still declaring that they would revoke the Renewable Energy Sources Act. However, the grand coalition of conservatives and Social Democrats re-enacted the Renewable Energy Sources Act in 2008 in a form which, in some respects, served to improve the conditions for the expansion of eco-power production. In the meantime, all five parties represented in the German Bundestag have, on many occasions, expressed their political will to retain and continually improve the Renewable Energy Sources Act. Impressed by its great economic and environmental success, even the conservative and liberal coalition that has been in government since the autumn of 2009 now supports the legislation. This support is one of the keys to continuing investment in the manufacture of renewable-energy systems in Germany.

Validity? of feed-in legislation

A feed-in law must remain in force until market investment in renewables is ensured without the need for guaranteed feed-in tariffs. This will be the case when the generation of power from renewables is cheaper than the generation of power from conventional energy sources.

Some technologies, such as wind power at locations with lots of wind, are already more economical than the generation of power at new coal-fired power stations and other conventional methods of producing power. Solar power is not expected to become competitive until some point in the coming decade and will initially be used to cover loading peaks. However, since it is imperative for the conventional generation of power to be superseded on grounds of climate protection, a feed-in law can only become superfluous if the generation of power from renewable sources can compete with the existing pool of power stations. This will certainly be later for solar power than for wind power or hydropower. Nevertheless, photovoltaics will eventually attain competitiveness because the cost of renewable-energy technologies will fall as large-

scale manufacturing increases, while the energy sources on which they depend, apart from biomass, are available free of charge. At the same time, the fuel costs for conventional power plants will rise ever more sharply in coming years, driven higher by resource shortages, political conflicts and the necessity of environmental protection. The current rise in oil prices following the turmoil in North Africa clearly illustrates this point. Although Libya accounts for no more than about one per cent of global oil production, world oil prices soared by more than $20 a barrel in a few days during the crisis, which is a clear sign that peak oil – the point at which the maximum rate of global oil extraction is reached before decline sets in – is already casting its fateful shadow.

Nevertheless, individual aspects of the Renewable Energy Sources Act will continue to be necessary until green electricity has achieved 100 percent market penetration, even if it has only become competitive thanks to the current system of compensation. This is true in particular for the obligation to purchase green electricity, privileged feed-in to the grid and the obligation to upgrade the grid.

The legislature should therefore examine very carefully which technologies are already competitive and can be exempted from a feed-in law. The litmus test is the development in the market of an economically driven self-sustaining impetus towards the replacement of conventional energy. However, it is also necessary to ensure that there is a genuinely free power market, regardless of the interests of a small number of business monopolies. At present, there is no functioning power market in Germany and many other countries, because a few groups dominate the power sector with their interests.

No limitations on market volume (no caps)

Limitations on the volume of market supply are written into feed-in laws by many legislatures. Such a cap works like a brake on the expansion of the market. It can be more or less tight, with an upper limit that is reached after several years or even just a few hours, as in the case of solar power under the Green Electricity Act (*Ökostromgesetz*) in Austria. The volume of funding for photovoltaics approved in Austria for 2008 was just 21 million euros, which merely corresponded to an expansion in capacity of approximately three megawatts. Investors applied for all this extra capacity within a few minutes. No other significant expansion activities are taking place. The current Austrian legislation is a perfect example of the fact that some legislatures do not really want the expansion of renewables and are encouraging a semblance of activity rather than real change. A feed-in law that provides for a low volume of expansion is not, in truth, intended to promote the growth of renewable energy, but to restrict or even prevent its growth.

Moreover, a cap can have a further inhibiting effect in the marketplace, since many investors will fear that connection to the grid might be delayed until the ceiling has been reached. As the Spanish case study shows, no technology can be developed

sustainably in these conditions. When a 500-MW cap was placed on the development of solar power in Spain, all that was actually achieved was a volume of about 350 MW of new capacity.

At any rate, a cap acts as a brake on the construction of factories to produce renewable-energy systems, as the investors who would put money into these facilities cannot see any likelihood of the market growing but know it is going to be capped, and new investments are therefore not feasible.
Certainly, any legislature that wishes technology producers to base themselves in its country must prevent any limitation of market volume.

No funding from tax revenue

Where feed-in tariffs are funded by tax revenue, investors have no reliable financial basis for plant construction. No one can predict the decisions about the budget that will be taken in any future year. As a result, the volume of the market is dependent on decisions taken by the finance minister. This does not provide a basis on which investors can make reliable calculations about manufacturing facilities, and they usually decide not to go ahead with investments. At the end of 2008, severe restrictions were placed on the growth of solar power in Spain, with additional capacity capped at merely 500 megawatts for 2009. The background was the partial financing of the feed-in tariff from tax revenue. The state no longer had enough resources to fund a repeat of the rapid growth of solar power that had taken place in Spain in 2008. Furthermore, the impact of the economic crisis and the associated desire to cut public spending also played a part in this decision. Excessively high levels of feed-in tariff and the announcement that the market would be capped in 2009 sparked a boom in the Spanish market in 2008, when capacity rocketed to 2.4 gigawatts. Funding from tax revenue was therefore a cause for the Spanish cap and the consequent drastic shrinkage of the market. As was mentioned above, the development of some 350 MW in 2009 in Spain fell far short of even that ceiling.

Power customers

Power customers have to pay the increased cost of feed-in tariff. This additional cost is distributed evenly among all power customers, and the price of power has risen modestly as a result.

At the end of the 1990s, surveys carried out in Germany found that power customers were willing to pay slightly more for the generation of green electricity as long as all customers had to bear an equal burden. In practice, relatively few customers have chosen to move to an eco-power provider, because these companies usually charge more than firms selling conventional power. Many power customers are therefore of the opinion that, if there is no alternative to paying more for climate protection and the

introduction of new technologies into the market, these additional costs should be borne by all consumers equally and not just by the few who are most environmentally aware.

Power customers have indeed had to shoulder additional costs. In Germany, these costs amounted to approximately 8.2 billion euros in 2010, according to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. This sum may appear high, but the *per capita* amount passed on to customers is relatively small. For instance, in 2010 a typical domestic customer in Germany was paying approximately 24 euro cents per kilowatt-hour of power. The proportion of this amount deriving from the additional costs imposed by the Renewable Energy Sources Act was only 2.05 cents per kilowatt-hour, which corresponds to a rise in the price of power of approximately 8 percent . In return, end customers received an average of more than 17 percent green electricity in their power supplies in 2010.

For commercial power customers too, the increased expenditure arising from the introduction of renewables is easily affordable. In Germany, the average share of production costs attributable to energy is approximately five per cent. If the price of power goes up by approximately three per cent, the increase in production costs will therefore be well under 0.15 percent . These modest additional costs are not of relevance in day-to-day business and could easily be more than recouped by means of appropriate power-saving measures.

However, even minor rises in the price of power can impose an economic burden that has to be taken seriously by energy-intensive industries, such as aluminium works. The hardship clause included in the Renewable Energy Sources Act therefore grants considerable relief to certain energy-intensive industries when additional costs are passed on. In 2009, for instance, they only had to pay about 0.05 cents per kWh.

Energy-intensive industries consequently benefit in several ways from the Renewable Energy Sources Act. Firstly, thanks to what is known as a merit-order effect, the electricity exchange prices in Germany are already lower than they otherwise would be on account of the volumes of power from renewable sources being fed into the grid. This merit-order effect arises primarily as a result of the fact that a great deal of power is generated when winds are strong with no fuel costs being incurred. Consequently, German industry already has a competitive edge over companies in other countries. Despite this effect, German firms have to pay far lower passed-on costs than domestic customers. A third advantage, which is often underestimated, is that the rise of renewable energy has clearly increased the turnover of energy-intensive industries. For instance, the wind-power industry is already the second-largest purchaser of steel in Germany after the automotive industry.

Pressure Groups

The interests of the big energy companies usually run counter to the feed-in of energy from renewable sources. In Germany, the big energy companies are bitter enemies of the feed-in of renewable energy to the power grid; this is something that may not be expressed in their official pronouncements, but it is nevertheless evident from much of the action they are taking. The explanation for this is obvious: more than 80 percent of the power-generation capacity in Germany is in the hands of four large groups, namely E.ON, RWE, Vattenfall and EnBW. For the most part, they operate climate-unfriendly coal-fired power stations as well as environmentally damaging nuclear power plants. If the share of renewables in the generation of power were to rise to 50 percent , for example, a large proportion of these big, environmentally damaging power plants would then have to be decommissioned. This would reduce the groups' sales revenues and cut their profits or even push them into the red. This is why they are using a wide range of methods in a bid to stop strong growth in the generation of power from renewable sources.

Incidentally, this is true not just for Germany but is the main hindrance to climate protection and security of renewables supply all over the world. The managers of the big energy groups have excellent access to the highest levels of politics and are therefore often able to assert their interests. Where persuasion alone does not bear fruit, corruption is also used to help things along from time to time behind the scenes.

The problem is even greater where conventional power generators are actually in state ownership. The returns from these power generators flow into the public budget. For this reason, finance ministers are often opposed to the development of renewables, for rapid growth in this area would also drastically reduce government revenue from the conventional generation of power.

In order at least to create opportunities in the face of this resistance, it is imperative that the energy-supply companies should also have a stake in feed-in tariffs through their own investments in renewable energy sources. They would thus at least be able to make up for some of the power-generation capacities their businesses will lose, while making a profit by generating their own power from renewable sources.
Although the German Renewable Energy Sources Act has allowed the big energy companies to do this since 2000, they have invested very little in renewables. The reason is probably the rate of return of some five per cent. The large energy companies are used to earning returns of 15-20 percent and more. It is therefore no wonder that the lion's share of investment in Germany has not been made by the big groups but chiefly by private individuals who have invested private capital in the numerous community schemes. Financial companies and smaller energy suppliers, such as forward-thinking municipal utilities, have also supported the renewables boom.

Allowing energy-supply companies to profit from power feed-in tariffs too has proved to be a useful measure in Germany. This was still out of the question until 2000. In the meantime, even the big energy groups have come to acknowledge that they cannot simply leave the strongly growing renewables market to their small and medium-sized competitors. As a consequence, they have now set up their own operations, which are investing in renewable energy sources.

The legislature

Any legislature that prepares a feed-in law must, of course, identify and reconcile all the various criteria, targets and interests. The legislature's objectives must be guided by the interests of the common good and not the interests of a few power conglomerates. The following objectives can be identified as important for the common good in the context of a feed-in law: economic development with new business activity, securing energy supplies, creating new jobs, supporting innovations and translating them into marketable products, reducing dependence on energy imports, securing future energy supplies, developing cost-free energy sources, combating climate change by avoiding CO_2 emissions and improving local environmental protection.

All of these desirable objectives conflict with the interests of the conventional power generators, who generally have excellent access to decision-makers in parliaments and governments. Parliamentarians are often less susceptible to lobbying than members of the government. One of the constitutional principles accepted by democratic societies is that Parliament makes laws, not the government. It is indicative that the German Renewable Energy Sources Act was introduced from the floor of Parliament without a government draft. Indeed, it was even pushed through by the German Bundestag in the face of fierce resistance from Federal Economics Minister Werner Müller, who was responsible for energy matters at that time. This example may embolden other parliaments to assert themselves in the face of lobbying from the energy industry, even when, as so often, its interests find a receptive audience within government.

However, Parliament should also be guided by other criteria. These include, for example, the reduction of public spending, at least if it cannot be afforded without incurring new debt. It is therefore in a parliament's own best interests to ensure that the advantage of independence from tax revenues, which has already been touched on at several points, is realised in such legislation.

Furthermore, it is important that parliaments ensure the laws they adopt are able to unfold their effects over a number of years. Renewable-energy plants can only make a positive impact on the climate if they generate power over a lengthy period. This has been achieved in a highly efficient manner by means of the 20-year guarantee for the payment of feed-in tariffs. The alternative of state subsidies would, firstly,

overburden the national budget and, secondly, offer no assurance that subsidised renewable-energy plants would actually be operated for 20 years. These are all important considerations from the perspective of the legislature that are often overlooked.

Conservationists

Conservation groups campaign for an unspoilt environment. They strive to check global warming and to conserve nature and protect the environment at a local level. Conservation groups therefore have an exceedingly strong interest in the introduction and implementation of feed-in laws, as these represent the most successful option for effective climate protection. At the same time, conservation groups are rightly vigilant against any failure to pursue the classic goals of nature conservation. These goals – the protection of biodiversity, air quality, soil and water – must all be the focus of attention. Normally, renewable-energy plants automatically help to achieve these goals. But there are also conflicts between different goals, although these can be resolved. For instance, large-scale hydropower plants should be avoided if they would involve flooding great expanses of land. At small-scale hydropower plants, it is necessary to take account of the requirements of biodiversity, e.g. by incorporating fish ladders. The preservation of air quality is an important objective at plants where biofuels undergo incineration processes. Emissions of health-damaging fine particulates must be precluded, and the same applies to emissions of nitrogen oxides and other classic air pollutants. The methods used to cultivate energy crops should accord with social and environmental criteria, as should be the case in food production. Monocultures dependent on the use of pesticides, genetic engineering and climate-damaging mineral fertilisers, which are sometimes used with disregard for international workplace safety standards, should be avoided. Sustainability criteria for the use of bioenergy are indispensable to feed-in laws.

Problems with approval

It is not enough to lay good statutory foundations for economic investments – with regard to both the returns to be expected and privileged feed-in to the power grids. It is also necessary to eliminate further barriers that can hinder investment in renewable energy. Above all, insurmountable barriers can be built up by the way in which the approval of renewable-energy plants is administered.
It is necessary to distinguish between various types of approval:

- approval for the granting of compensation;
- approval for grid connections;
- approval for the construction of plants.

Approval for compensation

Under the Renewable Energy Sources Act, public bodies do not issue any approvals for the granting of compensation. Nor is there any reason for them to do so, because the Act makes it compulsory for grid operators to pay compensation. Many grid operators demand the conclusion of a feed-in contract as the precondition for the payment of compensation. However, this is contrary to the law, because the Renewable Energy Sources Act stipulates that the conclusion of a feed-in contract is not necessary. The legislature adopted this provision in the 2004 revision of the Renewable Energy Sources Act because many grid operators had abused feed-in contracts in order to impose conditions that served their interests but took away the statutory rights vested in those who wished to feed green electricity into the grid.

Approval for compensation is therefore unnecessary, as the legislature has made the payment of compensation compulsory. Nor should approval for compensation be put within the discretion of grid operators, lest they abuse their power, for example to protect the position of the conventional generation of power. Disputes must be resolved by the courts on the basis of the law.

Approval for grid connections

Furthermore, there is no requirement for approval to be given by the authorities before a plant can be connected to the grid, because the Renewable Energy Sources Act expressly stipulates that grid connections for energy from renewable sources are to be given privileged treatment. Nevertheless, grid operators come up with all sorts of arguments as they attempt again and again to prevent the connection of renewable-energy plants. The clearing centre referred to above has been set up under the auspices of the German Federal Government in order to help settle disputes. It often resolves disputed cases successfully without having to resort to the courts and arrives at consensus-based arrangements for particular cases in collaboration with grid operators and eco-power generators.

Here too, it is vital that approval for grid connections should not be put within the discretion of grid operators, as otherwise they might abuse their power, for example to protect the position of the conventional generation of power. If the clearing centre does not find a solution for the parties concerned, the courts must resolve the matter on the basis of the law.

Approval for the construction of plants

The construction of plants is subject to a large number of provisions under building law, so planning applications can only be approved by public bodies.
Planning decisions must take account of many statutory instruments. These include, for example, emissions law, which prescribes standards for emissions into air or water at bioenergy plants where incineration processes take place. Compliance with

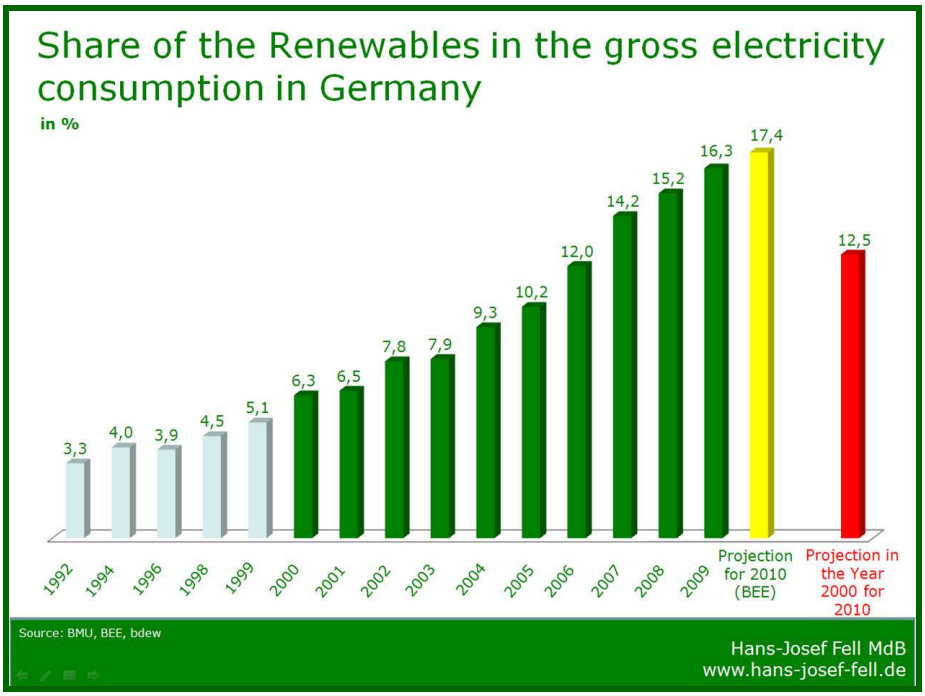
noise-abatement measures also has to be checked, for example at wind farms. Nature-conservation assessments are required, for example with regard to the protection of fish species at hydropower plants or the sustainability of forestry as a source of wood resources.
Building warrants must also be subject to the general statutory planning provisions. For example, no large wind farm can be constructed in the middle of a built-up area. This is why privileged treatment is given to wind farms at locations outside built-up areas, where very restrictive building laws usually apply in Germany.

Area planning and the system of planning permission are absolutely essential in order to prevent uncontrolled development. However, planning procedures can also be abused to protect the conventional generation of power. Authorities are often all too anxious to accommodate the interests of conventional generators by attaching excessively restrictive criteria to the approval of renewables installations, thereby engaging in what seems more like preventive planning than development planning.

A perfect example is the protection of birds at wind farms. Of course it is necessary to prevent the siting of wind farms in bird sanctuaries. However, there is scarcely any risk of bird strikes in areas other than bird sanctuaries, as extensive scientific studies have shown. Nevertheless, this possibility is often used as a pretext to refuse planning permission for wind farms. Such refusals are sometimes motivated by a desire to protect the conventional generation of power against unwanted competition from renewables. A plethora of other arguments that are valid in principle, such as the need to conserve the landscape and avoid the development of greenfield sites, can be misused for obstructive purposes. For instance, there are planning authorities that refuse planning permission for wind turbines on grounds of landscape conservation, but grant planning permission for opencast lignite mines without a moment’s hesitation, even though this means whole villages being bulldozed and wide tracts of countryside destroyed.

Some governments and their subordinate authorities use the planning system as a tool to hinder the growth of renewable energy if their political aim is to support nuclear and fossil-fuel-fired power generators. Planning procedures come as welcome obstructive instruments for this purpose. It is the function of a responsible climate-protection policy to put a stop to the exploitation of planning processes by authorities in this way.

The successes of the Renewable Energy Sources Act in Germany and global prospects



The German Renewable Energy Sources Act has been significantly more successful than anyone could have predicted.

In 2000, for instance, the Act enshrined the aim of doubling the share of power demand met by energy from renewable sources to 12.5 percent by 2010. This target was regarded as unrealistic and unattainable. Yet by the end of 2010, a share of 17.4 percent had been achieved in Germany. Thanks to this dynamic growth, it is now possible to press ahead with the complete conversion of German power supplies to renewable energy by 2030. Anyone who has any doubts about this should consider the industrial success stories of the personal computer, the mobile telephone and flat screens. All these industries have swept the entire world market with their products in less than two decades. The conversion of global power supplies to renewable energy within about two decades would require wind power, solar power, bioenergy, geothermal energy and marine energy to sustain growth rates lower than those already posted by these industries. In a wide-ranging study conducted by Stanford University and the University of California, Davis, the authors – Mark Jacobson and Mark Delucchi, demonstrated that a global conversion of all energy supplies to renewables by 2030 is industrially and technologically possible and, because of the avoidance of fuel costs, would actually be a more beneficial option financially than the preservation of traditional sources of energy supply. See Delucchi, Mark A., and Jacobson, Mark Z., 'A path to sustainable energy by 2030', in *Scientific American*, December 2009. (http://www.stanford.edu/group/efmh/jacobson/Articles/I/sad1109Jaco5p.indd.pdf).

The rate at which wind energy has developed, for example, far exceeds previous estimates. As late as 2002 the Paris-based International Energy Agency (IEA) was forecasting that worldwide wind-power capacity would expand to approximately 100 GW by 2020. In actual fact, 195 GW had already been installed by the end of 2010, and a steeply rising growth curve is set to continue.

Some allege that renewable energy is too much of a drain on national economies. In Germany, however, there is demonstrable evidence that renewables are already helping to reduce national expenditure. In many cases, they are already contributing to healthier corporate balance sheets too.

In 2010, as mentioned above, the additional costs for the generation of power under the Renewable Energy Sources Act amounted to approximately 8.2 billion euros, according to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. In exchange, billions of euros are already being saved thanks to the merit-order effect.

Through the use of renewable energy sources, significantly higher savings have already been made in Germany. In 2010, for instance, a total of some 7.4 billion euros was saved because of the reduction in the quantities of fossil and nuclear fuels that had to be purchased in Germany. The avoidance of external costs saved no less than eight billion euros. These two items alone are worth 15.4 billion euros, which means that all the expenditure on renewable energy has more than paid for itself. Other effects, such as increased revenues as new businesses pay local trade tax or costs avoided by social-security schemes as new employment opportunities open up are not even factored into these calculations.

The German Renewable Energy Sources Act proves that the use of renewable energy sources to combat climate change is not a necessarily a drain on resources but is already benefiting national economies today. Anyone who seeks to protect the climate by promoting renewables will incidentally reap many other economic benefits, such as domestic energy supplies that are independent of expensive imports and new jobs in a new growth industry.

Résumé

The development of renewable energy sources is a crucial task that is indispensable for the survival of humanity.
Legislation that creates the economic foundations for investments using feed-in tariff delivers many advantages for society:
action against climate change, securing energy supplies with domestic resources, defusing conflicts and wars over raw materials, local environmental protection and nature conservation, reducing poverty through the creation of many new jobs and action to fight the economic crisis.

Criteria that have to be fulfilled if a power feed-in system is to be successful:

- The feed-in of power from renewable energy plants must have priority over the feed-in of power from other sources.
- The levels of compensation and the length of the compensation period must be sufficient to ensure the viability of power plants – no more and, above all, no less.
- Realistic degression rates must offer incentives to reduce costs and prevent windfall profits.
- The cost of the system must be borne by power customers, and tax revenues must remain untapped.
- Bureaucratic rules and regulations must be kept to a minimum; in principle, not even power feed-in contracts are required.

Advantages of power feed-in systems compared with other funding arrangements:

- highly secure environment for planning, even at times of crisis;
- high degree of efficiency (lower costs – lower transaction costs and safety premiums);
- highly effective (rapid development of renewable energy sources and comprehensive saving of CO_2);
- strong incentives for innovation;
- no burden on public budgets;
- many new jobs;
- good opportunities for small and medium-sized enterprises in particular.

Important accompanying measures:

- expansion and consolidation of power grids;
- far-reaching reductions in red tape and, in particular, a supportive approach to planning applications;
- credit and guarantee programmes for easier access to outside capital.

My special thanks go to Carsten Pfeiffer, David Jacobs, Katharina Schulze and Milena Oschmann for their work on the production of this brochure and for their advice, corrections and additions.

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