

Are Germany's economy and research in renewable energies fit for international competition?

Panel discussion with representatives from research, politics and business

Shorter innovation cycles require more research and development

Aulich: In photovoltaics, prices have fallen dramatically, the competition is very strong. The Spanish market declined strongly in 2008, leading to a build-up of high excess capacities and manufacturers were pressured into disposing their products. In addition, the production technologies for renewables, developed mainly by German plant constructors, spread rapidly and become internationalised. This means that the cycle from the good idea in a research institute leading to production is not 7-8 years like it used to be, but only two years now. The only chance we have is to increase the pace of innovation and thus increase R&D expenditure even further. Otherwise, Germany will lose its leading position. It also requires greater willingness on behalf of the industry to implement new ideas to reduce costs. This is a prerequisite to keeping the jobs in Germany.

Competition from Asia puts pressure on industry and research

Stadermann (FVEE): My question is somewhat provocative: Research funds have increased slightly and the industry itself is also engaged in research. Why are Chinese solar cells as good as ours? Why have we lost the lead?

Aulich: Germany has been working on the subject for a long time and did all the preliminary work. Other countries, such as China, did not. But if you want to build a solar manufacturing facility in Asia today, because it is a future technology that generates profit and jobs, then you will be able to find a general contractor who will build the facility using the latest technologies, guarantee efficiency rates and even show you how it is done. That was not the case 7 or 8 years ago. If you go to China or Malaysia, you will see German plants that have been built by German plant constructors. These German plant constructors have strong links to the German research landscape. This landscape continues to supply good ideas for further developments. This should indeed be the case but the rate of know-how transfer has increased enormously. If you want to maintain the lead as a solar cell or wafer manufacturer, you already need to have the next technology in store in addition to the one used for constructing the plant. And you should also try to ensure that not all of the know-how remains with the plant constructor; a part of it should be kept to yourself so it is not as easy to resell the technology. But we should not fool ourselves. China is putting a tremendous effort into making its own developments with many engineers and scientists. It is not like they only plagiarise and nothing else is happening. In this respect, there is enormous pressure not only on the German industry but also on German research.



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Hoffmann: I would like to mention another factor regarding the competitiveness of German companies: A few months ago, the Landesbank Baden Württemberg (LBBW) published a study demonstrating that there is a 40 percent cost disadvantage for German manufacturers. To my knowledge, there is an investment assistance in China for production facilities of 20, 30 or 40 percent – it depends on the region – until the end of the first quarter. The Chinese manufacturer is provided the rest of the money by the Chinese state bank at a low percentage for 15 years. Added to this is the 10-year tax holiday. And when you add the dollar/euro currency factor to this, it is the "last nail in the coffin". For these reasons, there are heavy investments in new production facilities in China despite excess capacities. When German or European companies go to their banks, however, there will be long debates whether they get the money at all and on which terms. In other countries, people openly talk about the importance of domestic value creation when public market development programmes are being discussed. I am not suggesting to erect trade barriers to keep out foreign products but we have to react to these international challenges with our framework to be able to maintain Germany and Europe as a centre of technological innovation. So far, I have found no answer as to what exactly this is to look like. We need to consult with colleagues from all ministries and the EU and find out which measures are suitable for preparing us for the future.

International comparison of economic promotion

Kaiser: Yes, the Chinese are subsidising their PV production. But so did we: European structures provide grants to countries, there is support for municipalities, the KFW and funds from federal programmes. Germany, too, used its instruments to promote the domestic PV industry. Now it is a bit more difficult but nevertheless there are still investments in that area. Mr Asbeck is currently expanding his production. And that we now have competition in the market, that module suppliers are having difficulties with the new prices, is normal – it is, after all, a free

market economy. We have allowed profit margins of 30-40 percent in the production of PV modules. With this continuing for several years, it does not come as a surprise that we now have a bandwagon effect in this area that is building up excess capacities. The answer can only be: when the Chinese are coming, you have simply got to be better! First, you need innovation to stay ahead in production and cost structures. Secondly, you have got to be better in customer care. Advertise the fact that you manufacture in Germany and treat your customers well. I would like to give an example of what I mean with customer care. The magazine Photon asked a few people to get offers for a photovoltaic roof system with 6 KW. After one month and 30 inquiries, there were 5 more or less serious offers. This is the situation on the market. You really need to take better care of your customers before you step up to politics and demand protection or import restrictions!

European research policy

Hoffmann: I am not at all satisfied with the recent research policy on the European level. Mr Nick-Leptin from the BMU had shown in his presentation that more than 50% of the energy sector research expenditure in Germany is for nuclear energy and significantly less than 50 percent for the renewable sector.

Matters regarding distribution are even worse in the seventh EU Research Framework Programme – the eighth is currently underway. This inadequacy in resource allocation should be made more public! We should point out clearly that renewables have already proven what they are capable of – in contrast to the promises we heard in the last 50 years, for example from nuclear fusion. We already know it will be cheaper to generate electricity with renewables in 10 years than any of those systems will ever be able to – if at all. The title to decommission nuclear facilities is a necessity, which is bad enough. But as of now, we are not investing enough in technologies that are supposed to supply us in the future. I therefore have to admit that I am highly dissatisfied with the priorities set by our research policy.

Aulich: When the EU reveal their research and development funding, you can see that those funds are often spent at the national level but presented as part of the EU budget. I would consider it reasonable for the EU to draw up their own budget, handle topics themselves and focus more on renewables than they did in the past. As of now, the R&D budget for hardware, system development and grids is dominated by interests that are not consistent with promoting renewables. From the perspective of the manufacturing industry, the main demand on the national and European level especially is that the funds are not only extended, but granted sooner and more specifically.

Kaiser: Of course we welcome the fact that the EU are supporting research efforts. It is also all very fine when they introduce their own programmes. However, they should be oriented towards the politically set priorities. These include climate protection, energy efficiency and, above all, renewables. 20 percent renewables by 2020 is the mandatory target set by the EU. A meaningful way to back this is with increased research efforts.

More funding for research into renewables required

Weber: I would like to defend the way Germany promotes research in the area of photovoltaics. I believe that we are as strong as we are because we use our relatively small budget to support projects in a very sensible manner. For example in comparison to the NREL in the U.S., a huge institution with a strong institutional funding which is used to little effect in the industry in relation to their resources. In my opinion, the PV industry is well-suited to project-oriented funding in which you propose innovative projects which then should, of course, have at least a 50 percent chance to succeed. Regardless of the allocation procedure, we definitely need the doubling of funds as proposed by the FVEE.

Kaiser: In Germany, research funding is adequate and purposeful. Our next evaluation of our research programme will be in 2011. You are welcome to forward us your suggestions.

This is also about more money of course. For example, the approval rate for PV has decreased substantially. That is not because the applications have gotten worse but because there is simply more work to be done in this area. A market has developed there and the pace of innovation has increased. Therefore, there is actually more room for applications. Instead, however, the research budget for PV was frozen. Albeit at a high level – which was politically highly controversial, so the BMU was proud of being able to maintain this level – but frozen nonetheless. We had to grant other areas an increase in research funds. Result: declining approval rate for PV – a very bad situation for German research, very bad for the prices in this area.

Hoffmann: The extension of funds is an important issue. In order to maintain the industry in Germany, it is absolutely necessary to make even more use of existing collaborations between research institutes and the industry in the future. We must work together to achieve an increase of the research budget for renewables and that good applications can be successfully approved with a rate of at least 60 percent. This will require a budget three times as high. It is also to help the German industry remain internationally competitive. The means to this end are certainly not sufficient.

Two-track funding approach: Preliminary research and applied research

Staiß: Every innovation starts with a fundamental invention. Then there is the pioneer market such as we have today for solar thermal power plants. Then there is the market introduction, as now in photovoltaics. Market penetration comes next, such as for onshore turbines. This is followed by market saturation, now seen with hydroelectric power plants. The question is: Do we engage in research for the next 2 years to maintain a delta of technological advantage? Yes! But we also need preliminary research to discover revolutionary innovations for new applications which may only come about in 10 years time. This is the art of balancing, both of PV but also of other areas such as solar thermal

power plants, geothermal energy, ocean energy and energy storage. A healthy balance has to be found.

Rau (Roth und Rau AG): My comment regarding the BMU: Of course it is important to do preliminary and strategic research here in the Renewable Energy Research Association. But when we file an application as an industry, it is usually for projects that really need a fast implementation for reasons of competitive advantage. When we engage in a specific technology, we need it to be ready for the market by the year after next the latest. The application phases are too long in many cases. After all, the innovation advantage of German companies is the rapid realisation of these projects.

Competitors in Asia or wherever need 2 years as well. They do not necessarily rely on our work but conduct their own R&D. Our research environment is in direct competition to them, too. You have to consider that when you are thinking about deadlines.

Kaiser: To me, it seems a bit too hectic to say "If we do not make it in two years, then it is over". The bureaucratic response: We are talking about the federal budget 2010 at the moment. It will come into effect in April 2010. Then you can apply for funding in May and it is decided on in September.

Now the research policy response: If the Americans put a lot of money into renewable research now, it will not terribly surprise us at the Ministry. Americans are quick to put a lot of money into an area but two years later, they also withdraw it just as quickly. The strength of Germany was and is continuity. The combination of short-term and long-term projects and the persistent pursuit of many different paths.

We also view the fact that there are several ministries active in research funding as a strength because it provides for a plurality of approaches. There simply are several decision-makers, all of which are important and related in a very interesting way. This is a good structure as long as we work together and not against each other, as long as we share and avoid overlapping research, utilise synergies and encourage plurality.



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Not underestimating competition from the U.S.

Staiss: At this point, I would like to disagree quite strongly with Mr Kaiser because this American in-and-out policy has now taken on a wholly different quality. The Solar Energy Technology Programme rules that the solar research budget will be doubled for 2010, so another added 100 million euros. Of this amount, nearly 70 million goes to the National Renewables Energy Lab, and they work at a high level. Indeed, we are also competing for research leadership in several other fields. We have to be careful here, and there are also some industrial policy arguments. The U.S. would be so stupid if they would let their market for renewables, as it is visible today, be taken away from them. They are extremely professional and when they start something, they see it to the end. Underestimating the Americans would be fatal. This is why the FVEE recommends increasing funding significantly. The 20 percent per year we suggested is an enforceable compromise in politics but in fact, research needs considerably more.

Kaiser: What was NREL's problem in the USA? Their financing was secured via institutional funding but for whom were they supposed to do research? They had a buyer market which was hinged on tax concessions that had to be passed through congress every year – or sometimes not. You will not find a continuous partner there. In Germany, we have a solid research landscape based on continuously developed project funding. We have an excellent research landscape and we have an attractive domestic market on which you can put your research products and where you can find industrial partners. And we have a broad political consensus through all parties in the Bundestag, without any exception – this is a fantastic constellation. Now it is important that we, after having invested a lot in the past to develop this potential, put it to use. We cannot allow ourselves to make mistakes at this point.

We have to keep on improving. So my appeal to you is: Let us fight together, and not as competitors in the various renewable energy source fields, to ensure that we all make progress. We

must pull together and clearly show the decision-makers that this is not for amusement but rather for our medium-term future.

Research funding as an industrial policy?

Oberzig: There is the expectation that research policy increases competitiveness and creates jobs. Is research policy also an industrial policy?

Kaiser: Of course we have an interest in the continued development of our research landscape, in its stability, networking and good link to industrial applications. Our impression is that this works quite well. During the presentation by Mr Nick-Leptin (BMU), you heard that of the research titles of the Federal Ministry for the Environment for photovoltaics, about half of the funds go to the Renewable Energy Research Association but a good third goes to industrial projects. I think this distribution is very reasonable. We should continue to carefully pursue this transfer from research to practical applications. In this sense, research policy is indeed industrial policy with a strong scientific backdrop.

Staiß: Science is not an end in itself. The effects of 20 years of Research Association demonstrate this. Today's companies would certainly not be as successful as they are if they had not received the technological input. This is also a question of cycles. Public research funding heavily invested in photovoltaics in the beginning; the institutes – also those of the Research Association – took part in the technology transfer. There are very close partnerships with the companies in which we conduct joint R&D.

In the meantime, the sum of research investments from the PV industry is four times the public research funding, and that is only right and fitting. It is a stated objective and mandate of the Research Association to support the industry, but also to work out new scientific ideas that may only become important at a later time.

Industrial policy: Clusters of excellence

Oberzig: Is the Solar Valley in Saxony, Saxony-Anhalt and Thuringia a concept with which one can improve efficiency in research and which could also be part of an industrial policy?

Aulich: We have an excellent research and development landscape in Germany, we have outstanding people, we have scientists who enter into the field of solar energy – a very attractive subject – and want to work hard. On the subject of clusters of excellence, it is still too early for a final evaluation because it is only a year old. I think the approach is very good, it could be implemented very quickly but also proved quite complex here and there, a fact that should not be overlooked. In Solar Valley, there is a total of more than 98 individual projects in the various programmes that all need to be coordinated. Given the international competition, I think it is very fortunate that there are companies of many stages of the value-added chain located there, all within a radius of 100 km. You can even work together with your competitors because the problem is perhaps 3-4 years ahead. It is a good thing when more people come to the region – whether they are suppliers or investors. A cluster of excellence is like a boiling pot with the lid pressed onto it: pressure builds up faster and new ideas will bubble up. I think it is a very good approach.



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Research and development as an industrial policy

Schiel: The German Engineering Association VDMA represents manufacturers who offer products for all kinds of energy technologies, not just for renewables. We have had difficulties in the VDMA, for example regarding the integration of photovoltaics on the manufacturer side because we do not want to politically support the high PV remunerations. However, we recognised early that there is a strong group of manufacturers within the VDMA that is engaged in exploring photovoltaic production facilities. This group receives far too little attention in German discussions. The photovoltaics industry is often spoken about as if it lacks sufficient export quotas. Indeed, production technologies in Germany achieve a turnover of over 2 billion euros and 80% of this is exported. In this respect, we have a very strong photovoltaic production facility industry in Germany – in addition to the well-known end-product manufacturers.

The photovoltaic and wind industry provide good examples of a successful industrial policy encompassing basic research, demonstration projects and market introduction back-up. With the aid of energy policy instruments, an entire industry has been established. This holds especially true for the wind energy industry with the 100 and 250 MW Programme. We are attempting something similar in the area of fuel cell technologies with the National Innovation Programme. Something like that sometimes goes well and sometimes it does not. Back when the 100,000 Roofs Programme was discussed and implemented, I was working for a Member of Parliament and still vividly remember the difficulties of this process. We are now experiencing something similar with the market introduction of fuel cells, and electromobility powered by batteries will probably face the same problems. It seems very important to me that the various industrial policy tools – and R&D funding is, in my view, such an industrial policy tool – go hand in hand and ensure there are no gaps between research, development, demonstration and market introduction, or else the industry will fall into a recession.

If you have found an industry to be innovative with a promising export potential, then you have to engage in R&D even if it is ready for the market. There are research papers, such as that of the Helmholtz Association, that regard the wind industry as a market-ready technology no longer as worthy of research funding as other industries. I think that R&D has to remain an instrument of industrial policy – even if a technology is relatively close to the market or even ready for market launch.

Research for other climate regions

Uh (GTZ): I would also like to address some sectors other than PV for emerging and developing countries. An example from Morocco: Solar thermal systems are mainly used in combination with thermosiphons there. Such a system has a size of 2 m², produces 200 litres of warm water and costs about 1,000 euros. The mean per capita income in Morocco is 1,000 euros a year as well. So you can roughly estimate the proportion of the population that could afford it. And who needs 200 litres of hot water per head and day in Morocco? Storage collectors are, I am convinced of that, a fast seller for the whole MENA region. To do this, you need partners and possibly a trans-national research programme with a university in Morocco or in another country. This is just one example, but you always have to look very carefully as to what the markets beyond the developed countries actually need.

The same with medium wind power: This technology fully evolved in developed countries and was subsequently never optimised to meet the demands of the countries where it was newly deployed. Actually, it would have had just the right size for many electricity grids in developing countries but technically, it is still stuck in 1985. The demand for optimisation has to be looked at.

There is also a lot of work to be done regarding grid integration. But – and this important point is addressed to Mr Wollin from the BMBF and Mr Kaiser from the BMU – you cannot achieve all that from here. That is, we actually have to

think about getting the products from German manufacturers to the right place. What drives us is the climate problem and that is a global one.

Shortage of skilled workers – promotion of young talent

Schneider (University of Applied Sciences Berlin, HTW): We have talked a lot about development and growth now. To what extent do you consider the limits of available technical staff? Some graphs show an almost exponential growth for renewables but the universities do not provide this kind of output. How do you respond to this fact?

Schmid: The promotion of young talent is an extremely important issue and I think that academic and institutional research is suitable for this in order to add to the educational and training spectrum. We have a massive shortage of engineers in the entire machine and plant construction sector, even so during the economic crisis. We have a demand for additional experts especially in the rapidly growing renewable energy industry. This is particularly true for the wind industry. The graphs for Germany shown to us by the German Renewable Energy Federation may yet be accommodated somehow. But when installation is ready and done with in Europe, then there will be a lack of experts to manufacture to capacity. This is one of the key tasks for the next few years and it is not only specific to renewable energies. The manufacturer of a bearing or a gear box does not necessarily have to have special training as a "renewable energies engineer", but has simply to be a good mechanic or mechatronics engineer.

Aulich: I would like to differ from Mr Schmid on this. Photovoltaics have a huge demand for junior staff as skilled workers and in the bachelor's and master area. There are many approaches that can be supported by joint campaigns, allowing you to exercise some pressure on politics.

This is one of the advantages of a cluster formation such as the Solar Valley Central Germany. In Erfurt, for example, a training

centre for photovoltaics and advanced technology is being built in which several hundred apprentices will be trained in the coming years. There are also endowed chairs ensuring that the subject of photovoltaics is taught at universities.

Staiß: I think young people are in a position to properly assess their future prospects – perhaps the 130 students at this meeting are a good example. Regarding renewable energies, we do not necessarily need specialists but generalists in certain sectors such as process engineering, mechanical engineering, electrical engineering, chemistry and physics that focus on renewables. Asking actively teaching colleagues of the institutes in the Research Association, I learned that the number of students quadrupled in the last 2 to 3 years. I think that the students themselves make a statement with their participation, and universities will listen to this statement. There are now a one and a half dozen interdisciplinary master's and bachelor's programmes. So I am quite confident regarding the future. The one and a half million employees in the green industry give cause for a positive outlook.

Kaiser: The courses at the universities and universities of applied sciences are the federal states' responsibility. As the federal government, we cannot do much for the promotion of skilled workers except help by forming opinions. But the decisions made on the federal state level have longer-term effects. If you fully develop a course, it will have consequences on the labour market 4 to 6 years later. This only makes sense if you find a stable environment, when you can plausibly say that those people you are now attracting to the courses are needed in 5 to 7 years time. Therefore it presupposes that we, in the federal government, pursue a policy that has a long-term orientation.

Do you understand what I am talking about? We have to create a remuneration structure in the area of photovoltaics that enables people to do good business not only in 2010 and perhaps in the first half of 2011. We have to set down a stable political foundation that can bear the load up to 10 years in advance.



International cooperation

Staiß: We heard many presentations at the annual conference regarding the adaptation of technology to local conditions in other countries, to the regional climates, to grid integration, but also to the respective societies and cultures. To these ends, we require specific knowledge from the user countries. In this respect, an ideal research partner for global markets should offer competencies that complement our own. We can learn much from one another and especially from developing countries. So it does not always have to be an East-West partnership, it can also be a South-North partnership. There are many good examples in the Research Association. For example, when it comes to solar construction it is a wholly different story for Asia than it is for Central Europe. In this respect, it is obvious that you are going to look for a partner that can provide a lot of input based on experience with the climatic requirements.

Our deficit lies in non-European research collaborations. Americans and Europeans mainly engage in science in a competitive way. This

leads to a healthy competition. But on the other hand, we are not utilising synergies and have duplications of effort. There is practically no budget provided jointly that allows to increase the attractiveness of international and non-European research by offering a budget that can be applied to together. In Europe, we have the advantage of being strongly networked in scientific efforts. This is missing at the international level and is urgently required for global markets.

Kaiser: Yes, we do have budgets for international cooperation, allowing for joint applications. We have an agreement with Israel. My suggestion would be a reverse approach: If you find a meaningful level of cooperation, then file a request to the BMU or the BMBF for a joint project. The ministries would like to support such non-European cooperations because we perceive this deficit in the same way as you do. But we believe that this ought to grow from the bottom up, from the initiative of specific agreements between the institutes, rather than us developing a framework agreement and then desperately searching for participants.