Bundesnetzagentur

# Sprechzettel

Jochen Homann

Präsident der Bundesnetzagentur

Es gilt das gesprochene Wort

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## „Integrating Renewable Energy into EU Power Markets“

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Ladies and gentlemen,

Thank you very much for inviting me to this conference. I'd like to provide you with an overview of the challenges posed by the integration of renewable energy into the European market and especially into the German market.

Let me start with some figures regarding the development of renewables in our country. Between the end of 2004 and the end of 2010, the share of installed capacity held by facilities for renewable energy more than doubled from 20,5 GW to 50,5 GW. There has been growth across all energy sources promoted under the Renewable Energy Sources Act, or EEG.

There was however an above-average increase in wind and solar energy, both of which are volatile sources. The installed capacity of wind increased from around 16 GW at the end of 2004 to over 26 GW at the end of 2010. The statistics for solar are even more severe: The installed capacity of 1 GW at the end of 2004 grew to over 17 GW by the end of 2010. This was followed by further growth of over 7 GW in 2011, as indicated by the reports PV-facility operators must submit directly to the Bundesnetzagentur.

European energy policy also points towards an increase in renewables. The Renewable Energy Directive of 2009 (Dir 2009/28/EC) sets Member States the goal of covering 20 percent of their final energy consumption with renewables by 2020. This means an increase for every member state. Each state has an individual target, based on the existing energy mix in the country and its renewables potential.

As shown on the slide, some states such as Latvia, Finland, or Sweden already have a large share of renewables, mostly hydro power, in installed generating capacity. Therefore their targets for 2020 are more ambitious than for other countries. Germany’s individual target under the Renewable Energy Directive is to reach a share of 18 per cent of renewables in final energy consumption in 2020. In 2011, we had already reached a share of 12% renewables in final energy consumption, and around 20% in total power consumption. These figures show that the feed-in tariff scheme used in Germany to promote renewables has achieved its goal of allowing renewable energy to expand from a niche product to form a large and still increasing share of the market today, but it has done so at a high cost.

Today, renewables are the decisive factor in the energy system as a whole, in a positive sense as well as a negative sense. They determine the necessary grid expansion and have a great influence on prices at the EEX power exchange as well as retail prices. In a nutshell: Renewables have developed from a niche product to a mass product. And that means that we have to evaluate our support scheme for renewables. We need more than ever an integrated view on renewables. Because of that, I will focus in particular on the challenges posed by renewables in three areas. These are grid expansion, costs and their allocation, and policy and market design.

**Grid expansion**

The expansion in installed renewable generation capacity is accompanied by a corresponding need for grid expansion, both at the transmission and the distribution levels of the electricity network. At the distribution level, there is a need for new electricity lines that connect renewable energy plants to the network.

The vast majority of renewable generation capacity in Germany is connected to the network at low-voltage levels. At the end of 2010, there were 17 GW of photovoltaic, 26 GW of wind and 5 GW of biomass generation capacity connected to the networks of the distribution system operators.

Although the production of most renewable electricity is decentralized, this doesn’t mean that this production is necessarily close to consumption. On the contrary, the majority of regions in which renewable plants generate the highest yields are located in the north and the east of Germany, quite a long way from the large industrial centres of electricity consumption in the south and the south-west. Consequently, the electricity generated by renewable sources has to be transported to consumers using the transmission network.

The offshore wind farms currently being constructed and planned will also be connected directly to the transmission network by DC links. The goal of the federal government is to install around 25 GW of offshore wind capacity in the North Sea and the Baltic Sea by 2030. This will further increase the need for electricity transmission from the north to the south of Germany. Thus far, expansion of renewable energy generation has been encouraged without taking into consideration the effects on the distribution and transmission grids.

In future, it will be imperative that the pace of renewable growth matches the expansion of the networks. Otherwise, the progress made with regard to renewable generation capacity will come to nothing as the networks will not be able to incorporate the generated electricity. The grid is the bottleneck of the German “Energiewende”.

The German electricity transmission grids have always guaranteed maximum reliability and security of supply, but they are now increasingly operating at their limit. It is therefore our top priority as the federal network regulator to make sure that the necessary efficient investment in electricity transmission and distribution infrastructure takes place without unnecessary delay.

The government passed new legislation in 2011 to speed up the process of planning and approving new transmission lines. Under the new laws, transmission system operators must draw up a national Network Development Plan, containing all measures required for the optimization, reinforcement and expansion of the grid over the next ten years.

The first draft of this plan was submitted to the Bundesnetzagentur at the end of May, marking the start of a consultation in which the public are invited to comment. Following this, the Bundesnetzagentur is tasked with examining the revised plan. The focus at this stage is to assess grid expansion in terms of energy requirements and the associated environmental impact.

Once this draft plan has been checked by the Bundesnetzagentur, it will once again be made available for public consultation. We will ensure that all affected organizations, citizens and other stakeholders can participate at each step of the process. Following the consultations, the Bundesnetzagentur will submit the approved version of the plan to the federal government, who in turn will submit it to the legislator to be passed into national law. Detailed planning of the individual transmission lines will then be carried out on the basis of the Network Development Plan.

The TSOs’ calculations for the Network Development Plan are based on a scenario framework that has been approved by the Bundesnetzagentur. The framework contains three scenarios, covering a range of different assumptions on possible developments in electricity generation and demand in 2022. By applying a sufficiently broad range of assumptions, it can be ensured that the resulting measures necessary for stable system

operation are robust enough. Ideally, the measures contained in the Network Development Plan should be able to withstand a range of possible future developments.

As you can see from the assumptions on electricity generation capacity for the three scenarios, the main difference is in the values assumed for renewable capacity. Scenario A assumes moderate growth in electricity from renewable energy sources. In contrast, scenario B represents a medium-sized expansion path for renewables. The most ambitious growth in renewables is assumed in scenario C, which is based on each federal state's individual expansion goals. The TSOs conducted a market simulation for the year 2022 on the basis of these three scenarios. Based on a regional allocation of the assumed generation capacities and demand, they calculated the resulting flows at transmission network level. The necessary grid optimization, reinforcement and expansion measures were identified for all three scenarios by comparing these simulated flows with the existing transmission grid. The results for scenario B, our lead scenario, are shown in the map on the slide.

The most prominent part of the plan are four DC-lines, designed for the transport of wind power from the north to the south. It should be noted that the results are to be viewed as preliminary at the moment, as the Network Development Plan is still undergoing consultation and will then be subject to approval by the Bundesnetzagentur. So far, the results indicate that a large share of the proposed measures are robust across the three scenarios.

**Network management**

Network operators increasingly also face challenges in terms of network management. These could affect individual renewable energy facilities as feed-in priority must be taken into consideration, with network operators obligated to ensure that all electricity originating from renewable sources is picked up as a priority. However, if there is the threat of congestion in the respective network area including the upstream network, operators are entitled to perform feed-in management under the EEG. This means that they are able to adjust individual facilities to a lower level.

In 2010, feed-in management measures led to unused energy totalling almost 127 GWh, or around 0.16 percent in terms of overall feed-in from EEG facilities. The compensation paid for this amounted to 10.2 million euros. In comparison to 2009 this

represents an increase of 70 percent. This means: The German consumer has to pay for energy that is not needed!

In 2010, as with the year before, feed-in management measures were almost entirely performed on wind facilities. The northern network areas with high installed wind capacity were affected by this. These figures are expected to continue growing.

**Loop flows**

We are very much aware of the fact that Germany's energy policy does affect our neighbours. Due to the increasing share of renewables and the fact that electricity takes the way of least resistance, many flows e.g. from Northern Germany to Southern Germany and Austria are passing Poland and the Czech Republic in the East or the Netherlands, Belgium and France in the West of Europe. These flows are called loop flows or transit flows.

These flows often cause system security violations since the flows can be very large and they occur at irregular times. An important – most of the time ignored – fact, is that transits and loop flows are a Europe-wide issue! All Member States emit them and are affected by them. Depending on the situation, loop flows may have either negative or positive effects on power flows. With the anticipated increase in renewable generation power flows will become increasingly volatile. That means that the amount of loop flows will increase and the situation will become more difficult to handle if no action is taken. Therefore, we all have to make sure that grid expansion keeps up with the expansion of renewables.

Now we are in the situation to talk about solutions and measures to take. From my point of view, it is very important to be open to discuss all possible solutions to deal with these unplanned flow phenomena, to think of combining solutions and NOT to be prejudiced for or against any solution. For the time being, an arbitrary creation of smaller bidding zones, like it is proposed by some Regulators and the European Commission, does not offer a solution to the problems of loop flows. In 2010 the Bundesnetzagentur commissioned a study on the relevance of established national bidding areas. The topic was to investigate the impacts of market splitting in Germany on the network and the market itself.

The study came to the conclusion that market splitting of the area Germany/Austria would

1. reduce liquidity and competition,

2. increase market concentration,

3. have negative impact on progress in network expansion,

4. create regulatory uncertainty for TSOs and generators and

5. since power flows will become more and more volatile; a frequent ad-justment of bidding zones would be necessary.

Furthermore, if we considered a change in the current design of bidding zones we would put the 2014 goal of an internal energy market in question. Therefore loop flows must be considered at a European level. From my point of view, there are a lot of very good solutions to tackle the issue of loop flows. A combination of these remedies will help us to achieve optimal European welfare gains!

**Costs and cost allocation**

I'd now like to focus on the costs derived directly from the German EEG in the form of feed-in tariffs and the market premium and which are reflected in the renewables surcharge.

For those of you unfamiliar with the system in Germany, here is some brief background information: The four German transmission system operators are obligated to pick up all electricity from renewable sources for which a fixed feed-in tariff is paid. This electricity is then sold entirely by the TSOs to the German electricity exchange. There is a growing gap in financing between the TSOs' income and their expenditure, as the latter – mostly feed-in payments under the EEG and the market premiums – far outweigh the income from sales on the exchange. In 2012 the TSOs reported a gap of around 13 billion euros. This amount is passed on to the electricity suppliers in the form of a renewables surcharge, and ultimately on to the customers. The surcharge has increased from 2.047 ct/kWh in 2010 to 3.592 ct/kWh in 2012.

The TSOs will determine how high it will be for 2013 by 15 October this year. The forecast they delivered in November 2011 regarding the potential scope of the surcharge indicated an amount between 3.66 and 4.74 ct/kWh. And there are other

forecasts that go well beyond 5 ct/kWh. I'm not able to tell you whether the actual surcharge to be determined will fall within this range, but some key parameters for calculating the renewables surcharge in 2012 have deteriorated somewhat, which will lead to compensatory effects in the following year. For example, there was increased feed-in of PV electricity, while the price on the exchange and thus the TSOs' profits there decreased and consider-able use is being made of the market premium.

The increasing cost of the feed-in tariff, together with other factors such as the cost of grid expansion, is making electricity increasingly expensive for consumers. This is a particular problem for large industrial energy consumers, whose ability to compete is threatened, but increasingly also for households with low incomes, and for small businesses. While the EEG includes extensive offsets for industrial consumers with high energy consumption, there are additional burdens for smaller consumers.

It will therefore become increasingly important in future to strike the right balance between easing the burden for some consumers and thus increasing it for others, as public acceptance of the necessary changes to our energy system could otherwise be jeopardized.

**Policy and market design**

The effects on the network and the undoubtedly rising costs have triggered a heated debate: Does the system still work? What does the future of renewable energy look like in market terms? One particularly problematic aspect of the existing feed-in tariff scheme is that, due to the fixed remuneration for each unit of electricity produced from renewable sources, renewables are not integrated into the regular wholesale power market in any way. While the increased production from renewable sources drives down whole-sale power prices, producers of renewable electricity are not at all affected by this.

Another major point of criticism are the differentiated tariffs for electricity produced from different renewable energy sources. Photovoltaic power in particular receives a large share of the total payments, although it only contributes a small amount to total power generation. Furthermore, the intermittent generation of electricity, especially from photovoltaic and wind power, causes severe difficulties for the electricity system as a whole. It increases the uncertainty of generation forecasts and thus also the need for

balancing energy. Renewables must be brought closer to the market – this is the challenge that we have to meet.

In my view, there is no one prescribed right path here, but various good options. I'd like to talk about some of them.

**Direct selling**

The Bundesnetzagentur views direct selling as a first step in the right direction for market integration. The EEG supports this option by providing the possibility of carrying out direct selling while claiming a market premium.

Electricity from facilities which are entitled to payment of the fixed feed-in tariff is sold directly by the installation operator. To balance the difference between the fixed feed-in tariff and the unregulated selling price, operators receive the reference market value, which is calculated on a monthly basis. Moreover, the operator receives a management premium to balance the additional costs resulting from the direct sale. If an installation operator opts for the market premium, they are exposed at least partially to market risks. If feed-in is not profitable, they need to consider temporarily stopping it.

Interest in the market premium, which was introduced in Germany in 2012, has been considerable thus far. At the end of the first quarter, around one third of the total output of offshore wind farms was sold directly; for on-shore installations the figure was around 60 percent.

However, it's not yet possible to draw a summary regarding the market premium, as we need to wait and deter-mine whether this great interest can be sustained when the premium de-creases over time. It is designed to decline as a result of the expected learning curve effects. In terms of the costs it should be mentioned that at 0.3 ct/kWh for non-intermittent renewables and 1.2 ct/kWh for intermittent sources, the management premium for 2012 is significantly higher than the TSOs' sales costs for energy generated under the EEG (2010 average: 0.16 ct/kWh).

It is therefore perhaps now possible to conclude that direct selling and use of the market premium will initially probably not lead to less promotion of renewables, but that the promotion of these sources will be smarter.

**Quota / tradable green certificate model**

The most popular alternative to the existing feed-in tariff currently being discussed is the so-called quota or tradable green certificate (TGC) model. Under this model, the state would issue green certificates to electricity producers for each kWh of electricity generated from renewable sources. In turn, electricity consumers would be obliged to buy a certain quantity of their electricity from renewable sources. This quota would be specified in advance for each year by the government. To prove that they have fulfilled their obligation, consumers would buy green certificates from the producers of renewable electricity, thus creating a new market for these certificates.

The quota model has the great advantage that renewable electricity is traded directly on the electricity market, while producers receive additional revenue from the sale of green certificates. The result of this full market integration is that all renewable energy sources receive the same price per unit and the most cost-efficient renewable technologies are built first. In theory, this ensures that renewable targets are achieved at minimum cost. A quota could also be a way of ensuring that the pace of renewable growth is no faster than the corresponding expansion of the networks.

However, a quota model does have some serious drawbacks compared to the feed-in tariff: It introduces additional price risks that will be incorporated into investment decisions and creates higher costs for small renewables producers. And it is foreseeable that in a quota model, only the onshore wind option can survive. In my opinion, the debate often over-looks the fact that a lot of the problems posed by renewables cannot be remedied by simply changing the support scheme.

It is therefore my view that, in addition to addressing the question of the cost of a support scheme, we need to focus more on a market design in which renewables also have to share some of the responsibility for overall system stability.

**Capacity markets**

As a result of the growth in renewables and the current market design, investment conditions for conventional generating capacity are deteriorating. On the one hand, the low production cost of renewables puts pressure on the wholesale market price. At the same time, conventional power plants run for fewer hours. Investment in conventional power plants is therefore generating lower yields whilst also becoming riskier. On the other hand, an electricity system with a large share of renewables and currently very

little potential for storage or demand-side management needs conventional power plants more urgently than ever to balance the volatility of renewable electricity production and ensure system stability.

In future, it will therefore be necessary to create additional mechanisms to remunerate the provision of generation capacity as a good separate from the actual production of power. The “energy only-market” doesn’t work any longer! Recently, several studies have been published that present quite disparate ways in which such capacity markets could be implemented. It seems to me, however, that the perfect model without any adverse side-effects is yet to be found.

What is clear is that any mechanism we may eventually adopt will have to be as competitive and market-based as possible. It would be wrong to try to counteract the side effects of the renewables policy with a new subsidy for conventional capacity. Our next task should now be to analyze in depth the necessary scope of future capacity markets. A potential capacity mechanism must be well thought-out before it is implemented. It is more important to find a solution that addresses the problems at hand very effectively than to find solutions as quickly as possible.

Nevertheless, we also need to let generators know what our plans are, as construction of power plants that are required in 2020 will have to start around 2014. This leads to a wider question which I would leave for further discussion here: Would it be a sensible solution to switch more generally from a market where the traded product is generated power, to a market where secure capacity is remunerated?

**Conclusion**

I presented to you a couple of challenges which we are facing in our “Energiewende”. But my main message to you should be: Yes we can! We are willing and able to transform our traditional energy supply into a carbon-free future. And on our way to the future new green technologies will be developed and new markets for green technologies will emerge.

Thank you for your attention.