Interview with Thomas Unnerstall

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Bert Beyers: In Germany, all nuclear power plants will be taken off the grid at the end of the year and the next phase-out, namely that of coal, is also already planned. In order to stabilise the German electricity grids, gas-fired power plants are therefore becoming increasingly important. Do you think so too?

Thomas Unnerstall: Yes, absolutely.

What role do gas-fired power plants currently play in the grid?

Gas-fired power plants currently have a capacity of about 30,000 megawatts (MW) in Germany. To stabilise the electricity grid, we need a total conventional, controllable capacity of about 80,000 MW. This gap, roughly 50,000 MW, is currently filled by coal-fired power plants, nuclear power plants and, to a relatively small extent, by controllable renewable plants such as biomass or hydropower plants. So, if we actually should switch off nuclear power plants now and if we then also get out of coal, we will have to add gas-fired power plants almost to the same extent as we take these power plants off the grid. This can also be done by converting the current coal-fired power plants to gas, especially where, at the same, heat is also produced for district heating in the large cities. However, there are not pipelines everywhere which are needed to transport the gas to the power plants.

Gas-fired power plants also have the task of stabilising the volatile electricity from wind and photovoltaic plants.

However, they will share the function of stabilisation with other, new elements in the electricity system, especially with storage systems. These storage systems, especially batteries, will compensate for short-term fluctuations, especially in photovoltaics. We need gas-fired power plants above all to cope with situations when the batteries no longer work because they are empty; that is, situations in which renewable energies are not only unavailable for a short time, but for a longer period. These are, in particular, the so-called dark lulls that regularly occur in Germany. Several days of little wind, no sun – this is when the other stabilising elements in the system no longer function. And then you need conventional, controllable power plants to provide these 80,000 MW at peak times.

Let's take a mental leap into the year 2035. What will the German power plant fleet look like in the future?

We will have about 300,000 to 400,000 MW of renewable plants, probably about 200,000 MW of photovoltaics, about 100,000 MW of wind and 30 to 50,000 MW offshore, i.e., wind plants in the North Sea and the Baltic Sea. That is the renewable share, about 80 to 90 percent of the electricity we need over the year. In winter there still will be the problem that we won´t have enough renewable electricity overall. And then there are the dark doldrums. And that's why we will have gas-fired power plants in addition, on a scale of, as I just said, perhaps 70,000 to 80,000 MW. In addition to batteries, which compensate for short-term fluctuations, there are also electrolysis plants that produce hydrogen and are needed when photovoltaics and wind produce too much. Electricity that cannot be used directly have to be stored: on the one hand with batteries and on the other hand by means of electrolysis plants and hydrogen, in order to convert it back into electricity in the gas-fired power plants in winter, for example.

What will these gas-fired power plants be powered with in the future? With hydrogen or natural gas?

In 2035 it will probably still be a mix. I would guess that the focus will be more on natural gas. But hydrogen, which we have stored in the summer and autumn during the strong production periods of photovoltaics and wind, will then already make up perhaps a third or maybe 40 percent. Until approximately 2040 – when we will have 100 per cent hydrogen in the system.

Producing green hydrogen in Germany will probably not be cheap. Where will it come from?

According to current scenarios, about half of what we will need in gas-fired power plants will come from surplus electricity. The other half will not be produced in Germany, but imported, either by pipeline or by ship. It will be an exciting technological race between different producing countries; at least that's what we hope.

Would it also be conceivable for Germany to continue to purchase natural gas, burn it here and capture and inject CO_2?

It is conceivable. But I don't believe in it. From my point of view, the more likely scenario is that - in addition to green hydrogen, i.e., hydrogen produced with PV or wind power - we will also obtain blue hydrogen to some extent from 2035/2040. This hydrogen will be produced from natural gas, as before. In the countries that do this, the CO_2 will then be captured and put underground.

Where for instance?

Even if this may not sound opportune at the moment: for example, in Russia. Russia has large sources of natural gas, and it has all the necessary infrastructure. Moreover, unlike our densely populated country, Russia has an incredible amount of space to put this CO_2 underground in suitable storage sites and store it long term.

What interest should Russia have in it?

Russia has the problem, like all other exporters of fossil fuels, such as Saudi Arabia, the whole Middle East, etc., that they are running towards a world in which their products, with which they have so far represented considerable parts of their prosperity and their national budgets, are no longer in demand in the context of climate protection. So, they have to consider: How can we earn money in the future? The obvious thing for many of these countries, of course, is: I'll do it with renewable CO_2-free energy sources, for example with green hydrogen. Saudi Arabia, for example, has huge areas of extremely sunny land. There one can produce hydrogen with PV electricity and process it into synthetic paraffin or petrol, which then can be exported.

For you, natural gas is more of a bridging technology and not a technology that reaches far into the future?

CO_2 emissions from natural gas are significantly lower than from coal. But it is a fossil fuel that emits CO_2. If we want to reach climate-neutrality - and that is a reasonable goal - we must also gradually

replace natural gas with hydrogen between 2035 and 2045, or with synthetic methane, i.e., CO_2-neutral gas. And the production will happen in countries that have much better conditions for it; by producing either blue hydrogen or green hydrogen. In my view, this colour theory is not the decisive point. Both are ways that we can use well technically.

Let's talk about prices. At the moment, gas prices are going through the roof.

This is really a special situation we are in, right now. You can see that especially if you have been following the energy industry for 20 or 30 years. I think we have to assume that the average price will return to where it was in the last decades, namely between 10 and 20 euros per megawatt hour.

How much will hydrogen cost?

There are constant cost estimates, which, as with PV electricity, are constantly being corrected downwards. I think a realistic expectation is that in 2040 we will have a price of 40 to 50 euros per megawatt hour at the national border, that is including transport. So, in the medium term, hydrogen or synthetic methane will be significantly more expensive than fossil natural gas. But the quantities are lower because we are simultaneously electrifying and also advancing energy efficiency, so we won't need as much gas. That's why we might end up with a financial import volume similar to what we have at the moment. On average, Germany has spent around 60 to 70 billion euros per year on energy imports in recent years.

Electricity accounts for about one fifth of final energy consumption in Germany. Most of the energy we import is fossil. Will these proportions change if electrification continues?

Electricity currently accounts for about 20 percent of final energy consumption. I think we can assume that this share will rise to 35 to 40 percent. We will indeed electrify to a considerable extent, that is, replace molecules with electrons, if you like. Nevertheless, 60 percent plus X remains, which we have to solve differently.

Let's take another leap in time and find ourselves in the year 2050. What will be the ratio between Germany's own energy production and energy imports then?

Electric motors are more efficient than combustion engines by a factor of 3. But we will also save energy in households, for example by insulating buildings - perhaps not to the extent that is politically envisaged, but we will certainly make progress. Industry itself assumes that it will be able to save energy overall even with increasing output, i.e., with further economic growth. Currently, we have an import ratio of 70 to 75 percent. In 2050, this increasing energy efficiency will probably mean that we will only import 30 to 40 percent. That means we will remain dependent on imports, but not to the same extent as before. However, I believe that this will also be the case long term, and that is also sensible.

Why?

Germany is an extremely densely populated country, and the new energies, whether photovoltaics or wind, require a relatively large area. It simply does not make sense to produce all the energy in such a densely populated country as in Germany. It also makes no sense in terms of costs because there are regions of the world that are much more suitable: They have much more sun and wind and much more space. But there is another aspect that I find important, the economic aspect. We expect the world to continue buying our cars, our machines, our chemical products. Therefore, it is only fair that we also import. Up to now, that has included energy. And if we continue to do that, then we can also maintain this balance between imports and exports, which is important in terms of economic policy. Quite apart from the fact that energy exports also offer development prospects for the countries concerned.

What countries are you thinking of?

The entire Middle East, Russia, South America, Australia - all these countries are counting on being able to continue to generate economic prosperity and finance national budgets by exporting climate-neutral energy. That is why it is a win-win situation that we have had in the fossil world so far and that we should also have in a climate-neutral world in the future.

Listening to you, it all seems so simple. Where are the problems?

The difficulties along the way in Germany are mainly at the procedural level. We are incredibly bureaucratised. We have very

slow approval processes and also often long discussion processes to make decisions. We have interminable court proceedings. We can't afford this if we want to become climate neutral in 25 years. The second difficulty in Germany is the shortage of skilled workers, exacerbated by demographic change. This is a real bottleneck that has hardly been mentioned in the political discussion so far, and it is not something that can simply be changed; we also have to talk about targeted immigration. The shortage of skilled workers is a huge problem because we need skilled workers to be able to install the corresponding electricity grids, district heating grids, building renovations, heat pumps, etc. in the course of the energy transition.

Let's move away from Germany, what is your global view?

Globally, I am almost a bit more optimistic, there is an incredible amount of momentum all over the world. China is currently building a factory that will supply 60,000 MW of photovoltaics per year. That is as much as we have built in photovoltaics in the whole of Germany in the last 20 years. In Australia, a huge project has been decided aiming to produce hydrogen on a large scale in the desert with wind and photovoltaics in order to export it. A lot is happening there. And one should not forget that in recent years practically all the major countries in the world have committed themselves to climate neutrality. Whether it's China, India, South Korea, Australia, New Zealand, Canada, the USA, and so on.

What is special about the German way?

There is often talk that we are going down a particularly difficult path because we want to shut down nuclear power plants and at the same time get out of coal. I don't think that this is the decisive point. Even if we had kept the nuclear power plants running - which would have made sense from my point of view - that would be about 5 percent of the solution. That not decisive.

We are still in the year 2050. Let's get back to gas-fired power plants. What role will they play in the German power plant fleet?

In 2050, these are the conventional power plants that are still connected to the grid. They will be about the same size as the entire conventional power plant fleet today, perhaps 80,000 MW plus minus. And they will be hydrogen-fired and thus make their contribution in a climate-neutral way: to provide the same level of secure electricity supply that we have at the moment and have been used to for many decades.