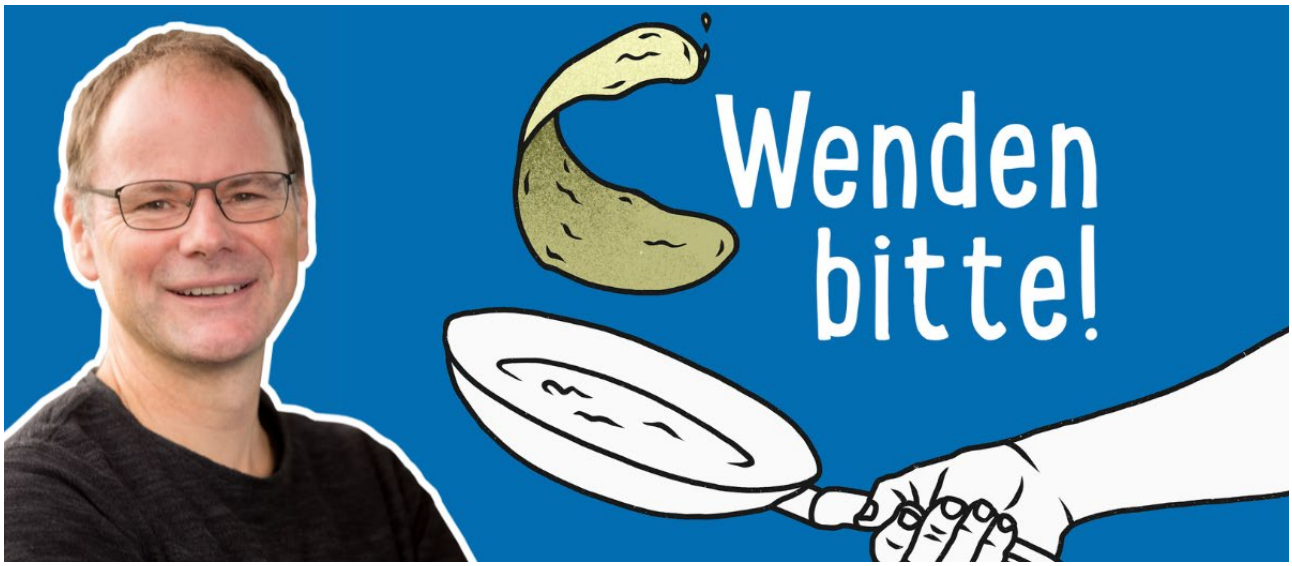

Transcript of the “Wenden, bitte!” [All change, please!] podcast:

Episode 14: “The heat transition”

Introducing the subject and today's contributors

Nadine Kreutzer:

Hello and a very warm welcome! Today we're back with you to discuss the issues of the moment around climate action and sustainability. And as we always do, we've teamed up with scientists from the Oeko-Institut who are going to share their wide-ranging expertise during the show. Today's subject is an issue that's currently all over the media and affects us all – heating. I'm Nadine Kreutzer, presenter and journalist, and I'm delighted that Mandy Schossig from the Oeko-Institut is here at my side again and has brought along another fascinating speaker.

Mandy Schossig:

A warm hello from me as well. I'm the Head of Communications and it's a real help that I can always invite experts from our large team of scientists. And yes, you said it; today's subject is one that is on many people's minds and unfortunately, I have to say, upsetting people. Because many of them are worrying about whether they'll freeze this winter, in the event that there isn't enough gas to go round. At the time of recording, which is mid-August, the taps of the Nord Stream 1 pipeline have been turned back on, but not at full flow. That means Germany is still receiving less gas, and at the same time, we also want to break our dependence on fossil fuels and rely on renewable energies in the future.

Nadine Kreutzer:

But right now that seems a long way off, given the sheer number of gas and oil-fired heating systems that are still found in German homes. And that's why our question today is:
How do we make the heat transition a success?

Mandy Schossig:

And to help us answer it, we've invited Dr Veit Bürger to join us. He is deputy head of the Energy and Climate Division at the Freiburg office of the Oeko-Institut and carries out research on the energy sector and heat generation. His work involves developing and evaluating policy instruments for the sustainable transformation of the buildings sector. This makes Veit the perfect guest to answer our questions. Welcome, Veit. I'm glad you're here!

Dr Veit Bürger:

Hello!

Nadine Kreutzer:

Hello, Veit! A very warm welcome from me, too! Now, at my parents' place we still have oil-fired heating. Here in Berlin, it's district heating. How about your place – speaking as an expert, what form of heating do you use?

Dr Veit Bürger:

Natural gas. I live in a listed building in the centre of Freiburg, in a top-floor flat, under the eaves. Our building has a 20-year-old gas central heating system and now, like many other people, we're weighing up our options: now what are we going to do about it in future?

Nadine Kreutzer:

Yes, Mandy was only just talking about the worries on many people's minds. So what do you do in winter to keep the cold at bay, apart from digging out your warm jumpers and socks?

Dr Veit Bürger:

Well, there's not really all that much you can do. You can make sure that the heating system is adjusted correctly so that it at least delivers the efficiency it's supposed to deliver. Otherwise, of course, there's economising, which means only heating as needed. Turning off the radiators when you leave the flat. I've already spoken to my two children, they love taking baths. I told them that taking baths will probably be a bit difficult this winter. Otherwise, quite honestly, lots of hope. Hope that the winter won't be too cold or hope that in the end, more gas will be supplied than we fear.

Mandy Schossig:

And have you and your neighbours now decided what to do about the gas heating system in your building?

Dr Veit Bürger:

We're discussing it intensively right now. I urged the owners' association to give some thought now to what we will do. Because the gas boiler is 20 years old and it won't last forever, and it's always good to have a plan up your sleeve. Gas heaters normally break down in the winter, and then panic breaks out and often the outcome is a new gas heating system. To make sure that doesn't happen, we are currently thinking very hard about what to do. Freiburg's city centre is in the district heating extension zone, which means that district heating will reach our building at some point. And that's the option we're currently pinning our hopes on.

Mandy Schossig:

Well, that's a pretty good example to start with, and one that might inspire our listeners. But tell me this – after all, we're reading so very many things in the media – what's your view of the situation? Are we really at risk from a cold winter or will our stored reserves be enough?

Dr Veit Bürger:

Well whether a cold winter is coming is, of course, hard for me to say. But just to mention two figures: in Germany we consume 360 terawatt hours of natural gas per year for space heating and hot water production. Germany's storage facilities have a capacity of 230 terawatt hours, which is two-thirds of that. Right there, we can see that, even with full storage facilities, if Germany receives no more gas supplies at all we have a problem. Because we need gas for more than just heating buildings. Industry also needs a lot of gas. A good one-third of German natural gas consumption goes to industry, meaning demand for gas is very high. The storage facilities do help us a bit, but full storage facilities don't automatically mean that we no longer have a problem.

Nadine Kreutzer:

Now today we don't just want to talk about heating and the looming capacity issues. We also want to look together at another question: how can we make the heat transition a success? And to give us all an idea of the issues, here's something we prepared for you. Have a listen!

Sound clip (brief subject overview)

At the moment many people are worrying that they'll have to freeze in winter because gas will be in short supply. Because of the war in Ukraine, Germany wants to become independent of Russian gas. But at the moment, most households still rely on oil or gas for their heating supply. Yet it's not just for political reasons that we want to switch from fossil-fuel heating; it's also for the environment's sake. So how do we make the transition to climate-friendly heating in the future? Zero emissions by 2045 is the German government's target. This means that the buildings sector must become climate-neutral. Last year, this sector was still producing around 17 percent of total CO_2 emissions in Germany. By the year 2030, emissions are supposed to be reduced by around 40 percent compared to today. Currently the sector is lagging significantly behind the climate targets. The German government has launched an urgent programme to greatly accelerate the heat transition. But will the planned measures be enough? What can we do to achieve the climate targets in the buildings sector and become independent of fossil-based energies?

Carbon footprint of "heating with oil & gas" and climate-friendly alternatives

Mandy Schossig

So lots of questions remain to be answered and lots of action is needed. Quite apart from political reasons to stop using gas (from Russia), just how much is the climate actually harmed by heating with gas?

Dr Veit Bürger:

Well, natural gas is a fossil fuel, so burning natural gas produces CO_2 Now for a very long time we've had this narrative that heating oil is something dirty and natural gas is something clean. But that's wrong, once we look at the amount of emissions released by burning the two fuels. For heating oil, it's 270 grams per kilowatt hour, and for natural gas, 200 grams per kilowatt hour. In other words, natural gas is cleaner – but far from climate-neutral. The combustion of natural gas still generates emissions. And that's why we not only need to phase out heating oil but also natural gas, and just as quickly.

Nadine Kreutzer:

You've already talked about the carbon footprint of the two fossil fuel-fired heating methods. Out of interest, how many of these fossil fuel-fired heating systems are there in Germany?

Dr Veit Bürger:

In Germany we have approximately 19 million residential buildings. Of these, around 40 percent have gas central heating and 30 percent have oil-fired central heating. So that makes some 13 million gas and oil-fired boilers. Added to these are systems which can be termed "self-contained gas central heating". They're buildings where each individual flat has a heating system and its own gas boiler. That's another four million or so. So we're talking about gas and oil-fired heating systems in the double-digit millions which all need to be replaced successively.

Nadine Kreutzer:

And does this apply only to private households? Or are oil and gas-fired heating systems also found in other sectors?

Dr Veit Bürger:

Next, we also have what we call “non-residential buildings”, which are commercial buildings, industrial sheds, schools, public buildings, hospitals... in other words, all buildings where nobody lives but which are used for work, repairs and storage. There are approximately two million such buildings. To be honest, we have no idea exactly how many of them have gas heating systems. But we can assume that a large proportion of them are still being heated with gas and heating oil today. That figure also has to be added to the total number of boilers.

Mandy Schossig:

Coming back to private households again: we need energy for all kinds of different things – for lighting, domestic appliances, cooking and so on. Is it possible to say how much of that energy a household requires for heating? Or is it not really possible to compare, because one is electricity and the other is gas or oil?

Dr Veit Bürger:

It’s certainly true to say that the lion’s share of energy consumption in private households is due to either heating or hot water consumption. And that is generally natural gas or heating oil.

Mandy Schossig:

So it does make a big difference if you economise. Now let's squeeze in a little public service question: how much can we really save if we turn the heating down by one degree?

Dr Veit Bürger:

There are studies on that, and they all say about five to six percent per one degree reduction in room temperature. It means that if you normally maintained an indoor temperature of 21 degrees but now turn it down to 19 degrees, you save approximately ten percent.

Climate targets in the buildings sector

Nadine Kreutzer:

We just heard in the clip that the buildings sector is another area that’s still a long way from hitting the climate targets. What targets are they, exactly?

Dr Veit Bürger:

The targets for the buildings sector can be found in Germany’s Climate Change Act. The legislation specifies what level of emissions will be allowable for each sector, including the buildings sector, by the year 2030. The level for the sector is 67 million tonnes of CO2. Today about 115 million tonnes of CO_2 come from the buildings sector. So we‘re talking about a reduction of around 40 percent by 2030 – that is, within the next eight years.

Mandy Schossig:

Why are we still doing so badly? What do you make of the figures?

Dr Veit Bürger:

The buildings sector is a very difficult sector and there are several reasons for that. First of all, it involves a very, very large number of players. It’s not like industry, where of course there are also a

large number of companies, but nowhere near as many companies as there are private households or private buildings, or even building owners. We have 19 million residential buildings and very close to that number of owners. In other words, millions of investment decisions are involved, and these need to be made in the right direction. And at the same time, often we‘re not talking about investments of 100, 200 or 500 euros but much more in terms of five-figure sums, for example if we’re refurbishing a detached family house for energy-efficiency. The investments involved are sizeable. And it’s the combination of these two things that makes transformation in the sector so difficult.

Nadine Kreutzer:

Yes, that is a very intriguing point. I do remember the expert consultation we had at home about our oil heating system and when it came to the bottom line amount that someone would have to invest, it was a mind-boggling sum. And I’m sure millions of people in Germany think the same! So what’s going on with the German government's plans? After all, they want to close this gap somehow. Once again, can you sum up for us what they have planned?

Dr Veit Bürger:

In its coalition agreement, the German government set out a whole range of very good approaches. Very briefly, I would like to name three: one is called the “65 percent requirement”. It was agreed in the coalition agreement and the subsequent papers that from January 1, 2024, or in about one-and-a-half years’ time, every time a boiler is replaced, the new system must run on 65 percent renewable energy sources. The result will be that it’s no longer possible to replace a gas boiler with a new gas boiler that doesn’t use renewable energies. Then there’s a range of proposals or plans to make the complete package of building subsidies much more compatible with the targets. So that the state only provides financial support for things that are in conformity with the targets. And then there is a range of other instruments, such as “municipal heat planning”, all of which are aimed at encouraging not only building owners but also large housing companies to make investment decisions in the right direction. So that when money is invested in the building, it’s done in a way that also makes the building compatible with climate targets in the long term.

What does the “heat transition” mean?

Nadine Kreutzer:

We’ve already used the word “heat transition” a few times. Our show is always about transitions! Can you say a bit more about this term? What exactly does it mean? What are all the parts that make up the heat transition?

Dr Veit Bürger:

Generally people always imagine that the heat transition only applies to buildings. And of course the heat transition does involve the heating of buildings. It’s about refurbishing buildings, improving their energy performance so that they consume less energy. And at the same time, it’s about converting our heating systems to renewable energies. But as well as buildings, the heat transition includes other kinds of heating – for example, all the process heat in industry. Large industrial companies often need heat for their production processes, at varying temperature levels – some require several hundred degrees of heat while others need lower-grade heat of around 100 degrees. All these are applications that we gradually have to make climate-friendly, and they come under the heading of the heat transition as well.

A climate-neutral heat supply

Mandy Schossig:

And can you give us an equally good summary of what a climate-neutral heat supply will look like in the future?

Dr Veit Bürger:

The heat transition can broadly be subdivided into a few different pillars. At the top of the list is, of course, efficiency – “efficiency first”, as we say. This is ultimately about reducing the demand for heat. For buildings, it means insulating roofs, insulating external walls, and replacing windows to improve efficiency. And then if we go down to the boiler room, which is where the heat is generated, there are two key technologies:

On the one hand, heat pumps, which are powered by renewable electricity and then produce heat. That’s one of the key technologies among heat generation technologies, and the other technology is district heating. This needs to be developed, but also made climate-neutral at the same time. Particularly for such built-up urban areas as cities, for the most part there’s no better alternative form of supply than district heating.

District heating

Nadine Kreutzer:

Yes, now at this point it would be great if you could give us an explanation of district heating as well. What does it mean exactly? How does it work? And as an individual tenant, how can I find out whether it's an option in my neighbourhood? Can you request it individually, or do you need a number of people to get a supply laid on? Explain it to us, please!

Dr Veit Bürger:

District heating is effectively a network of pipelines running underneath the street, which pipes hot water – steam as well, in the past, but nowadays it’s hot water – into the buildings. And then inside the building is a transfer station. Essentially, this is a heat exchanger where the building’s heating system draws off heat from this pipeline system in the street. But district heating is actually just an infrastructure, a pipeline system.

And the really interesting question, of course, is this: which energy sources actually feed into this network? Now where does the thermal energy that’s being piped into the buildings come from? Here again, renewable heating technologies play a major role. Large heat pumps, for example, use solar thermal energy. Many municipalities in Denmark have large solar collector fields which collect solar energy and then feed it into the pipelines. Then there is biomass – meaning wood – but also industrial waste heat. Because many industrial plants produce excess heat. It’s often released into the air via chimneys or ends up heating rivers – in other words, it’s cooled away. Well instead of that, this heat can be used for heating buildings and for district heating. It’s a very, very interesting and important source for the generation of climate-neutral heat.

Nadine Kreutzer:

For district heating to be CO_2-neutral, it must be based on renewable energies. What is the carbon footprint of district heating today?

Dr Veit Bürger:

Today, a great amount is generated from natural gas, with coal in some cases as well. District heating still has a worse emission factor today – in terms of how many more grams of CO_2 it emits per kilowatt hour of heat – than a modern gas heating system, for example. But the phasing out of coal is forcing many companies to give urgent consideration to how they can gradually convert the heat generation for their district heating to renewable energies. Or indeed how they can use waste heat, as I said earlier. Obviously, the pressure is now mounting due to the shortage of gas. That means we expect district heating to become progressively cleaner and more climate-friendly in the next few years. But that, of course, is still a long way off and will involve massive investment. And it won't happen overnight, and certainly not of its own accord.

For that as well, we need political instruments so that district heat producers and district heat supply companies are not only required do it by regulatory law but are also given subsidies, so that they can complete this changeover as rapidly as possible.

Other alternatives for climate-friendly heating

Nadine Kreutzer:

So are there any other climate-friendly alternatives for heating?

Dr Veit Bürger:

Well, another of the renewable heating energies is solar thermal energy. These are solar collectors on the roof, which are normally used to produce hot water. But for most households this only makes up ten to 15 per cent of their total demand for heat. So solar thermal on its own is not sufficient for a renewable heating system. And then, of course, there's also biomass. When it comes to buildings, this is primarily wood, and we have to view this use of wood very critically because wood is a finite resource in Germany. And when I talk to my colleagues who are working on the electricity sector, or other colleagues looking at industry or specialising in transport, of course each person in those discussions wants to grab the biggest possible piece of this "wood pie" or this "biomass pie" for their own sector.

But if we really consider it from a system perspective, we find that wood is best used where there are few other alternatives – in industry, for example. If I have an industrial plant that requires heat at a very high temperature level, then wood is suitable for that.

However, putting wood in a wood-burning stove or in a wood-pellet stove to generate our heat is actually almost a waste, because there are other alternatives. And that's why we take a relatively critical view of using wood for heating in buildings. Of course there are exceptional cases. Let's imagine a listed building which isn't easy to refurbish for energy efficiency and which can't be connected to district heating because there simply isn't a district heating network. For a building like that, it makes sense to use wood. But those are highly selective, exceptional cases. The widespread use of wood should really be avoided.

Heat pumps

Mandy Schossig:

Right, so now let's come onto the subject of heat pumps, which you also mentioned earlier. Alongside district heating, they're the second major pillar in this subject of heating. And I hear you've recently published a study on this, which emphasises the potential of this technology for the heat transition. Explain just to begin with, how do these heat pumps work? What are they like in terms of carbon footprint? And why do they actually have so much potential?

Dr Veit Bürger:

Well, in principle everyone already has a heat pump in their home, namely their refrigerator. A heat pump is nothing other than a refrigerator in reverse. The fridge is there to produce cold. And the waste product is heat. All the heat pump does is to make use of heat. From that point of view, it's a relatively familiar technology that has been around for a long, long time.

The heat pump essentially runs on electricity. And what the heat pump does is to utilise what we call "ambient heat" or "environmental heat". The source can be the air. But it can also be groundwater, for example, or the heat in the ground – that is to say, relatively low-temperature heat. To raise this environmental heat to a temperature level with which we can then heat our buildings, I need electricity.

And that's also the answer to the question about climate impact. A heat pump is as clean as the electricity I use to power it. So if we take a look at the targets for expanding renewable electricity generation, which are extremely ambitious, reaching 80 per cent by 2030, then heat pumps will gradually become more and more climate-friendly. But even when they run on today's electricity mix, heat pumps are distinctly more climate-friendly than gas or oil heating, at least in buildings where they are run efficiently.

Nadine Kreutzer:

A listener has asked us about heat pumps and whether there will be more efficient heat pumps in the foreseeable future than those currently on the market.

Dr Veit Bürger:

The heat pumps that are on the market today are already very efficient. A heat pump's efficiency depends mainly on the size of the difference in temperature between the source temperature, meaning the outdoor air or the soil or groundwater – the temperature difference from this source temperature to the temperature that I need in the radiator. The smaller the difference, the more efficient the heat pump. So I have to try to make this temperature difference as small as possible. Obviously, the air temperature or the soil temperature, I can't really influence. But the room temperature or my heating circuit temperature, I can. And that depends on questions like: how big is my room? how high are the ceilings? how well is my building insulated? But also: how big are my radiators? The larger the radiators, the lower I can go with the temperature level and still get my flat warm.

This is being tackled by fellow scientists, mainly from the Fraunhofer Institute for Solar Energy Systems, just around the corner from us here in Freiburg. They're evaluating heat pumps. In the last few years, they've been looking at how efficiently heat pumps work, including in existing, and in some cases unrefurbished, buildings. They've found that the current generation of heat pumps can be used very efficiently even in those kinds of buildings. Sometimes minor works are needed. Sometimes it's necessary to replace the radiators with larger radiators in one or two rooms. But then such a heat pump can be used relatively efficiently. It also helps that some of the radiators in the flats are hopelessly oversized and can therefore make do with lower temperatures, so that they can be operated with heat pumps.

Mandy Schossig:

And if we come back to this issue of size, there's also a kind of myth – because this area needs to be so large – that you can only install these heat pumps for new builds or underfloor heating systems in any case. Is that actually true?

Dr Veit Bürger:

I hear it time and time again, unfortunately – time and time again, even from energy consultants. And back when I started at the Oeko-Institut 20 years ago, that was indeed the case – but the world has moved on, research and development units have also moved on, and after all these years it's just not true any more. We've seen from empirical monitoring that heat pumps work well with radiators, too. It's just that you have to look closely at a few things: is the flat or the building suitable? how well insulated is it? what sizes are the radiators? But a good energy consultant and a good system designer will see all that relatively quickly.

And these days, we also see that more of the heat pumps sold per year now go into existing buildings than into new builds. And not all of these existing buildings have underfloor heating; in fact, a lot of the buildings are heated with perfectly normal radiators.

Nadine Kreutzer:

As I mentioned earlier, in my hometown we have oil heating and we're now faced with the problem of what to do. And on the one hand, there's the option of installing a heat pump in the house or having a deep borehole drilled in front of the house. So now we're introducing another new term. Maybe you can just explain deep boreholes in one sentence? And then I'd like to ask you something else about the heat pump, too, because a heat pump doesn't necessarily sound all that big. But in our building it would actually mean two pieces of equipment, and they're pretty large boxes that you have to install behind the house. They're on a scale that I didn't expect at all. And I imagine they make a bit of noise, too...

Dr Veit Bürger:

Heat pumps need an energy source or a heat source that they can draw on. And the simplest one is, of course, the air. But there are also heat pumps that take heat from the ground. That can be done, if you have a big garden, by laying coils of pipes under the lawn or in the garden – a ground collector is the technical term – and drawing energy from the ground at a depth of maybe one metre. Or you drill something called an "earth probe", which is very deep, 100 metres for example, and that reaches higher temperatures because 100 metres down, it's a bit warmer than just below the soil surface, especially in winter. That is the most expensive way of obtaining environmental heat.

We call this "source exploitation", meaning accessing the heat source. It's a challenge because drilling the earth probe is very expensive. Things are easier if I have a detached house with a garden, for example, because I can place the air source heat pump somewhere in the garden. It's more of a problem with inner-city apartment buildings because if this fan is in the courtyard, there will be a certain level of noise emissions. They're getting quieter all the time, for sure, but nevertheless, you do hear it because there's a fan moving inside a casing. You can also put it on the roof, but the noise emissions are an issue, especially if more and more people install air source heat pumps.

We know that the manufacturers are already making them quieter and quieter. But there is also the psychoacoustic effect. Even the sight of one of these outdoor units can make people feel stressed and uneasy. And you might well laugh about that, but at the end of the day it's a fact, and these effects are really there, so we have to take them seriously. And most people won't find the housings,

these boxes, aesthetically appealling. But there, too, progress is being made. They look much neater now. Designers are getting to grips with that. So there is quite a lot going on. And particularly now that the heat pump has been identified as one of the key technologies, many companies are working on refining them, making them quieter, making them nicer looking, and also making them cheaper. Which is another important issue for the heat transition.

Costs and subsidies

Nadine Kreutzer:

Of course both these approaches cost an unbelievable sum of money. And that's a concern for many, many people in Germany who have to consider: how am I supposed to afford this? how can I finance it? My boiler isn't even all that old, and now – even though I would actually like to do my bit for the environment – am I really expected to spend that amount of money? The final bill ends with so many zeros that I'll have to invest a five-figure sum. One feels as if the end-user is the loser, if I can put it like that. What's your take on this situation? What's the best way to handle it?

Dr Veit Bürger:

Again, this needs to be considered in a slightly more nuanced way. We have to differentiate between the investment costs, meaning the purchase cost of the heat pump, and the running costs once it's installed. When it comes to the running costs, the heat pump runs on electricity and needs considerably less electricity than the amount of gas that a gas heating system needs. But of course it's important to consider which way electricity costs are likely to go in future. And that's crystal-ball gazing. Just like predicting what will happen to gas costs.

But right now, the cost of gas is showing us the scale of the price hikes that happen during crises, like the war in Ukraine, but also due to other constraints on gas supplies. I would argue that the likely movements in both gas prices and heating oil prices pose higher risks than the movements in electricity prices.

Regarding the purchase costs, at the moment a heat pump does indeed cost considerably more than a gas boiler. Here again, there are two effects that come into play – one is the purchase cost of the heat pump itself, and the other is the cost of paying the installers to come and install it. We can assume that the purchase costs will go down significantly in the next few years simply because heat-pump manufacturers will be producing many more heat pumps and this will make a noticeable price difference. Prices will fall. The issue with the installers is that they all have full order books, and of course this is reflected in the prices they quote.

It's a political task and one of the very big challenges of the heat transition to get a grip on this bottleneck, namely the shortage of skilled workers, so that we have enough people installing heat pumps. This will bring down the installation costs. But at the same time, particularly for heat pumps, we also need systems that are quick to install, easy to install, which are robust and tolerant of installation errors. We don't yet have all that, or it's very early days. But the direction of travel will become clear in the next five to ten years.

Political programmes to promote the heat transition

Mandy Schossig:

You mentioned political tasks just now. So what are the German government's plans for helping with this changeover from oil and gas boilers to heat pumps or district heating?

Dr Veit Bürger:

The German government is effectively planning two things: it has released a consultation paper and there is already a public debate on the central regulatory instrument, which is known as the "65 percent requirement". This states that from January 1, 2024, every replacement heating system must use at least 65 percent renewable heat. And that is a very efficacious instrument, because then it will no longer be possible to replace an old gas boiler with a new gas boiler, not even a more efficient one.

And in parallel, of course, there are also funding programmes. The German government is providing funding through a programme called Federal Funding for Efficient Buildings (BEG). This is a Federal Government funding programme with a budget of four billion euros per year. That means, if I invest in a new heat pump or a wood pellet boiler or a solar collector, I'll get a decent subsidy from the state. The subsidy rates have just been lowered somewhat, but I still get around 35 percent of the investment costs – that's one-third of the investment costs – subsidised by the state to reduce the purchase costs for me.

Mandy Schossig:

Yes, there's still quite a lot to be done. So if gas and oil heating systems are going to be banned in future, well not banned directly but in the way you just explained, using the 65 percent rule, how is that going to be regulated during the transition period? I mean, when the majority of households no longer use any gas at all but a few buildings are still dependent on the gas supply? How will things look then?

Dr Veit Bürger:

This is a very, very important issue but also a relatively new one. If we phase out the gas supply for heating buildings, in the end the entire infrastructure, meaning the gas distribution networks, will gradually become superfluous. At least in parts of districts. And so far, that hasn't really been dealt with or covered by the regulatory instruments. We do have regulations on how to get new buildings onto the gas supply, but no real regulations on how to take buildings off the gas supply again.

Let's assume we have a street of buildings, and more and more of the buildings are taken off the gas supply. When does it actually reach the point that the gas supplier says: it's now no longer worth our while to supply gas at all, for these one or two buildings? What does that do to the costs, because the maintenance costs for the gas network are then shared out among ever fewer people? What about all the money invested in the gas distribution networks in the past, which is depreciated over decades? And probably, if I invest one euro in a new gas distribution network pipeline today, I will no longer be able to write it down completely – at least that's my working assumption – under today's regulatory framework.

So what we need, and this falls to politics, is a regulatory framework that regulates the phase-out of the gas supply. The discussion is starting, it has already made an impact in Berlin. But the discussion is only the beginning – we also need solutions to the issue.

Mandy Schossig:

One of the things you mentioned earlier was municipal heat planning. Maybe we can pick that up again in this context. How might that promote the heat transition, and what does it mean?

Dr Veit Bürger:

Municipal heat planning is a new and, from our point of view, a very important instrument. Municipal heat planning is a strategy; it obliges municipalities to develop a heat transition strategy. And unlike normal municipal climate protection strategies, it's about developing strategies that are truly spatially specific. Under municipal heat planning, maps are developed to show the current status quo – where are there oil heating systems today, where are there gas heating systems, where are there gas pipelines, where are there district heat pipelines and how is the situation developing? How should it ideally develop in the future? And that makes it possible to identify areas where more district heating should be developed, in other words district heat priority areas. It gives people guidance on whether heat insulation and heat pumps are the best option for a climate-friendly heat supply on estates of detached housing.

That is to say, municipal heat planning is a tool which can also guide the investments of individual building owners. Lots of people really don't know what the best option is for them. Even in the street where I live, for a long time we didn't know if district heating would eventually reach us. This kind of guidance is just so important for coordinating investment decisions, but also for preparing infrastructure decisions. If I know that a particular street will stop needing the gas distribution network in the long term, then I need not keep renovating it. And things like that affect both individual investment decisions, but also overarching infrastructure decisions, on gas networks, heat networks, and also electricity grids. That's where municipal heat planning is a very, very valuable, very important instrument. And we can see in other countries as well, particularly in Denmark, for example, how valuable such an instrument can be.

Energy-efficiency refurbishment

Nadine Kreutzer:

So we've now talked a lot about heating. As another part of the overall heat transition, you mentioned refurbishments and more efficiency in buildings. And thinking back to our own consultation, I recall the expert saying: "Well, what I'd do before anything else is replace all the windows and then see how much you consume, and then decide on the right method." So what options are there? Focusing on efficiency.

Dr Veit Bürger:

Efficiency is about making the building envelope more efficient. And what are the relevant structural elements? We're talking about the roof, the outer wall, the windows, and the ceiling to the basement beneath. These are all structural elements that can be insulated – the roof, exterior walls and basement ceiling. And regarding the windows, it's essentially a matter of installing very efficient windows with thermal insulation glazing. The physics of it are relatively simple, but these are, of course, comparatively expensive measures.

Mandy Schossig:

And what is the German government planning to do about this, to speed up the refurbishment of buildings?

Dr Veit Bürger:

For efficiency with regard to building refurbishment, again there are both regulatory plans and subsidies. In terms of regulatory plans, an instrument is currently being discussed. This actually comes from Brussels via the European Commission. But the German government announced in its coalition agreement that it was actively supporting this discussion. The instrument in question is known as “minimum energy performance standards”, which we always abbreviate to “MEPS”. And these MEPS define minimum efficiency standards for certain building cohorts, meaning certain parts of the building stock, which have to be achieved at a certain point in time.

So we can divide buildings according to their energy efficiency, like refrigerators, into classes from A, B, C, D right up to H. H is very inefficient, A is very good. And the idea is that by 2030, for example, all buildings in efficiency classes H and G, the two worst efficiency classes, must achieve at least efficiency class C or D. That system can be used to gradually refurbish the entire building stock to a certain minimum standard, working successively and always starting with what Brussels calls the “worst performing buildings”.

The advantage of this is that it lets every building owner know when it’s their turn, and what they have to achieve by when. So that gives them planning security, which enables them to schedule their refurbishment in a way that somehow fits into their renovation cycle. For example, if they were going to repair the roof anyway, they could do the energy-efficiency refurbishment at the same time and ensure it’s done to the standard that’s compatible with the target.

The German government is already implementing the second point of its funding programme by more or less aligning our entire funding landscape towards target conformity. Until now, we also used public money to subsidise energy standards that were not compatible with the targets. This is now being progressively changed so that only those refurbishment measures which relate to our long-term vision of a climate-neutral building stock will be subsidised.

Mandy Schossig:

Okay, then the other question that arises in the case of refurbishments is, who’s going to pay for them? Let's take the example of my in-laws again. They have a house, quite an old one, which probably last had new windows in the 1980s. But now they’re retired and on a relatively low income. If they want to do an energy-efficiency refurbishment, which is quite costly, do they have to cover the costs themselves or is there any financial assistance? You already said that there is some, but what can be subsidised and where can people go for specific information? Maybe this is a good moment for another little public service spot.

Dr Veit Bürger:

Germany has a very extensive funding landscape, but the most important funding programmes are those at the Federal Government level. These are organised and operated by [the German development bank] KfW, or by the BAFA, the Federal Office for Economic Affairs and Export Control. People can get relatively good subsidies both for the renovation of the building envelope, i.e. external walls, insulation, roof insulation, replacement windows, and for replacing or investing in environmentally friendly heating systems.

But the question is a broader one, of course: how will we finance the complete remodelling of the buildings sector? And we are not just dealing with owner-occupiers. We also have lots of rented buildings in Germany. Then there is the problem that the landlord or landlady is required to invest, but the beneficiary is actually the tenant in the form of lower energy costs. So how do we balance out the costs and benefits so that there are sufficient incentives to renovate and the benefits are shared out in such a way that everyone ends up with something? That’s a very difficult task because

Germany is not particularly homogeneous. In conurbations the situation is completely different than in the countryside, where the costs invested in building refurbishment can't easily be passed on to tenants. Questions like this have to be taken into account, and that's not easy. But they are already being given plenty of thought.

Nadine Kreutzer:

Yes, and it's really interesting that you've brought it up. Now we've talked a lot about owner-occupied property, but if you're a tenant in a big city and you'd like to have your flat refurbished for energy efficiency, how can you apply? Is it quite straightforward? Who pays for it? Or do you really have to create incentives for the landlord first, to get that under way? What options do you have, if any, if you live in a rented flat?

Dr Veit Bürger:

You have to go via the landlords and try to persuade them to renovate the building. The normal situation tends to be that due to regulatory requirements or funding programmes, landlords are already incentivised or, to put it bluntly, forced to refurbish the building. As a tenant, you have relatively little scope to get actively involved.

Of course, I would recommend approaching the landlord and trying to talk to them. But also, if they have decided to refurbish the building, there are lots of cases where tenants sue, where they try to prevent the renovations. Obviously this is very counterproductive for climate protection. If I, as a tenant, sue against the refurbishment, then at some point the landlord will say: "Then I just won't refurbish." And then the building won't be refurbished and its energy consumption will stay high and so will its CO_2 emissions.

Mandy Schossig:

Coming back to the distribution of costs: what you just said, Nadine, is that they're passed on to me as a tenant. What is the position on this today and what does the German government plan to do to perhaps distribute these costs more fairly?

Dr Veit Bürger:

Well, according to tenancy law in Germany, the landlord can add eight percent of the investment costs for energy-efficiency refurbishment to the "cold rent" [rent excluding heating costs] on a permanent basis. And there are, of course, regions where this works without any problems and where it's already happening to some extent. But there are also rental markets, especially in the countryside or in areas that people are moving away from rather than moving to, where there are many vacant flats and buildings – and no way can I, as a landlord, pass on the eight percent because my tenants would immediately move out. And then I've refurbished but my building is vacant. These complexities have to be considered.

What the German government is planning is a kind of "warm rent" [rent including heating costs] model. The first projects, considerations and calculations for this already exist. The landlord invests in the building refurbishment and the tenant ends up paying exactly the same rent as before, as a total of "cold rent" plus energy costs. In effect, this means that while the tenant's energy costs are lower, the cold rent is raised by the corresponding amount so that the landlord has money to refinance the investment. But often it's not enough, and that's why it's always a combination of contributions by tenants, contributions by the landlord and ultimately contributions from the state. That means we need state support in the rental housing sector as well, so that sufficiently high incentives are set for landlords to make the necessary investments.

Standards for new builds

Nadine Kreutzer:

Right, so now we've talked about building stock that has been owner-occupied for decades, and about the rental situation. But there are also people who have built or are planning to build new homes. What's the deal there? What standards are needed for new builds, to make them energy-efficient and as climate-neutral as possible? Are there long-standing laws on this and I only have to look them up and then I'll know how to start? What's the situation in this respect?

Dr Veit Bürger:

The standards for new builds in Germany are laid down in a law called the Buildings Energy Act. It specifies what minimum standard I must meet when I construct a new building. And the new German government tightened the minimum standard in July. In future, you will have to reach the so-called "Efficiency House 55" standard, at least on some criteria.

From our point of view, it's necessary to ensure that new buildings are constructed as efficiently as possible. It's substantially easier to build an efficient new building than to refurbish an existing building to improve its energy efficiency. And that's why you should get it right first time if you build a new home. This ideally means going straight for passive houses, or at least houses that meet the "Efficiency House 40" standard. These buildings are very, very well insulated, and although they still have a heating system, of course it's usually a renewable heating system, and they no longer need so much energy input.

I also think that the German government should implement what was planned: it should go ahead and ban the use of gas boilers and oil-fired boilers in new buildings. They are no longer needed. Heat pumps can generate heat in buildings very, very, very efficiently. And every gas boiler that I install in a new building today will still be there in 2045. It will then ruin our carbon footprint. Seen in those terms, it's almost anachronistic to put a heating oil or gas boiler into a new build today.

Outlook and conclusion

Mandy Schossig:

Okay, thanks. I think we've now covered the complete heat transition package. As always, we end the show with the Chancellor question. So Veit, you now get to put yourself in the role of the German Chancellor and tell us what you would do as Chancellor to drive forward the heat transition.

Dr Veit Bürger:

Well, in actual fact I'm a scientist, and very deliberately didn't become Chancellor! But if I were the Chancellor, I would simply implement the coalition agreement. The coalition agreement contains some really good things which, if they are properly implemented, can be very efficacious. So it has potential. Of course, coalition agreements are in coalition-agreement language. Important matters are dealt with in one or two sentences. And afterwards everyone wonders: how are these meant to be interpreted? But if they're interpreted correctly and the many good approaches are fleshed out really well, then this coalition programme, as we always call it, really has huge potential. Everything is in there. The seeds have been sown, now we only need to water them. And that's what I would do as Chancellor.

Mandy Schossig:

And that's a pretty optimistic note to end on. Do you have any final tips for our listeners if they want to find out more about the subject?

Dr Veit Bürger:

Well, to find out about possible subsidies or refurbishment options, it always makes sense to request information from the KfW or the Federal Office for Economic Affairs and Export Control, especially about the available subsidies. Many municipalities have small energy agencies, regional energy agencies, staffed by knowledgeable colleagues who can advise on the best type of refurbishment in each particular case. Or there are energy consultants you can approach if you're more interested in the policy instruments. As in, what's the current state of play? What proposals are in the pipeline? You can always check the website of the Federal Ministry for Economic Affairs and Climate Action to keep up to date with developments. And any time you're interested in proposals from the scientific community, you can go to the Oeko-Institut website, of course. That also has comprehensive material on the issues.

Nadine Kreutzer:

It's been great that you could join us today as an expert from the Oeko-Institut and give our podcast the benefit of all your expertise. Because we were keen to talk about the heat transition and I hope there were lots of good takeaways for everyone listening. I've really enjoyed myself. And a lightbulb went on in my head at various moments. Maybe it will help with knowing how to deal with the situation in future. Veit, thank you very much for your time!

Mandy Schossig:

Yes, thank you, and all the best!

Dr Veit Bürger:

Bye! I really enjoyed myself, too!

Nadine Kreutzer:

So we still have one last episode to come this year. Next time, it's a very political subject that is also very much in the news.

Mandy Schossig:

Probably at least some listeners have heard of emissions trading, for industry and for the energy sector. It has been an important EU instrument for climate protection since 2005, aimed at reducing emissions. And at European level, a process known as the trilogue will be opened in autumn, where the EU Commission, Council and Parliament will convene and discuss extending emissions trading to other sectors – buildings and transport – but also tightening up emissions trading. What does this actually mean? Who is trading what emissions? How does that contribute to protecting the climate? We'll be taking a closer look at all that next time.

Nadine Kreutzer:

If you've got questions about that already, you're more than welcome to get them off your chest and send them to us in advance at podcast@oeko.de. And of course we'd also be grateful for a quick review on Apple Podcast or Spotify. And with that, we head into the final lap for this year in the next episode. So stay tuned, and many thanks for listening. See you again very soon!

Mandy Schossig:

Until the next time, goodbye!