DISTRICT HEATING

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With the Russian war in Ukraine, the European Union is looking at ways of accelerating the green transition and replace fossil gas in sectors like heating and power generation. Can district heating play a role?
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Gas crisis accelerates energy transition in district heating

By Frédéric Simon | EURACTIV.com

The war in Ukraine is shifting the economic fundamentals behind the choice of fuel supplying district heating networks, with large-scale heat pumps becoming a more attractive option for energy operators looking to decarbonise.

District heating – networks of hot water pipes running below the ground – supplies millions of homes in cities across Europe, representing about 10% of heat supply in the EU.

Yet, most of that runs on polluting fossil fuels - chiefly natural gas and coal which currently make up around 30% and 26% of the fuel mix, respectively, according to EU-wide industry figures.

Before the Russian invasion of Ukraine, many eastern EU countries had made plans to switch their district heating systems to fossil gas, which produces about half the global warming emissions of coal when burned in power plants.

That was seen as a cost-effective way of meeting EU climate goals. But with gas prices going through the roof, these assumptions are now being turned upside down.

“The economics of heating with gas have completely changed,” says Jan Rosenow, director of European programmes at the Regulatory Assistance Project (RAP), a non-profit group dedicated to accelerating the transition to clean energy.

According to Rosenow, the reason why European countries have used so much gas and coal in district heating is simple – it’s because they were cheaper to run. However, he says that has changed: coal and gas have become more expensive, while in the meantime, the cost of renewable electricity and heat pumps has come down.

“In Europe, we’ve benefited of fairly low gas prices for a very long period because we got lots of our gas from Russia. And that is that is now completely changed,” he said. “For many years, there was this story that gas would be used as a transition fuel to replace coal in district heating. But I think now there’s a much stronger case to say that’s no longer a viable strategy and that we need to leapfrog to something else”.

District heating plant in Borås, Sweden, January 2019. [stilrentfoto / Shutterstock]
Just what this something else will be is not entirely clear yet, with many options available.

OPTIONS ON THE TABLE

One vast untapped resource is waste heat produced by industry and the power sector. According to an EU-funded research project, Europe “could save all of the natural gas currently used for heating buildings” by collecting this waste heat and feeding it through district heat networks.

The big advantage of using waste heat is that it doesn't require additional power generation capacity to be installed. “This is why we have to focus on reusing waste heat from industrial facilities. This is a huge untapped potential that does not require additional energy supply,” says Birger Lauersen, President of Euroheat & Power, the association representing the district heating sector in Brussels.

The downside is that collecting and distributing waste heat requires building new pipeline infrastructure, which can take years to complete because of administrative complexities or political apathy.

Another increasingly attractive option is large-scale heat pumps. “In Denmark, Finland, and Sweden, we have seen an increasing number of those being used to supply heat for district heating,” Rosenow says. “So there is a shift happening. And where we’re going next is clearly in favour of renewable electricity and heat pumps.”

Biomass is also becoming more competitive compared to gas, even though that can be problematic from a sustainability perspective because it involves felling trees, which play an essential role in cooling down the earth’s climate.

“I’m not a big fan of burning biomass for heat,” Rosenow says. “But clearly, the new geopolitical situation with gas is making biomass a lot more cost-competitive. And I think there’s a risk that we switch off the gas and coal generation and use biomass instead. But the economics are driving us in that direction.”

In Poland, energy groups are looking at all options available to decarbonise district heating.

The challenge for them is huge: nearly six million households in Poland – out of 14 million – are currently supplied by district heating networks, which are running 70% on coal, the most polluting fossil fuel.

With climate change, a top political objective at the EU level, Poland’s priority is first getting rid of coal. “Our aim is to phase out coal in district heating by 2030,” said Wanda Buk, vice-president for regulatory affairs at Polska Grupa Energetyczna (PGE), Poland’s largest electricity company.

“In several our location, we are assessing the possibility of building large-scale heat pumps, and we are expecting huge investments in this area,” Buk said, adding that PGE is also exploring power-to-heat technology and large-scale electric boilers.

Small-scale heat pumps for individual households are also aggressively rolled out. “The heat pump market in Poland grew by about 88% last year,” says Piotr Sprzaczak, director of district heating at the Polish Ministry of Climate and Environment. “So this is something that we want to we want to pursue,” he added, saying more heat pumps were installed in Warsaw last year than in London.

POLAND SAYS WILL BE FREE FROM RUSSIAN GAS ‘BY THE END OF THE YEAR’

But deploying alternatives to coal will take time, experts warn, saying gas is likely to remain part of the mix for some time.

“I think it will be challenging to replace all the gas at once,” said Andrej Jentsch, programme manager at the IEA DHC, the International Energy Agency’s hub for international district heating research.

“Even ambitious plans require time,” he said at a recent EURACTIV event. “Personally, I would definitely vote for a transition to renewables and to emissions-free sources as quickly as possible. But that can be very expensive for society, so it’s kind of a balancing act,” he argued.

In Poland, efforts to decarbonise heating are also driven by concerns over air pollution, which typically gets worse during the winter season. A clean air programme recently launched by Warsaw encourages households to “switch from hard coal furnaces to boilers, heat pumps and pellet boilers,” Sprzaczak explained during a EURACTIV event held earlier this week.

“The polish people want to breathe clean air. But in order to provide clean air, we also need district heating,” he added, insisting that Warsaw needs “a full palette of solutions” to decarbonise – including gas.

PGE, the largest electricity company in Poland, has asked EU regulators for more leeway to replace coal in district heating...
systems, warning that new standards put forward in the revised Energy Efficiency Directive (EED) are too strict to allow using gas as a transition fuel.

“Of course, we understand that the war in Ukraine poses a threat because the natural transition fuel for large district heating systems was natural gas,” Sprzaczak said. However, Poland has made tremendous efforts to diversify its suppliers, he added, saying Russian gas will be out of the mix in a matter of months.

“By the end of the year, Poland will be completely free of natural gas from Russia,” Sprzaczak told participants at the EURACTIV event. “But now we need solutions for district heating,” he added, saying gas from Norway and the US needs to remain among the range of options available to Poland.

THE CASE FOR GAS COGENERATION

Jentsch agrees that gas can still have a role to play in district heating – but only if it uses high-efficiency cogeneration plants that produce heat and electricity simultaneously. “CHP [combined heat and power] is a technology that can easily help to reduce dependency on gas quickly. So essentially, we use the same fuel, we just do it better,” Jentsch said.

According to him, using high-efficiency CHP instead of electric boilers can cut gas consumption by 50% while freeing up renewable power capacity for other uses. “So essentially, we can halve the gas demand without using renewables that might not yet be deployable at sufficient speed,” he said.

Using gas cogeneration in district heating networks also avoids putting too much extra strain on electricity networks, the industry argues. “We cannot electrify everything,” warned Hans Korteweg of trade association COGEN Europe, explaining that CHP can supply electricity at times of high demand in winter when there is insufficient solar or wind supply.

However, the industry argues that new decarbonisation targets for district heating currently being mooted by the EU are too ambitious and cannot be met. “Some amendments to the energy efficiency directive suggest that CHP should be close to 100% renewable from 2025 onwards – and that’s just not realistic,” Korteweg said.

The European Commission sought to assuage the industry’s concerns. Claudia Canevari, an official at the EU executive’s energy department, told participants at the event that the new standards will only apply to new investments, not to existing gas cogeneration infrastructure.

The Commission’s stance echoes worries from environmentalists like Rosenow, who warn against investing in new gas infrastructure like LNG terminals, saying those are incompatible with the EU’s climate goals.

“In five years’ time, when the war is hopefully long over, that infrastructure is still going to be there,” Rosenow said. “And that I think is a dangerous pathway because it locks us into expensive infrastructure and makes the whole effort more expensive.”
EU ready to increase energy efficiency target to eliminate Russian gas

By Frédéric Simon | EURACTIV.com

The European Commission is revising the economic assumptions behind its energy and climate laws package presented last year, saying sky-high gas prices fuelled by the war in Ukraine have strengthened the case for more ambitious energy efficiency goals.

Brussels tabled a revision of the energy efficiency directive last year, introducing new targets to reduce primary (39%) and final (36%) energy consumption by 2030, becoming legally binding at the EU level. The current target – of 32.5% overall by 2030 – is non-binding, leading to criticism that the European Union was being too soft on enforcement.

“Obviously, the situation has changed because we are now unfortunately in a world of higher energy prices,” said Claudia Canevari, an EU official heading the unit in charge of energy efficiency at the European Commission.

“The Commission is looking into how a higher energy efficiency target could be substantiated,” Canevari told participants at an EURACTIV event held earlier this month.

Discussion on the recast directive is currently ongoing in the European
Parliament and the EU Council of Ministers, “so it is important to provide the scientific support to the extent possible so that both co-legislators can agree on more ambitious targets,” Canevari added.

Previous estimates found that the economic potential of energy efficiency gains were 5% lower than the technical potential, meaning it was too costly to aim higher. But with gas prices now likely to remain high long-term, Canevari said those assumptions need to be revised.

“Our assumption is that this gap of five percentage points has reduced. But we still don’t have the full analysis, so we are looking into it,” she said.

In the European Parliament, there is an appetite to aim higher. The lawmaker steering the energy efficiency directive recast, Niels Fuglsang, has proposed “a reduction of 43% for final and 45.5% for primary energy consumption, respectively” higher than the Commission’s initial proposal.

“The war in Ukraine has shocked everybody and is upsetting everything,” said Eleonora Evi, an Italian lawmaker from the Greens who is drafting the Parliament’s environment committee opinion on the energy efficiency directive.

“The most efficient way to stop Putin’s war is to increase energy efficiency and decrease our energy consumption,” she said, stressing that every percentage point gained in energy efficiency cuts Europe’s gas imports by 2.6%.

“This is tremendous. It gives us an idea of how important it is to talk again and again about energy efficiency,” Evi said at the EURACTIV event.

HEATING SECTOR IN FOCUS

Europe’s drive to eliminate Russian gas and boost energy efficiency will inevitably impact European consumers, who rely almost 40% on gas to heat their homes.

This could open fresh opportunities for the district heating sector, which utilises a network of underground hot water pipes to deliver heat to entire neighbourhoods in European cities.

District heating networks are considered one of the most efficient ways of supplying heat to households. “All cities with ambitious energy and climate agendas intend to develop district heating,” says Birger Lauersen, the President of Euroheat & Power, the association representing the district heating sector in Brussels.

“By collecting the waste heat from both industry and electricity production and using smart district heating grids, it is possible to save all of the natural gas currently used for heating buildings in Europe,” according to an EU-funded project, which evaluated the potential of industrial waste heat in Europe.

But the sector also has a considerable challenge to wean itself off fossil fuels. In Poland, nearly six million households – out of 14 million – are supplied by district heating systems, according to PGE, the state-owned Polish electricity company. And 70% of that is still done by burning coal, the most polluting fossil fuel.

“The reason why we have used so much gas and coal in district heating is simple – it’s because they were cheaper to run,” says Jan Rosenow, director of European programmes at the Regulatory Assistance Project (RAP), a non-profit group.

“And that has changed: coal and gas have become more expensive, while in the meantime, the cost of renewable electricity and heat pumps have come down,” he told EURACTIV.

District heating is a substantial sector, which is responsible for about 10% of home heating supply in Europe, Rosenow pointed out. “So it’s huge. And most of that is fossil fuel-based. So clearly, there’s potential for replacing fossil fuels, and now also gas increasingly, with renewables.”

The Commission is well aware of this and has put forward new efficiency standards in its proposed revision of the EU’s Energy Efficiency Directive (EED). “In district heating and cooling, the definition of ‘efficient’ systems will gradually be tightened to move away from fossil fuel-based systems,” the Commission explained.

Likewise, under the Commission proposal, combined heat and power plants widely used in district heating systems will no longer be considered “efficient” if they emit more than 270 grammes of CO2 per 1 kilowatt-hour of energy output.

This is expected to drive out coal-fired cogeneration plants and the most inefficient gas ones.

But Warsaw is worried that the standards are too tight and will not give Poland enough time to transition its coal-based district heating systems to gas, which produces about half the global warming emissions of coal.

“We’re going to get fully rid of coal in Poland’s district heating systems by 2030,” said Wanda Buk,
vice-president for regulatory affairs at (PGE), which supported the EURACTIV event.

“Decarbonising district heating must be carried out in a reasonable timeframe to maintain uninterrupted heat delivery to businesses and households,” Buk said. “And from a Polish perspective, a must-have in the package is reshaping the definition of efficient district heating systems and the definition of high-efficient cogeneration for gas under the energy efficiency directive,” she insisted.

In fact, the choice of fuel in district heating very much depends on local circumstances, Lauersen says. “Not all countries can replace all of their coal with solar PV or wind turbines, many of them will need some kind of thermal power production. And what is the obvious choice? In a lot of countries, that might be natural gas,” he said.

"Whether natural gas should play a role in the energy transition is not for the district heating sector to decide – it’s a national choice each country will make,” Lauersen told EURACTIV.

For Buk, Poland’s choice of gas as a transition fuel remains a valid one, despite rising prices caused by the war in Ukraine.

“The Polish situation is specific because we are a country which has diversified already” and will continue to diversify in the coming years, Buk said. “We have invested in an LNG terminal” allowing imports from the US”, and now we are carrying on with investment in the Baltic Pipe, which will enable us to provide gas from Norway,” she explained.

“So we are diversified, we are not fully dependent on Russian fossil fuels".
District heating networks are set to receive a boost under draft EU legislation requiring all municipalities above 50,000 inhabitants to map out heating and cooling decarbonisation roadmaps.

District heating networks – hot water pipes running below the ground – supply millions of homes in cities across Europe, representing about 10% of the EU’s heat market.

As Europe seeks to wean itself off coal and gas, switching those networks to renewables is becoming an urgent priority.

“If you look at the trend in investments across Europe, all cities with ambitious energy and climate agendas intend to develop district heating,” said Birger Lauersen, president of Euroheat & Power, an association representing the district heating sector in Brussels.

“And these projects, to a great extent, are based on renewables and waste heat, usually coming from industries or the tertiary sector like data centres,” he told EURACTIV in an interview.

District heating in Europe today runs mostly on fossil fuels, with natural gas and coal currently making up around 30% and 26% of the fuel mix, respectively, according to Euroheat & Power. And switching to clean energy sources is a slow process: by June, the association is expected to put together a roadmap to decarbonise the sector by 2050.

One largely untapped energy source is waste heat from heavy industries like steel plants or petrochemical sites, which could save all of the natural gas currently used for heating buildings in Europe, according to an EU-funded research project.

However, collecting waste heat and bringing it to households requires building a network of underground pipes, a process Lauersen said is fraught with political and administrative difficulties.

“District heating is all about context: you have to mobilise cities, regions, building owners, investors, waste heat producers, and so on,” Lauersen said, explaining that these kinds of projects are more complex.
to bring over the line than large wind farms.

“For district heating, you have to get the local authorities involved every step of the way to solve issues because you have to dig in the ground to build the infrastructure,” he said, warning also that “the gaps are mainly in the member states, not at the EU level”.

This is something that the European Commission is seeking to address. Under a proposed revision of the Energy Efficiency Directive (EED) tabled last year, all municipalities above 50,000 inhabitants will be requested to prepare local heating and cooling plans.

Those plans will be based on data provided in “a comprehensive heating and cooling assessment” prepared by each EU country as part of their national energy and climate plans submitted to the European Commission every year.

“This is very important because very often what is missing is the knowledge about the situation and about the potential,” said Claudia Canevari, an official working at the Commission’s energy department who spoke at a recent EURACTIV event.

Others agree that national plans will be crucial for EU countries to develop renewable-based heating and cooling systems. “We will need certainly integrated planning at a local level where we focus on the entire energy system,” said Hans Korteweg, managing director of COGEN Europe, a trade association representing the cogeneration industry.

According to Korteweg, national plans should take into account all available resources – whether coming from waste heat, electricity, or gas networks – in order to “maximise renewables across all energy vectors and ensure that those renewables are efficiently used”.

DE-RISKING INVESTMENTS: IT’S NOT ALL ABOUT MONEY

Regardless of the fuel, getting projects over the line usually takes time because district heating networks have high upfront costs and long payback periods. And money is not the biggest problem.

“Basically, the money is there,” Lauersen said, noting that private equity firms and pensions funds are very keen on district heating projects because of their long-term commitments.

“What’s missing is perhaps not so much the money as the handling of risk, because these are long-term investments,” he added.

Indeed, district heating projects can come in competition with other heating solutions like individual heat pumps, or new wind farm projects, which take less time to complete and tend to receive more attention from policymakers.

“You could put a district heating network in place and suddenly you end up without customers because the gas prices or the electricity prices might be too low,” Lauersen said. “These are part of the risks.”

However, he argued that district heating projects are worth pursuing because they provide a more “systemic, collective approach to heating decarbonisation, versus individual solutions” like heat pumps, which have high upfront costs and can be unaffordable to most households.

Others agree that district heating is a better option when it comes to serving the masses.

In Germany alone, “at least one billion euros of subsidies per year” is needed by 2030 in order to expand the networks, said Andrej Jentsch, programme manager at the IEA DHC, the International Energy Agency’s hub for international district heating research.

“Without district heating and cooling it is very likely that heat supply is going to be much more expensive,” he said at the EURACTIV event.

Jentsch praised the European Commission’s push to decarbonise heating, saying the war in Ukraine gives the EU many reasons to get off coal and gas fast. But he warned against an excessive focus on fast individual heating solutions.

While heat pumps “might be feasible for the more rural areas or suburban ones,” he said that “highly dense cities should also keep their option open to connect to a district heating system”.

According to him, regulatory certainty is paramount to ensure projects are completed on time. “In Germany, we had some issues with legislation going back and forth and thus raising insecurity of investment,” Jentsch said.

“So if we have a legal framework that is guaranteed to last a certain time or at least not make the situation economically worse – that would help a big deal,” he added.
Industry chief: District heating sector looking at ‘other options’ than gas

By Frédéric Simon | EURACTIV.com

Russia’s aggression in Ukraine is prompting the district heating sector to look at other options than fossil gas, with the industry’s representative in Brussels underlining the huge untapped potential of waste heat coming from industry and data centres among the immediately available options.

Birger Lauersen is President of Euroheat & Power, the association representing the district heating sector in Brussels. He spoke to EURACTIV’s Frédéric Simon.

The ongoing conflict in Ukraine is looking increasingly like a major turning point for EU energy policy, which makes the decarbonisation of heating more urgent than ever before. What are the consequences for district heating? Is a gas phase-out now becoming a priority for the sector? And how quickly could that be achieved?

First of all, it’s important to underline that the use of natural gas in district heating and the heating sector in general is very different from country to country.

There are countries like Sweden, where district heating is well developed, but where natural gas hardly plays a role. And there are countries like the Netherlands where natural gas plays a huge role but where district heating is not much developed. In other countries like Germany, natural gas plays an important role in district heating, also indirectly through the use of gas and combined heat and power (CHP).

And finally, there are countries where natural gas is seen as an insurance solution for the phase-out of coal. And in those countries, coal might be seen in the short term as an alternative option to the use of gas –
for instance in the Czech Republic.

So the situations vary widely. In my country, Denmark, we rely on natural gas for approximately 12% of our district heating. And the political environment is focused basically on phasing out gas and replacing it with heat pumps and district heating.

So it’s a very diverse picture across Europe.

**Is the sector ready to adapt to the changing geopolitical environment on gas?**

Yes, the sector is willing to adapt. But it’s not up to us to choose what we replace gas with. In some places, it might mean that coal will be retained for a longer period.

If, for example, a country wants to replace gas with electricity, where is that electricity going to come from? Is it going to come from wind turbines, nuclear, coal, or something else? That is a national decision, which, for the most part, is out of our hands.

**Central and east European countries like Poland are contemplating gas as a transition fuel to get out of coal. But with the Ukraine crisis, the case for gas now looks much weaker…**

That’s putting it mildly! Probably they will have to consider other options. People are talking about replacing natural gas with renewable hydrogen and heat pumps. But where on earth is the electricity going to come from?

In Northern Europe, we currently have sky-high electricity prices because the wind hasn’t been blowing over the winter and the hydro reservoirs in Norway are empty. That does not indicate an abundance of renewable electricity – it’s a shortage. And at the same time, we’re increasing the demand for electricity in sectors like transportation, industry and heating.

Looking at this, I don’t think there will be much electricity left for green hydrogen production or even for electric boilers. This is why we have to focus on reusing waste heat from industrial facilities. This is a huge untapped potential that does not require additional energy supply.

In Germany, they have 20 million individual gas boilers. 20 million! Let’s be honest, it will take more than a decade to replace all of them with heat pumps. And even if they have the electricity to replace those, where on earth are they going to find 20 million heat pumps?

**It becomes an industrial challenge, indeed…**

There are no short term solutions in the heating sector – everything is long term. These are tectonic movements that we’re talking about. And there is no magic bullet.

So we will support any short term measure to reduce gas consumption – like lowering the thermostat, and improving the insulation of buildings. But everything else takes time.

**District heating networks can be supplied with any source of energy, which makes them particularly versatile. However, many of them are still running on fossil fuels. Looking at the EU-27, what is the current energy mix in district heating systems?**

At EU level, natural gas makes around 30% of the mix, biomass and biofuels 27%, and then coal and peat, around 26%.

Now, two thirds of heat supply comes from high-efficiency CHP installations producing both heat and power, which is the most energy efficient. And if you look at the trend in investments across Europe, all cities with ambitious energy and climate agendas intend to develop district heating. And these projects, to a great extent, are based on renewables and waste heat, usually coming from industries or the tertiary sector like data centres.

Looking at Eurostat statistics, you will notice that the countries with the highest shares of renewable heat are those where district heating has a high market share: Iceland, as well as the Nordic and Baltic countries.

In fact, the choice of fuel is very much based on local or national circumstances and the diversity across the sector is enormous. If you take ‘mature’ district heating countries like Sweden, Finland and Denmark, renewables already dominate the supply of district heating. Whereas in Germany and Poland, where coal has tended to dominate the electricity sector, obviously it also dominates the CHP sector. Denmark has traditionally used coal, but we have now almost completely gone out of coal.

So as countries phase out coal-based electricity, they also phase out coal in the district heating sector to a great extent. And then they will start replacing it with something else, such as renewables and waste heat.

In addition, we have some
thanks to digitalisation we are also entering a new era to further develop efficiency of heating systems. And we are now talking about local systems which integrate different energy carriers and networks together, which is in line with the European Commission communication on Energy System Integration (July 2020).

What are the most notable regional differences when it comes to the fuel mix and the technologies used?

If you look at Sweden, they have always had a dominant share of renewables – bioenergy or biofuels – in their heat supply, because that is widely available there.

Denmark has been dominated by coal for many years, but those facilities will be shut down in 2025 and 2028. In Germany, coal is still important but natural gas certainly dominates. So, all in all, the energy transition is reflected also in the district heating sector: where coal is available, coal is used, and where coal isn’t available, it is not used.

District heating systems are quite popular in Scandinavian countries and eastern EU states from the former communist bloc. Are there also some differences between regions in how the systems are installed? Or are district heating systems similar?

The systems are broadly comparable between countries. Technically, there are differences. In Denmark for instance, the district heating systems are typically operated at much lower temperatures than in many other places. Denmark has also spread district heating networks into the suburbs (or lower heat-density areas), which you normally would not do in with district heating.

The reason is because Denmark used to import all its coal, which was delivered to harbours located in the city centres. And this is where we located CHP installations as a result. In the 1970s, when we had to replace oil in the heating sector, we just expanded our district heating network because we had the heat available.

In Germany, it is different because they built the coal plants where the coal is and transport the electricity rather than the coal because that’s much simpler. And typically, there is not that sort of urban or suburban heat market available near coal mines. So technically, these kinds of structures also play a role and district heating.

Ownership structures play a part too. In Denmark energy cooperatives have traditionally dominated our electricity sector, while elsewhere it is based on different models. So historically, all these things have had an influence on the development of district heating, because it is essentially a very local thing.

What plans does the industry have in order to meet the EU’s decarbonisation targets for 2030 and 2050? Do you have a phase-out deadline for coal?

In 2019, we made the pledge as a sector to fully decarbonise by 2050.

Now, that ambition has very different consequences around Europe and our member associations are currently developing national decarbonisation roadmaps. And that can be a bit challenging for some. Because we are always directly or indirectly dependent on what happens in other sectors.

If a country decides to phase out coal power generation, obviously something else needs to take over. If that coal power is replaced with biomass, you would still have a heat source to use in CHP. But if you replace it with wind energy, then you won’t have a heat source available anymore – and other solutions should prevail. So we’re very dependent on what happens in other sectors.

That said, all our member associations also recognise the necessity to have a sustainable climate neutral product by 2050. And in some countries, both the heat source and the network need to be replaced because they are in a very bad condition. Whereas in countries like Sweden, the infrastructure is in perfect condition and their heat production sources are also relatively modern.

For the Swedes, the Finns and the Danes this is probably a much easier exercise than it is for Central and Eastern European countries. But we accept the challenge and we try to inspire them. And by June, we plan to have an aggregated roadmap for the future direction of district heating in Europe. And I bet it’s going to be very diverse.

As an example, in Denmark, we have a national ambition to have a climate neutral heating sector in 2030. So we won’t have a roadmap for 2040 and 2050! But for the Czech Republic though, it will be a huge challenge to replace their coal-based district heating with something else: they don’t have offshore wind, or biomass widely available so the challenge is much bigger. Whereas for other countries, it will be much more convenient.
Are there any low-hanging fruits when it comes to decarbonisation in district heating?

One of the low-hanging fruits is to use what is already available.

Take Antwerp in Belgium for instance, they have a gigantic petrochemical site there. Obviously, the low-hanging fruit is to use the waste heat from these installations to supply heat to the city and its neighbourhoods. And probably there would still be excess heat that could be piped to Brussels.

Some of these things are obvious. But why haven’t they been done before? Because district heating is not so much about technology. District heating is all about context: you have to mobilise cities, regions, building owners, investors, waste heat producers, and so on. It’s not like when developing a wind turbine where the government will clear the way, tell the TSO to build infrastructure, deal with local public opinion, etc. For district heating, you have to get the local authorities involved every step of the way to solve issues because you have to dig in the ground to build the infrastructure.

The basic technology – low-temperature hot water and pipes – is not rocket science. But the projects are hugely complex to bring over the finishing line.

Why haven’t the Belgians done that? Because they never had to. Gas was available from Germany and the Netherlands, so why bother? Some countries learned the lesson from the energy crisis in the 70s, while others went for convenience. But that is not fit for our climate goals in 2030 or 2050. In many places in Belgium, you will still find single glazing windows. I mean, come on...!

This is why we support the level of ambition in the European Commission’s ‘Fit for 55’ package. Because we have a clear destination for 2050, and that’s really important for operators to know where they are going. And then, there are the tools to get there.

And one idea we support very much is to have a coordination framework for waste heat. Because that way, we can have all interested parties around the table – cities, utilities, industries and citizens– to organise a dialogue.

Going back to the example of Antwerp, it’s obvious that we should use this vast amount of waste heat but it’s not being done. This is one of the reasons we support the increased level of ambitions and then tools in the ‘Fit for 55’ package – because developing district heating infrastructure is the only way to decarbonise our cities, where heat demands are located.

Can natural gas be a transitional solution for district heating? And if so, how can the industry ensure there is no lock-in effect?

Again, it depends on local circumstances. Whether natural gas should play a role in the energy transition is not for the district heating sector to decide, it’s a national choice each country will make.

Not all countries can replace all of their coal with solar PV or wind turbines, many of them will need some kind of thermal power production. And what is the obvious choice? In a lot of countries, that might be natural gas.

Our position is not to say whether they should use gas or not. Our position is that if they use thermal power production, they should do so using CHP because otherwise you dump the heat. And that would go against the Energy Efficiency First principle.

As an association, we cannot tell the Germans whether they should use natural gas or not – not even the Americans can do that. The reality is that some countries will use natural gas in the energy transition, before phasing-in other fuels. And our message is: whatever energy sources in a transition phase you use, if there is waste heat, please take it.

In the long term, there are also questions about the volumes of renewable gases that will be available. These resources should be used in the most efficient way. And I have the feeling that this has been acknowledged. If you look at the EU or German strategies on hydrogen, there is an acknowledgement of the Energy Efficiency First principle – hydrogen should go for those sectors ‘difficult’ to decarbonise.

Cleary hydrogen should never make its way to the residential heating market, it doesn’t make any sense. It should be used in priority for sectors that are really difficult to decarbonise – heavy industries, the steel sector, heavy duty transport – but not in the residential heating sector. These fuels are way too costly to be used to heat our buildings at 70 degrees. There are far better products for heating than hydrogen.

Biomass is a popular source of energy for district heating networks in Scandinavia. How can the industry ensure that the biomass is sourced sustainably? Are additional safeguards needed there?
The 2018 renewable energy Directive already introduced a set of safeguards to ensure that we only use sustainable biomass. We believe that those requirements are adequate.

If we’re going to change the regime around the use of biomass every two years, this will create uncertainties in the market and make it difficult for operators and investors.

One important proposal from the European Commission in the renewable Directive is to make the cascading principle a legal obligation. But this is unnecessary, we believe the market already does that. The market already ensures that stem wood or ply wood is not being used in energy production: the price that the energy sector is ready to pay for biomass is lower than the market value for this kind of wood so we simply would not be buying it. And our members witness this every day – in Denmark for instance, we even export wood to Russia.

That being said, we fully acknowledge the need to ensure that the biomass used in the energy sector is sustainably produced and recovered. But for the time being, we would rather have a legislative pause on this so that we know on what basis to invest.

Biomass can be used to produce these high-value low-carbon fuels for the transportation sector, heavy industry, etc. So rather than having a debate on eliminating the use of biomass, we should ensure that we use this biomass in the most sustainable and circular way.

The European Commission has actually addressed the same issue in its communication on sustainable carbon cycles. So, I think we’re on the same page.

The European Commission presented legislative proposals last year to cut the EU’s emissions by at least 55% before the end of the decade – the so-called ‘Fit for 55’ package. What regulatory measures are being envisaged to support the development of district heating in the Commission’s plans? And do you see any gaps in this package?

On the Energy Efficiency Directive, we support the idea of making the national heating and cooling plans – or ‘Comprehensive Assessments’ – more impactful. We need to see a better link between the identified potentials for district heating and CHP and the new policy measures that are taken at national level to decarbonise the heat market.

We are also supportive of the approach to define the kind of efficient district heating and cooling we want to see in the future, with references to an increasing share of renewable and waste heat over time, moving towards fully decarbonised systems. And this gradual approach is important because we are dealing with a lot of diversity at national and local levels when it comes to the heating market, as described before.

On the energy efficiency directive, there is also a welcome focus on cities. Under the revised Directive, every city above 50,000 inhabitants should develop local heating and cooling plans, which is very important.

Regarding the renewable energy directive, we support the increased level of ambition – the 40% target for 2030 – and in particular the binding objective regarding the share of renewable heat. There is also a welcome recognition of the value of waste heat, and the complementary interplay between the use of renewables and waste heat.

How much is the untapped potential of waste heat?

We evaluated that in the Heat Roadmap report. But it depends on temperature levels. If you have a district heating system using 100 degrees centigrade heat, then the potential is different because anything below that temperature either has to be upgraded or cannot be used. But if you have a district heating system operated on, say 40 degrees, with a local boost of hot water to the production, obviously sources are much richer and much more diverse. This is why we’re talking about fourth and even fifth generation of district heating – because the distribution technology also will affect the possibility to use waste heat.

And the potential is huge, there is enough waste heat at the moment to heat the whole of Europe, whether it’s coming from industry or data centres. It’s just that not all of it is available where we have a heating demand. And on top of that there is an enormous geothermal capacity potential.

What about the gaps in the Commission proposal?

On the energy performance of buildings directive, we’re still in the process of analysing it at the moment. But we have the impression that EU policies still tend to look at buildings in isolation, like islands isolated from the rest of the energy sector.

That said, I would add that the gaps are mainly in the member states, not at the EU level. District heating is something that countries could have done on their own initiative if they wanted to. The European Commission has been pushing and making planning requirements stronger and stronger. But at the end of the day, it’s up to the member states and local
authorities to make the investment decision.

**District heating networks typically have high upfront costs and long payback periods. What is the current landscape at EU level when it comes to the financing instruments for district heating infrastructure? Do you see improvements there that are needed?**

This equation of financing is, is really important. We see appetite from the baking sector for some recognised criteria for funding projects – and the EU sustainable finance taxonomy recognises district heating as a green investment. Now, it’s too early to draw the conclusions on the effects of the taxonomy; we’ll have to see if that really helps more projects materialise or not.

Basically, the money is there. Private equity firms and pensions funds are very keen on district heating projects because they have long term commitments.

What’s missing is perhaps not so much the money as the handling of risk, because these are long-term investments. And member states should employ some kind of mechanism to ensure that the risk is handled once you go into these investments. You cannot sell district heating on a house-by-house basis, you need to address issues at the district level and ensure there is a critical mass of demand in an area before you start building the grid.

You can address this uncertainty through planning or by keeping the alternatives out of the market through pricing, for instance by keeping taxation on natural gas at a certain level. Member states have to look into this element of risk and not just assume that you can sell district heating in competition with say natural gas or electricity whose networks are already there.

**What kind of risk are you talking about?**

You could put a district heating network in place and suddenly you end up without customers because the gas prices or the electricity prices might be too low.

People may prefer individual heat pumps because the EU buildings directive promotes on-site-solutions rather than district heating.

These are part of the risks. But with district heating, we’re talking about a systemic, collective approach to heating decarbonisation, versus individual solutions in the buildings directive, which basically just looks at what happens on the individual plot, and does not take into account the systemic consequences of all these individual heat pumps.

If you decided to install a heat pump, would you know the systemic consequences for the electricity grid in Belgium? No, you wouldn’t.

What we say is that there should be some element of planning into this, to ensure that we see the broader perspective, and not just something that consists of random, and sometimes even sub-optimal individual decisions.

**That planning dimension, is it not better dealt with at the local or national level?**

The Commission indeed proposes that cities with more than 50,000 inhabitants do heat planning.

You know, I come from a country where the planning is something we’ve been doing for 40 years. And why do you think we have so much district heating? This is why we can go through the transition of the heating sector so easily and so cheaply. There is a connection.

If we want to meet our 2030 climate goals, we got to act now, collectively – with governments and local authorities – because we have no time.

**And that planning dimension doesn’t really exist at the moment, right?**

My impression is that in a lot of countries that is not strong. Basically, the energy policy has been left to the market. That may have worked very well, for many years. But it’s not going to work if we want to decarbonise the heating sector.

Look at the Netherlands, they’re desperately looking for ways to address emissions from the heating sector. Their current heating system is entirely based on natural gas, for obvious reasons. It was so convenient for the Dutch. And they’re now looking at what on earth they can do to address this.

The question is: do we go for private investments where everybody is spending €5-10,000 to install a new heating system? Or do we go for collective heating systems that allow to use renewables as well as resources that would otherwise be wasted? This is a decision which is in the public domain. Somebody needs to take responsibility, to take the risk.

Banks are quite at ease with giant projects like wind farms, they’re less so with diversified and smaller projects like district heating.
District heating has a great potential to accelerate its decarbonisation, including through exploring waste heat, but also deploying heat storage. However, taking into account the specificities of existing district heating systems, in particular in the Central and Eastern Europe, the evolutionary transformation of district heating is essential.

WHERE DO WE START?

Compared to other European Union’s countries, Polish district heating distinguishes with its scale. Urban agglomerations are covered by large-scale district heating systems with high production capacities (i.e. hundreds of megawatts of ordered thermal capacity). Nearly 6 million households in Poland, out of a total of around 14 million, use this type of heating and a total length of heating networks in Poland amounts to over 22 000 km. These figures prove Poland to be one of the key EU’s district heating markets.

To that end, the share of heat generated in cogeneration supplied to district heating systems in Poland is approximately 66%. And although the energy mix is still dominated by coal in almost 70%, efforts are being made to upgrade inefficient heating plants to low-emission high-efficiency
combined heat and power (CHP) plants, mainly to phase out coal in heat generation.

**HOW ARE WE GOING TO ACT?**

PGE Energia Ciepła in the PGE Capital Group, is Poland’s largest producer of electricity and heat, generated in a high-efficiency cogeneration. PGE Capital Group operates on around a quarter of cogenerated heat market, owns 16 CHP plants (with thermal capacity of 6.9 GW and electric capacity of 2.6 GW) and 677 km of district heating networks. Heat generated by PGE is delivered to large agglomerations and smaller Polish cities – overall to more than 2 million users.

PGE was one of the first Polish energy utilities to declare climate-neutral by 2050, while deploying low- and zero-emission district heating based on high-efficiency cogeneration is one of the pillars of PGE’s strategy until 2030. By then, the share of these sources in heat production will amount to at least 70%.

“We are facing challenges that are extremely important for the future of heating industry in Poland, so that it can continue to function and ensure energy security. Poland is a specific market when it comes to heating. In this respect, we are a unique, most developed market in Europe. The Polish district heating industry must develop itself towards zero and low-emission sources and extend the services provided to our customers.” – concludes the President of the Management Board of PGE, Wojciech Dąbrowski.

At PGE, coal-based heat generation is expected to end by 2030. New sources will produce heat predominantly from natural gas, waste heat and renewables. In several of our locations PGE is assessing the possibility of building large-scale heat pumps. However, as district heating markets are diversified due to the local conditions, all alternatives to replace solid fossil fuels (e.g. geothermal facilities) are taken into account. We plan to build approximately 1700 MW of new thermal capacities by 2030. Thanks to all these actions combined, PGE’s cumulative CO2 emissions from heating sector will decrease by 50% until 2030.

Nevertheless, PGE business activities are carried out in a robust regulatory environment. For that reason, some of the provisions proposed under the “Fit for 55” package may impede further development of district heating in Poland.

**EFFICIENT DISTRICT HEATING IN THE „FIT FOR 55” PACKAGE**

New definition of an “efficient heating and cooling system” as proposed by the Commission will have a tremendous impact on district heating systems, especially those based on fossil fuels even if used transitions.

High-efficiency cogeneration, at the moment based on gas or biomass, is the most preferred technology due to Poland’s weather conditions, required temperature parameters and high capacities of district heating systems, which cannot be fully replaced with low-temperature renewables. It is worth noting that in the future these high-efficiency natural gas assets will be ready to be adjusted to be fuelled
with hydrogen or biomethane to contribute significantly to climate neutrality target. But it cannot happen within a couple of years – in Poland it requires decades. (please see Graph 2 on the following page.)

Without introducing necessary modifications to the recast of the Energy Efficiency Directive, the vast majority of heat and electricity generation in Poland will be deprived of the status of the efficient ones. This may, paradoxically, block green investments in district heating, due to the limited financing possibilities, but also result in increasing CO2 and other pollutants emissions.

This is why it is particularly important for heat from high-efficiency cogeneration to be recognised as a criterion for an efficient district heating and cooling system over a time horizon that goes beyond 2035. Furthermore, to be able to continue benefitting from cogeneration, it is important that the criterion of direct emissions of 270 gCO2/kWh for high-efficiency cogeneration is introduced from 2030 so as to ensure stable and predictable conditions for heating companies.

Moreover, the definition of efficient district heating and cooling system is connected with a series of other files within the “Fit for 55” package. For instance, under the recast of the Energy Performance of Buildings Directive, the Commission proposed that new buildings, from 2030 or 2027 regarding public ones, must be supplied only by renewables or waste heat and this also pertains to efficient district heating and cooling. Efficient district heating systems as well as heat from high-efficiency cogeneration should provide a tool for the gradual decarbonisation of the building stock and for that reason, connecting new buildings to all efficient district heating systems, not only those based on renewable energy and waste heat, should be allowed.

District heating requires tailored solutions and these also cover power-to-heat technologies. Having different characteristics than heat pumps, electrode boilers may be an option for larger cities. However, to make this technology future-proof, it is crucial for heat produced this way to be classified as renewable under the new Renewable Energy Directive. In order to demonstrate renewable nature of electricity, both direct connection or power purchase agreement could constitute a basis for adding up this
energy towards heating targets, while ensuring there is no double-counting.

**ELECTRODE BOILERS AS AN OPTION FOR SECTOR COUPLING AND LARGE-SCALE DISTRICT HEATING**

Centralised district heating systems are a natural storage system for thermal energy – creating an opportunity to develop power-to-heat sources. In combination with the ability to store heat they can serve to utilise renewable electricity at times when power system is oversupplied – thus improving its economics.

Worth noting, the technology of electrode boilers will play a particularly important role in just a few years, when electricity grid will include clean electricity from the first offshore wind farms in the Baltic Sea in the PGE Group. PGE recently commissioned the electrode boilers facility in Gdańsk. This is the first implementation of such large scale power-to-heat installation in Poland. It consists of two electrode boilers of 35 MWt each. This technology, will enable a quick response to changing heat demand to start operation in just a few minutes.

“This is a turning point for us – we have started numerous investments in CHP plants and all our activities are focused on emission-neutral heating” – said Przemysław Kołodziejak, President of the Management Board of PGE Energia Ciepła. – “However, proposals included in the “Fit for 55” package may have a disturbing impact on the transformation of district heating.

With such a dynamically changing regulatory environment, right now it is very difficult to make business decisions in the area of investment projects – added Przemysław Kołodziejak.

In brief, heat markets are particularly domestic and specific, which gives no space for transferring excess heat from remote locations. For this reason, European Union regulations should allow local communities to choose from a wide range of available low- and zero-emission technologies, from transitional gas cogeneration to renewable sources, solar collectors, heat pumps and electricity, depending on internal conditions, which are, after all, extremely different.
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