

# Academic: Oil and gas boilers should be banned across Europe by 2030

By [Frédéric Simon](#) | [EURACTIV.com](#)

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"If we are still installing natural gas boilers by 2030, then we should ask ourselves whether we're really serious about the transition to low-carbon energy," says Brian vad Mathiesen. [[marketlan / Shutterstock](#)]

**Carbon emissions from residential heating can be drastically reduced if Europe agrees a ban on new oil and gas boiler installations by 2030 at the latest, according to a Danish researcher who led an EU-wide study to decarbonise the heating and cooling sector.**

*[Brian vad Mathiesen](#) is an academic and researcher specialised in smart energy systems at Aalborg University, Denmark. He is the lead coordinator of the [Heat Roadmap Europe](#), an EU-funded project which developed a low-carbon heating and cooling strategy for Europe.*

## INTERVIEW HIGHLIGHTS:

- Solar PV systems and heat pumps are like clean energy “limousines” that most people can’t afford;
- At least 50-70% of EU households could be served more cheaply by thermal infrastructure, or district heating networks;

- An end date for oil and gas boilers should be included in the EU's 2050 low-carbon strategy, with 2030 "the last deadline" to install new gas boilers;
- Such a ban would free up available gas for use in higher value purposes than heating;
- However, most EU countries are currently planning to expand gas, not reduce it;
- And EU funds currently support only cross-border gas and electricity networks while there is enough waste heat available to heat Europe's entire building stock.

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**Heating represents around half of Europe's final energy consumption today. And the vast majority (82%) is still being met with fossil fuels – i.e. oil, gas, and coal. Let's look at households: what are the main avenues available today to help bring those emissions down to zero?**

First, a bit of context. I find it extremely frustrating to see how we seem to be content waiting for a solution to one of the largest environmental problems in Europe – to heat our houses – when we know the solutions at hand: an acceleration of deep renovation and looking at shared solutions like thermal grids to avoid having to balance the electricity grid at the building level.

But it seems that in some European countries, they are so mentally and physically addicted to gas that they are talking about producing hydrogen, synthetic or green gases to keep on heating individual households with gas, which will require a very costly expansion of renewables to produce low-temperature heat.

And that is extremely frustrating to see because those who are pushing those ideas have not really thought of the consequences of such a strategy.

**So you're saying there are alternatives that would allow getting rid of gas entirely when it comes to household heating?**

Yes.

**And you think this is a desirable outcome?**

It's utterly desirable. I was very happy to see the European Commission come up with net-zero emission scenarios in November last year. It is however sad to see that known technologies are not being implemented for such a predominant sector like heating – whether for household or industry.

I completely agree that we will need gas in the future. But we need it for completely different purposes than to heat our houses. Also, the future gas grids will be much more complex than

currently envisaged. Gas is not a viable option to supply hot water if we want renewables resources to expand in the entire energy system, have cheap heating and avoid energy poverty.

And it's mind-blowing to see that the Commission does not seriously consider known solutions in its scenarios – the use of local heat sources through thermal infrastructure, in combination with large energy savings in buildings.

**Can you mention the main avenues available to decarbonise household heating – outside of gas? You mentioned thermal infrastructure...**

Yes, district heating or smart thermal grids if you like. Our research shows that this infrastructure goes very well with energy savings in buildings. We can actually see a lot of synergies from doing both.

We have underlined these as the two most desirable options for urban areas in the '[Heat Roadmap Europe \(HRE\)](#)' project, which is now coming to an end. In this project, we have documented how we can completely decarbonise and eliminate boilers burning fossil fuels such as oil and gas from households in Europe.

**So, energy efficiency in buildings and thermal infrastructure are the two main options. What else?**

Through thermal infrastructure, we can use waste heat directly from industry, and indirectly with large-scale heat pumps, waste heat from incineration, solar thermal, geothermal, combined heat and power, etc.

There are a lot of options that become available once you have smart thermal grids in place because thermal infrastructure is an energy carrier. For example, the use of renewables from solar thermal and geothermal in combination with large-scale megawatt-size heat pumps in district heating is a very desirable option for a cheaper integration of renewable energy from wind power as well due to the low-cost energy storage option in large hot water tanks.

Countries which do have thermal infrastructure in place are much better positioned to transition from fossil fuels to renewable fuels. Because you can simply change what you put into the pipe. These larger production units can more easily be changed than the millions of household with gas boilers which are currently in place across Europe.



## **Renewables in heating will tame oil market volatility, EU official says**

Promoting renewable energies in the heating and cooling sector is “a productive investment” that will strengthen Europe’s resilience to the renewed volatility seen on oil markets since the US pulled out of the Iran nuclear deal, a senior EU official told a EURACTIV event.

### **How can European countries figure out whether district heating is a good solution for them?**

The main question you should ask yourself is: do I have a neighbour? If you don’t, then installing an individual ground source heat pump is a good idea – this is typical in rural areas and it can be combined with solar thermal. In urban areas, however, it’s a better idea to support thermal infrastructure, such as district heating systems.

Think of it like this: If it made economic sense to build a grid somewhere in order to bring gas to households, then it probably also makes sense to build a grid to transport thermal – or hot water if you like.

For example, in the Netherlands in the 1970s and 80s, the government planned and publically funded the roll-out of gas networks in areas where the population density was high enough. With the population density of the Netherlands, you could place thermal infrastructure exactly where the gas infrastructure is placed. Smaller heat pumps can be used in more isolated rural households, which usually have an oil boiler.

In the EU, up to half of the heat and hot water demand can be met by individual heat pumps. And half or more can be met by smart thermal grids – but both require zoning and planning

which was done when the gas infrastructure was deployed in the Netherlands and other countries.

**District heating is commonplace in Nordic countries and in some former communist countries in the East. But most other European countries have nothing.**

That is not true. In Germany and France for instance, there is actually a lot of district heating. Of course, it does not represent a big percentage of heat demand but there is a lot of district in major European countries. And this is what we have to build on.

In France, we have below 10% of heating being met with thermal infrastructure, in Germany the figure is about 12%. So it's not negligible. Austria, for instance, has almost 25% district heating.

So when the European Commission comes up with those ambitious low-carbon scenarios, I find it frustrating. I would call these scenarios extreme in the sense that they are heavily reliant on green gases for hot water. What I'm arguing for is to make use of available technologies for producing hot water and use green gasses for higher value purposes.

**In other words, it would make sense to build thermal networks in all European cities, even those which do not have any such kind of infrastructure at the moment?**

Yes. A few years back, I was at an event where we discussed how to decarbonise a big city like London. And there was a lot of talk about electrification and gasification. Both these industries have an interest in saying they have *the* solution.

But if we want to decarbonise a city like London without district heating, we're going to have to triple or quadruple the electricity grid. And if you want to achieve this with green gas, the losses of creating green gas with the purpose of making 50° hot water is rather extreme and a challenge.

To decarbonise a city like London, it's more realistic to provide hot water and use low-value heat for low-value purposes, which is what the city of London is trying to do – using excess heat from the Tube, and heat pumps, etc.

So there is a misunderstanding about where we should electrify and where we should use green gases or not.

**You said at an event in Amsterdam earlier this year that the solution was not about 100% electrification or 100% greening gas. Still, electrification is expected to play a much bigger part in 2050 than today in decarbonising heat. So can you give a tentative breakdown for gas and electricity?**

Basically, you can have thermal infrastructure wherever gas or electricity is used for heating. Because it is flexible and you can store heat on a large scale to create the flexibility needed for the integration of renewables on the electricity grid.

When it comes to gas, ideally, we should completely eliminate gas boilers in Europe. This is what we should do if we are serious about decarbonising the heating sector – decide an end date for natural gas and oil boilers. That can be inserted in the net-zero emission scenarios that the Commission presented in November.

### **When should be the end date?**

It depends on the country. The Netherlands, for example, has made such a decision. And the EU could promote an end date for gas boilers in each country, depending on their national circumstances, as part of their comprehensive assessment.

If you want to eliminate oil in transport and some parts of industry, you're going to have to electrify to a large extent, I can only support this. Most likely, the electricity demand should more than double.

But if you want to meet peak electricity demand for heating during the 4-6 months of the winter, the expansion of the electricity grid and the expansion of renewables production needs to be immense. It means you need to have extreme amounts of peak capacity available for just 4 to 6 months.

And the costs of putting the infrastructure in place will be very high. This is why electrification needs to be combined with a heavy expansion of thermal grids and energy savings.

### **So you're saying the Commission has not fully understood this?**

No, they haven't. They have a fundamental problem with using this known technology – district heating – and making scenarios into the future. This is a major problem and it has been for the last 20-30 years.

The Commission's enthusiasm for a range of rather 'exotic' solutions like hydrogen and green gas in every home is easy to understand. They help support the illusion that we will be able to simply tweak our existing system for sustainability in the future instead of having to embark on a program of fundamental change straight away.

That's a comforting narrative and it's easy to understand the attraction for political decision-makers. The only problem is it just isn't true. I'm a huge fan of making scenarios showing that a net-zero emission Europe is possible. But I'm not a fan of the scenarios that have been produced because they will be too expensive, for the citizens, and for industry. I am not

convinced by a complex renewable energy system that changes hour-by-hour and which needs several types of energy storage.

**Going back to the idea of decarbonising gas and producing green gas: one of the main arguments put forward by the industry is that existing infrastructure shouldn't be discarded and could be reused and converted relatively easily to carry green gas or hydrogen, at relatively low cost. What do you make of this argument?**

I think it shows an industry that does not take its responsibility when it comes to decarbonisation. Every strategy I've seen coming from the gas sector says that we are able to use the same amount of gas in the future, or more. And that gas can meet this demand while going green or becoming renewable.

I don't think this is possible. And I don't think these industries have actually looked at the whole picture – the transport sector, the industrial sector, the household sector – and how much gas is actually needed and where.

The industry's argument that we can cost-effectively reuse the existing gas infrastructure assumes that we have enough resources to do so. And I don't believe we do. So any strategy that comes from the gas sector that doesn't indicate where we should *not* use gas in the future is not very serious in my opinion.

Right now, in many places across Europe, we're asking citizens to sort their waste to produce biogas which is then burnt in an individual boiler to produce 60-70 degree hot water in order to heat a house. But at the same time, we have almost enough waste heat across Europe to heat our entire building stock!

I don't think we can take this gasification debate seriously if we don't talk about where we should *not* use gas in the future. Because, even if we combine this biogas with hydrogen from electrolysis, we will need to produce a lot of electricity to do that. And this is not a viable option. We have to set goals for renewable gas and have fewer gas boilers for heating.

We have recently created a scenario for Germany on how they can be 100% based on renewable energy. And it is very clear that if Germany doesn't use less gas in some sectors while using more in others, they will end up in very big trouble. It will be very hard to make ends meet if you look jointly at the bioenergy resources, the solar and wind resources that Germany has.





### **Gas lobby chief: 'In 2050, 76% of gas could be renewable'**

The excess wind and solar electricity generated at times of oversupply could be used more systematically to produce synthetic gas, providing a convenient way of storing renewable energy that would otherwise be lost. The potential is huge, and can be used to heat homes during winter, argues Beate Raabe.

**You said one area where we should stop using gas is household heating. Are there other areas?**

The other areas are in industry, although there are nuances because some areas of industry will use more gas to replace oil. So parts of oil consumption can be replaced with green gases. And then, there are other parts of industry where we can replace gas with electricity.

So the transformation of industry is going to be a complex one, combining energy efficiency and savings, electrification, gasification, using excess heat, and exploiting synergies between industries.

This means it's hard to know whether there is going to be a bit less or a bit more gas use in the future – because it is so dependent on individual industrial sectors. Industry is not as homogeneous as buildings. It is much more diverse and comprises demand for things like process heat, pressurised heat, steam, electricity, etc.

**Looking at renewable energies, there are several technologies available nowadays to heat people's homes: air source heat pumps, solar PV, biomass, solar thermal, etc. However, none of them have emerged as clear winners for different reasons, including cost. What are your projections for 2050? Do you expect some of them will dominate the scene?**



I don't make projections. The whole point of the [Heat Roadmap Europe \(HRE\)](#) project is to not make projections but to make scenarios for the future and supporting informed decisions.

Take biomass. If we start to replace natural gas with a biomass boiler, then in a very short time, there won't be any biomass available for other purposes, such as transport fuels or to use as backup power for wind and solar.

Let's look now at household solar PV, combined with an individual heat pump. People who can afford it should have the possibility to do so. But for normal citizens, this "limousine" solution is completely out of reach. A solar PV installation should be considered for large industrial roofs of more than 500m<sup>2</sup>. And the electricity produced in this way can also be shared more easily.

Looking at ground-source heat pumps, which is the preferable option, this is a huge investment and most people will have a hard time paying for it. There is also the question of space: do we really want to install ground source heat pumps in a residential area with more than 100 houses? If we combine these 100 heat pumps into a single shared one, it may reduce the capacity and costs by 50%.

So we need to think about other solutions than these individual solutions, and think about what we can do as a society, together with our neighbours and city.

We can eliminate the use of gas in individual heating in the 14 countries that we have analysed, which is 90% of the heat demand in Europe. And that is with known technology – district heating combined with energy savings.

Of course there will be urban areas that will have biomass boilers and individual heat pumps, maybe even some with fuel cells. But what is the main technology that can decarbonise the major part of buildings in cities in Europe? It's thermal infrastructure. And I don't think the Commission scenarios have realised that yet.

**The latest [Heat Roadmap Europe \(HRE\)](#) report that you drafted, says district heating can cost-effectively provide at least half of the heating demand in 2050, up from 12% today. Why not more? Is it because district heating can only reasonably be envisaged in urban areas?**

As usual, the devil is in the detail. In Italy and Spain for example, they have virtually no district heating today. And they could have up to 70% of their demand for heat provided by district heating. It would be a good idea, economically and environmentally.

In other countries, like Finland and Sweden, a small expansion of thermal grids may be feasible. But in most European countries, there is a high potential to increase district heating. And the main reason is because of urban density. Even in rural areas, the density of energy demand is often high enough to make district heating economical.

In countries like the Netherlands, Italy and Spain, the houses and energy demand are really close together – in many cases a much higher energy density than in “established” district heating countries. In other countries like Hungary or Romania, there is a larger spread in the buildings. And this is why we end up with this 50% figure – it’s because we look at Europe as a whole.

We’re actually pointing to the fact (p.6 in the executive summary) that it can be economically feasible to go closer to 70% for district heating across the whole of the EU. The problem is not technological but political and regulatory.

**And doing that would be cheaper than electrification or gasification?**

Yes, 50% is a safe target to have for district heating but there can be benefits also going beyond, towards 70%.

But right now, the main paradigm across European countries is completely different. There are exceptions like the Netherlands and France where there are huge efforts to build a larger thermal grid or to understand what regulatory frameworks are required.

In many places, however, especially the new EU member states in the East, we are seeing a heavy expansion of gas – in existing buildings but also in new buildings. So it is becoming urgent for the European Commission to have a policy in this area.



## **IEA analyst: A heating and cooling target 'could make a big difference'**

As talks on the EU's renewable energy rules resume, one of the main talking points is how to decarbonise the heating sector, and deploy technologies like heat pumps and district heating. The International Energy Agency's Ute Collier told EURACTIV in an interview that the task is complex and difficult.

**What is the right forum to discuss the future of gas and district heating? There is a revision of the gas directives which is due for 2020. And there is also the ongoing consultation on the EU's 2050 low-carbon strategy, which includes a net-zero emission goal.**

Many of these issues should be dealt with at the member state level. Because heating is inherently local. This means the infrastructure should be owned locally, by the citizens themselves. And actually, the decision to build the infrastructure should be made locally. It shouldn't be a top-down decision, this would be counter-productive.

But it doesn't mean that the Commission can't do anything. For example, it could encourage countries to ban oil boilers outside urban areas, and report about it. A ban could happen very soon, like 2022, 2023, or maybe even 2020. The alternatives are certainly there so it's entirely

feasible to do it. And that would give a clear indication of when the last oil boiler will be sold in Europe.

The same goes for natural gas. When will the last residential gas boiler be installed in each member state? In many EU countries, this could happen very soon, at least for new buildings.

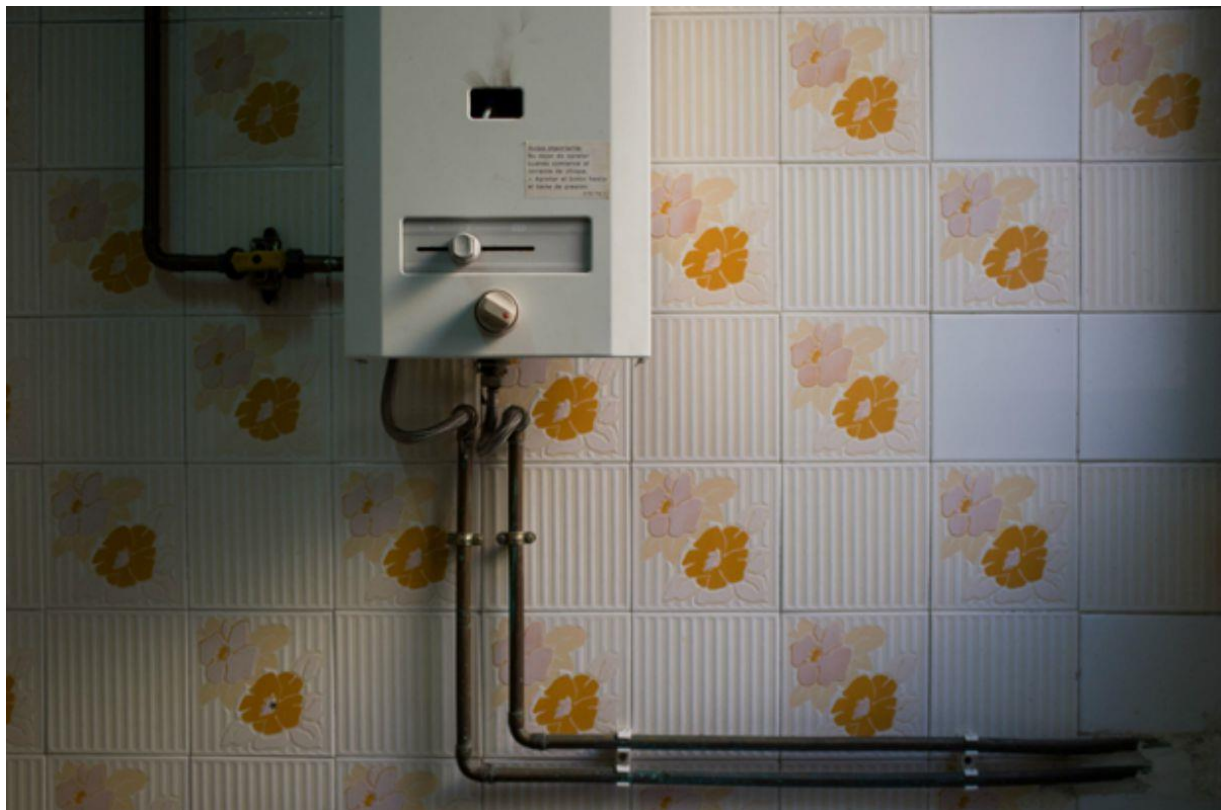
### **So when should the last one be bought?**

2030 should be considered as the last deadline. And I think a lot of countries are politically and technologically ready to do it.

If we are still installing natural gas boilers by 2030, then we should ask ourselves whether we're really serious about the transition to low-carbon energy. You have to remember that gas boilers have a lifetime of 12-15 years so any ban would have to be set within the next few years to make a difference – and to prepare citizens for a new paradigm.

But that is not something that the Commission should decide top-down. It should ask the member states to decide and have a debate at the national level so they can come up with their own deadlines.

The process of the Paris Agreement and the mandatory comprehensive assessments of heating and cooling makes this debate possible. These are good signposts that can create a debate with concrete scenarios and quantifications.



## **EU ban on aging boilers expected to bring ‘mammoth’ energy savings**

New energy standards for home boilers entering into force this month are expected to take offline the equivalent of 47 Fukushima-type nuclear power stations in Europe by 2020, according to official EU data compiled by the European Environmental Bureau (EEB).

**There is also a question of awareness. The notion that gas will still be needed beyond 2030 just to meet demand for residential heating is pretty strongly rooted, in Brussels and beyond. And that is currently a powerful argument to keep gas in the mix.**

Well, this notion has to be challenged. In the [Heat Roadmap Europe \(HRE\)](#), we provide country maps 100 meters by 100 meters, where you can identify whether there is waste heat in a nearby industrial facility. So you can make a screening, from bottom to top. Our aim is to democratise the debate by putting facts on the table.

People talking about electrification or gasification should really put the facts on the table if they want to be taken seriously.

### **What else could the European Commission do?**

What they could do is take another look at its [PCI list](#), the Projects of Common Interest for energy infrastructure.

To me, it is very clear that the environmental assessment of both electricity and gas infrastructure is lacking – there is no evaluation of how those projects can help reduce emissions of greenhouse gasses. When you decide to invest billions of euros in infrastructure that will last 30-50 years, CO2 emissions, health and environmental impacts should be stop-or-go criteria.

A good idea would be to stop investing in new gas infrastructure and start giving subsidies to build thermal grids across Europe, allowing local authorities to apply for a 10% subsidy. That would really help move things forward.

Unfortunately, the Commission has a harder time funding such infrastructure because it says it's not transnational. But by focusing on transnational gas networks, the Commission is forcing gas on European citizens. Because this infrastructure, once it is constructed, will have to be used. It's like building a highway, once it's there, it will be used. The geopolitical and internal market arguments are valid in some cases. But lowering energy demand and switching to thermal grids is a safer pathway, both geopolitically and environmentally.

So why not have a PCI list for smart thermal grids infrastructure, across Europe? My impression is that many EU civil servants and policymakers would support such a move.





## **EU's Cañete warns gas pipelines risk becoming 'stranded assets'**

Miguel Arias Cañete, the EU Commissioner for climate action and energy, had an unpleasant message for the gas industry when he presented the European Commission's 2050 vision for a "climate neutral" economy earlier this week.