

GOODBYE GAS: why your next boiler should be a heat pump

Comparative study of green heating
options for consumers, 2025-2040.

Executive summary and key findings



INTRO

The climate crisis means we need to rethink how we heat our homes, moving away from gas to more efficient solutions. Gas boilers, which are used by millions of consumers across Europe, are both polluting and leave us exposed to major price fluctuations. As we've seen in recent months, this can have a major impact on consumers' energy bills. So, what will be the most affordable alternative for consumers to sustainably heat their homes? And therefore, what solutions should upcoming EU and national legislative revisions promote?

To answer these questions, consumers organisations in Italy (Altroconsumo), Czech Republic (dTest), Poland (Federacja Konsumentow), Spain (OCU) and BEUC commissioned a study from economic analysis firm, Element Energy.

The study estimates the cost of heating the two most typical homes (a house and an apartment) in those countries by using electric heat pumps, hybrid electric-hydrogen heat pumps and hydrogen boilers in the period 2025-2040. This period was chosen as it is when legislation on residential heating that is being revised or will shortly be revised will enter into force and as 15 to 20 years is the average lifetime of a heating appliance.

The cost of heating is calculated by considering the total cost of ownership of the different appliances. It includes the cost of energy generation, the cost of operating energy networks and make the appropriate upgrades, the cost of insulating the buildings and the cost of purchasing and installing the appliances.

KEY FINDINGS



Electric heat pumps are the most affordable option for consumers to decarbonise their heating. In high density areas, district heating powered by heat pumps is also competitive, but consumer rights must be improved to match those in electricity. Hydrogen boilers and hybrid heat pumps (hydrogen/electric) are the most expensive option for consumers. Hydrogen will be far more expensive than gas is today.



In cold climates, major home energy efficiency improvements deliver significant financial benefits to consumers, reducing consumption and helping to reduce energy bills. This applies in all four countries, helping to keep homes warm in winter. In warm climates, shading (e.g. the use of blinds) can decrease consumption and improve comfort.



'Smart heating' (e.g. when it's cheaper at off-peak times) with heat pumps will reduce consumers' heating costs by up to 31% compared to conventional heating. This is because consumers using electricity smartly reduces the need for investments in electricity grids. The savings have the potential to reduce grid charges on consumers' energy bills.



If national governments roll out ambitious home renovation programmes, allowing many consumers to improve the energy efficiency of their homes, this could also mean **lower grid tariffs (and energy bills)** for all if savings are passed on to consumers.



To be able to reap the benefits of lower energy bills, consumers will need financial support (affordable and green loans and/or grants) to help with the high up-front investment to purchase a heat pump and pay for energy efficiency improvements.

POLICY RECOMMENDATIONS

01

EU and national policies should support a switch to electric heat pumps as it will be the most cost-effective heating solution for consumers. They should not support reliance on hydrogen in the residential heating sector, as it will never be a cost-effective option

Consumers relying on gas for heating should not be switched to hydrogen as a result of EU and national policies. The European Commission and national governments should prioritise the roll out of individual electric heat pumps and, in urban areas, district heating with fully electric or with hybrid hydrogen/electric heat pumps.

For this reason, the upcoming Gas Package should not set a target for blending hydrogen into existing gas networks. Similarly, national governments should not aim to decarbonise heating by blending hydrogen in the gas networks.

02

National governments and local authorities should financially support consumers to switch to electric heat pumps and where needed to improve the energy efficiency of their homes. To that end, EU and national governments should also guarantee consumers' access to finance and ensure consumer protections for credit

Switching to heat pumps and improving energy efficiency brings significant financial savings for consumers and the energy system, but up-front costs can represent a barrier for many consumers.

Countries should provide grants of up to 100% of the initial investment needed for vulnerable consumers to make the switch.

Consumers should also have access to affordable green mortgages/loans and on-bill schemes. Member States should also introduce guarantee funds to reduce the risk of providing loans or mortgages, so that banks can offer better interest rates to consumers. At the same time, financial services regulations should require banks to be responsible when lending money and EU should foresee a cap on the total cost of credit for green mortgages/loans under the Consumer Credit and Mortgage Credit Directives.

03

Governments should ensure that all consumers have access to trusted, tailored advice, and to a skilled workforce

Consumers often struggle to find reliable professionals to undertake renovation works or replace their heating appliance or who could advise them on these works.

The Energy Efficiency Directive should require countries to set up one-stop shops to advise consumers on renovation works or heating appliances, and on where to find skilled workers or financial support. Consumers should be advised according to their individual situations as, for example, homes in colder climates require more insulation than homes in warmer climates.

The Renewable Energy Directive and the Energy Efficiency Directive should require that the workforce specialised in carrying out these works is available to all consumers.

04

Governments and regulators should ensure that consumers have access to tariffs and to financial rewards, giving them incentives to heat their homes smartly and benefit of the reduction in the cost of operating electricity networks

As smart heating (e.g. operating heat pumps at off-peak times) will help reduce the cost of managing electricity networks, these benefits should be passed on to consumers in the form of financial incentives. This will be increasingly important as the share of wind and solar power in the electricity mix is expected to increase. Flexibility on the demand side will greatly help reducing the cost borne by electricity networks to balance supply and demand and will hence reduce consumers' network tariffs.

Countries should swiftly implement the measures in the Electricity Directive that give such financial incentives to consumers to use energy outside peak times (i.e. allowing them to sign up for dynamic electricity price contracts).

05

Ecodesign rules should not force consumers who need to purchase a gas boiler to buy a hydrogen-ready one

In the next decade, consumers whose gas boilers break down may still need to replace them with a new one and may not be able to switch immediately to a heat pump. There are discussions on requiring all gas boilers on sale to be able to function with hydrogen under the Ecodesign Directive. Hydrogen may never become a reality for consumers, hence this functionality may never be useful for them and may only come at a premium. Hence, the new Ecodesign rules should not require all gas boilers on the market to be hydrogen-ready.

COUNTRY SUMMARY

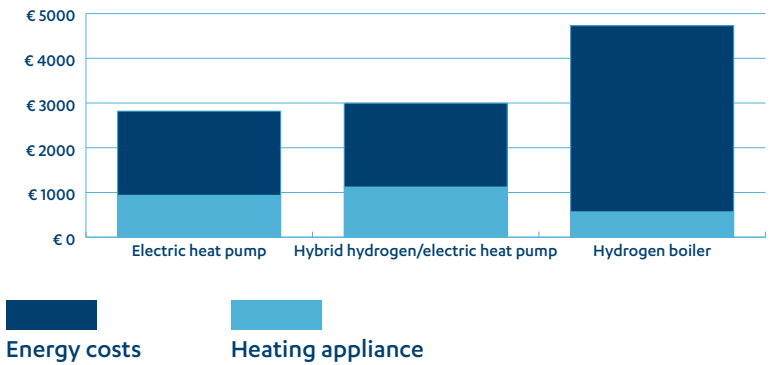
CZECH REPUBLIC

Heating appliance

Heat pumps will be the cheapest heating option for consumers in the Czech Republic. The total cost of ownership of hydrogen boilers in this period would be 56-68% higher.

The reason is that despite the higher up-front cost of heat pumps, the running cost of hydrogen boilers is typically more than double that of heat pumps in the Czech Republic. The price of hydrogen can be lower than the price of electricity, but the efficiency of hydrogen boilers is much lower, so more fuel is required.

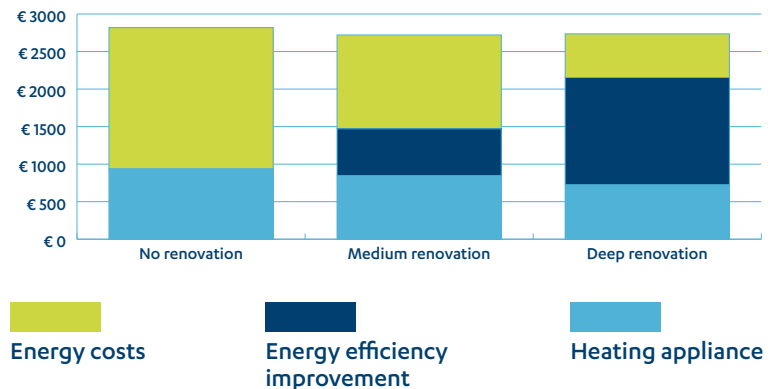
Annual cost of heating a single family home in the Czech Republic in the period 2025-2040 with different heating systems



Home renovation

Home renovation measures pay back in the Czech Republic within 30 years, which is their average lifespan. Deeper renovations are more cost effective in single family homes than they are in apartment buildings, where a medium renovation can already bring significant monetary benefits. The reason is that less energy is required to heat an apartment. Hence, making additional investment in deeper renovation would not bring significant extra energy consumption (and bill) reductions. Improving energy efficiency in homes would also reduce the cost of operating electricity networks, and hence network tariffs on consumers' bills.

Annual cost of heating a single family home in Czech Republic in the period 2025-2040 with a heat pump, with different levels of energy efficiency improvements



District heating

In urban areas, in the same period, renewable electricity-based district heating will have similar costs for consumers as individual heat pumps. However, hydrogen-based district heating would be 34% more expensive for consumers than district heating with fully electric or hybrid hydrogen/electric heat pumps.



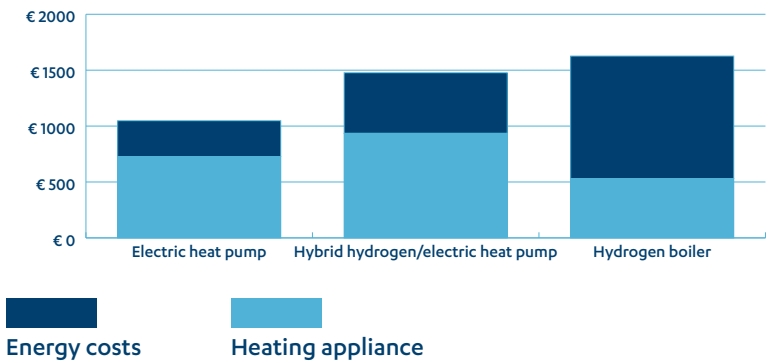
COUNTRY SUMMARY



Heating appliance

Similarly, as with the other countries, the best and cheapest heating option for Spanish consumers, would be an electric heat pump. The total cost of ownership of hydrogen boilers would be 55-60% more expensive for consumers than for electric heat pumps in the period 2025-2040. It needs to be noted that while heat pumps will be able to also deliver cooling during the summer, hydrogen boilers will not and consumers would need to purchase a separate appliance, further increasing their expenditure for energy.

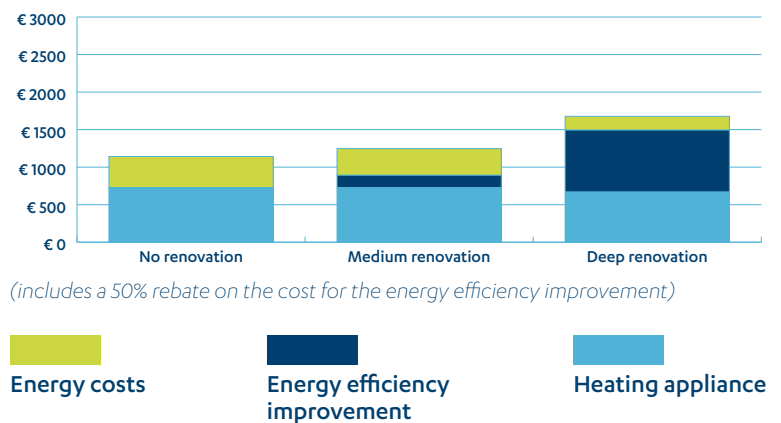
Annual cost of heating an apartment in Spain in the period 2025-2040 with different heating systems



Home renovation

Bill savings from energy efficiency improvements in Spain, however, would often not be sufficient to recover the initial investments over the lifetime of such interventions due to milder winter and hence less heating needs, even when savings on summer cooling costs are factored in. Deep retrofits are much more expensive for consumers over the lifetime of the intervention than not carrying out any energy efficiency measures, due to high costs in Spain linked to higher labour costs.

Annual cost of heating an apartment in Spain with a heat pump in the period 2025-2040, with different levels of energy efficiency improvements



Shallow retrofits lead to slightly higher annual costs 7-9% but also offer other non-monetary benefits, such as increased comfort. However, if many consumers adopt such measures, this will lead to a significant reduction in electricity

grid costs (~€0.8bn/year), due to lower consumer demand and their ability to use energy smartly. Hence public support for energy efficiency improvements is important to help consumers reap their benefits.

District heating

District heating networks could deliver heat at an affordable cost to consumers living in urban areas, which is 3% cheaper than using an electric heat pump. However, rolling out district heating to rural areas would not be cost-competitive with individual solutions.



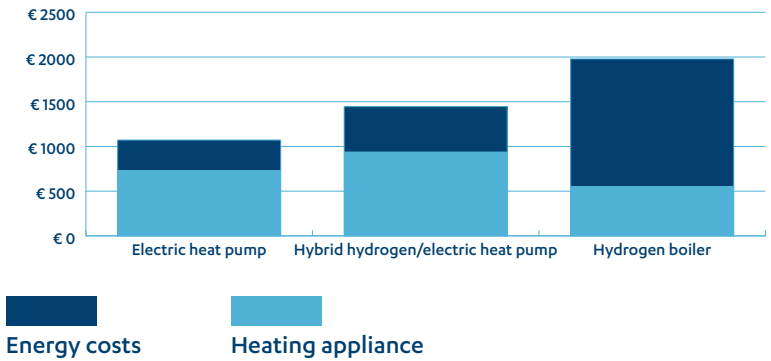
COUNTRY SUMMARY



Heating appliance

In Italy, the cheapest individual heating option for consumers from over the 2025-2040 period would be an electric heat pump. Hydrogen boilers would be 84-123% more expensive than electric heat pumps over their lifetime, while hybrid hydrogen-electric heat pumps would typically be 31% more expensive than fully electric. It needs to be noted that while heat pumps will be able to also deliver cooling during the summer, hydrogen boilers will not and consumers would need to purchase a separate appliance, further increasing their expenditure for energy.

Annual cost of heating an apartment in Italy in the period 2025-2040 with different heating systems

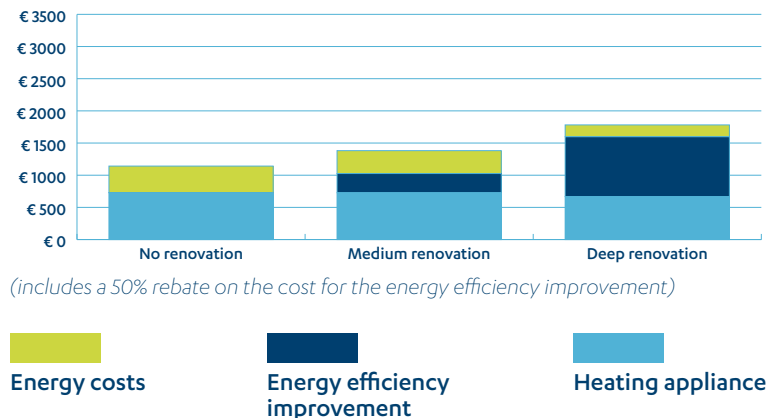


Home renovation

Improving the energy efficiency of homes in Italy would allow consumers to make savings by using less energy for heating and by using heat pumps flexibly. This would reduce electricity grid costs by 7% and flexibility would allow consumers to save up to 31% in their electricity bills.

However, public support is needed to help consumers retrofit their homes due to the significant up-front costs, which often do not have a payback period over their lifetimes. This is due to higher labour costs and milder winters which reduce heating needs.

Annual cost of heating an apartment in Italy with a heat pump in the period 2025-2040, with different levels of energy efficiency improvements



While medium efficiency measures could be more cost-effective in multi-unit buildings, as

they would allow consumers to cut energy needs and operate their heat pumps smartly without being too financially burdensome, deep retrofits should be encouraged in single family homes.

District heating

District heating with electric or hybrid electric/hydrogen heat pumps would have similar costs for consumers as individual heat pumps and hence could be an affordable solution in urban areas, while hydrogen-based district heating would typically be 46% more expensive.



COUNTRY SUMMARY



Heating appliance

Electric heat pumps would be the cheapest way to decarbonise heat for consumers in Poland. Typically, hydrogen boilers would be 53-61% more expensive than electric heat pumps over their lifetime.

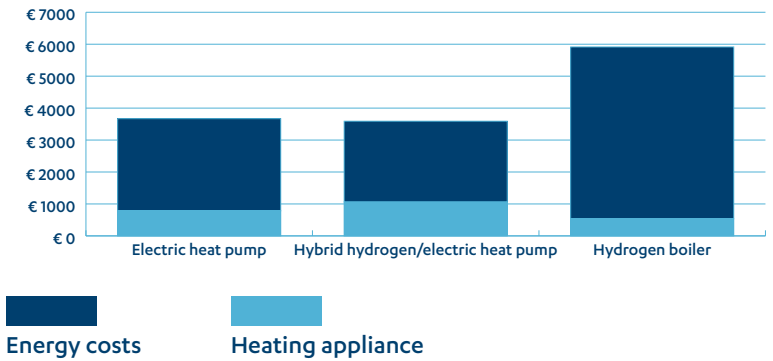
Home renovation

Energy efficiency improvements would help consumers make big savings on their energy bills (18%), with the cost of investment paying for itself within the works' lifespan.

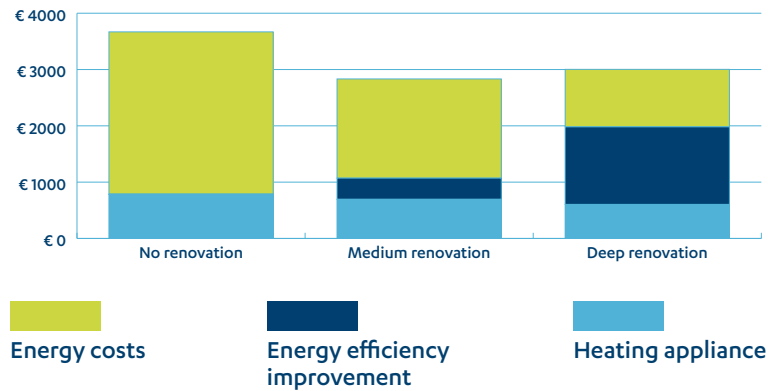
District heating

Renewable electricity-based district heating networks could heat consumers' homes in urban areas at a similar cost to individual heat pumps. District heating with hydrogen boilers would be approximately 29% more expensive for consumers than district heating with electric heat pumps or hybrid hydrogen/electric heat pumps.

Annual cost of heating a single family home in Poland in the period 2025-2040 with different heating systems



Annual cost of heating a single family home in Poland with a heat pump in the period 2025-2040, with different levels of energy efficiency improvements



CONCLUSION

The study shows that, although the cost of heating our homes may increase in the future as we decarbonise our energy, consumers will continue being able to heat their homes affordably and can do so sustainably if EU and national policies focus on proven and cost-effective solutions, such as heat pumps. They should not focus on promises, such as hydrogen, that may never materialise and, even if they do, would be very expensive for consumers.

In addition, a switch away from gas boilers to heat pumps powered with electricity that is increasingly produced with wind and solar power will also mean more stability, as we will be less exposed to volatility in global gas markets, which has led to very high energy bills in recent months. Improving the thermal insulation of our homes will also contribute to reducing our energy bills.

Clearly, as switching to a heat pump and improving the energy

efficiency of our homes is a quite expensive investment, government support will be essential to ensure that all consumers, including the most vulnerable, are able to reap the benefits of these measures.

In addition, we should not forget that the transition in the heating sector will bring a wider range of benefits than monetary savings alone. Well insulated homes will not only also help with improving the air quality of our cities, but it will also bring important benefits in terms of adequate thermal comfort and health to consumers, as they will be warmer during the winter and cooler during the summer.

Hence, BEUC calls on EU and national policymakers to speed up the decarbonisation of the heating and buildings, prioritising cost-efficient energy efficiency improvements in homes and the deployment of heat pumps. This will benefit both the environment and consumers.

