

Hydrogen Europe Position Papers

Hydrogen technologies can boost the energy performance of buildings

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Introduction

An accelerated shift to hydrogen-based solutions for heating must be supported by the Energy Performance of Buildings Directive (EPBD) revision, or as a bare minimum, should not be blocked by it. Buildings are responsible for 40% of energy consumption and 36% of greenhouse gas emissions in Europe. Thus the revision of EPBD will have to ensure that dependence on fossil fuels in this critical sector is drastically reduced. Hydrogen will be an important solution to achieving zero-emission buildings in an inclusive and system-efficient way.

Hydrogen heating technologies present a cost-effective solution in any type of building, ensuring a reliable supply of heat and/or power throughout the year and across seasonal fluctuations. Hydrogen use in buildings can range from boilers running on pure hydrogen or methane-hydrogen blends, fuel cells for combined heat and power, centralised heat and power using hydrogen for district heating and cooling networks, decentralised off-grid heat and power and hybrid as well as thermally driven heat pumps using hydrogen. The industry is dedicated to delivering these applications at scale, with more than 80 projects under development across Europe.¹

The use of hydrogen for heating is often questioned under the premise that hydrogen will be available in limited quantities and at a high cost, so its use should be limited to hard-to-abate sectors. However, it should be considered that hydrogen and its sector coupling with electricity allow better renewable energy integration and offer options for large-scale seasonal storage. These are necessary pieces to render the transition to a decarbonised energy system cost-efficient. Besides, in some European regions interested by the emergence of Hydrogen Valleys, the use of hydrogen will be extended for multiple purposes, and hydrogen infrastructure will be developed accordingly.² Residential and commercial buildings in these regions will benefit from the expected hydrogen supply infrastructure and the development of large hydrogen production facilities. Therefore, its use would be the most cost-effective solution locally.

Hydrogen Europe is firmly convinced that the use of hydrogen for heating in buildings can support the market ramp-up of hydrogen by securing demand and better valorising regional investments in grid infrastructure, helping to achieve economies of scale faster.³ It will also be a key technological solution for those buildings that find it challenging to self-supply their needs with onsite renewable energy generation alone. The latest BNEF and ENTSOs market projections for Europe and globally see a role for hydrogen in buildings and low-temperature heating applications.⁴ This reflects an important reality: the

¹ European Heating Industry, Heating Market Report 2021.

² According to the FCH 2 JU report on Hydrogen Valleys (2021), there is a visible trend towards shifting the main activities of Hydrogen Valleys beyond the mobility sector. Within the energy sector, Hydrogen Valleys typically focus on the supply of stationary fuel cells (e.g., applications in residential heating, back-up, or prime power) but also blending into the gas grid.

³ According to ENTSO-E and ENTSO-G's Global Ambition Scenario (TYNDP 2022), 466 TWh of renewable and low-carbon hydrogen could be supplied in 2030. The same year demand adds to 358 TWh of hydrogen, of which, 52 TWh are demanded for buildings, 57 TWh for transport and 249 TWh for industry. In 2040, 1.575 TWh could be supplied and 1.497 TWh demanded, of which buildings demand 380 TWh, transport 411 TWh, industry 480 TWh, and the power sector 226 TWh. Assuming demand for buildings and other sectors remain as expected, the estimates indicate that there will be sufficient quantities of locally produced and imported hydrogen available for buildings in the short to medium term.

⁴ The ENTSOs' Global Ambition Scenario projects that 15% of total hydrogen demand in 2030 and 25% of total hydrogen demand in 2040 will be residential and tertiary demand (or even up to 23% in 2030 and 13% in 2040 as per Distributed

electricity grid will not be able to cope cost-efficiently and within the accelerated time frame with a fully electrified heating system. This is because peak demand will pose challenges both for transmitting power and ensuring sufficient supply at all times, especially during extremely cold periods.⁵

Based on these considerations, we propose three main recommendations that would considerably improve the directive currently under discussion.

1. Ensure alignment across all decarbonisation initiatives impacting the use of hydrogen in buildings

As explicitly stated in the explanatory memorandum, the EPBD proposal complements the Energy Labelling Regulation (ELR) to incentivise consumers to purchase best-in-class energy-related products placed in buildings and works in tandem with the Ecodesign Directive (ED) to set energy and environmental performance requirements on energy-related products and equipment used in buildings.

This is why we ask legislators to carefully assess the effects of the revision of the Ecodesign and Energy Labelling regulations on the EPBD. The currently proposed rescaling for the labelling of appliances⁶ requires an urgent review. In particular, Hydrogen Europe is deeply concerned with the introduction of a 1.65 Primary Energy Factor (PEF)⁷ for hydrogen heating technologies in the interim proposals for the Ecodesign and Energy Labelling review on Space and Combination heaters of January/February 2021. Consequently, a gas-based technology ready to switch to hydrogen would receive a lower rating than a gas-based technology not equipped for hydrogen integration. As a result of this rating, we are concerned that we are concerned that, as a result of this rating, the energy performance standards of buildings using such hydrogen technology would also decrease.

A viable alternative is to remove the PEF as a reference value and introduce mandatory hydrogen readiness requirements for gas condensing boilers space and combination heaters, hybrid unit space and combination heaters, thermally driven heat pump space and combination heaters and micro-CHP by 2029.

We also note that the current definition of 'energy from renewable sources' (art. 2(13)) only covers some renewable gaseous fuels, such as biogas and landfill gases, while excluding Renewable fuels of non-biological origin (RFNBOs) covered by the REDIII definition in (art. 2(22a), where '*renewable fuels*' means

Energy Scenario). In the global market, in BNEF's Energy Outlook, 5-10% of total hydrogen demand will be demanded for buildings in the same period.

⁵ Frontier Economics study, The role of hydrogen in heating buildings, March 2021

⁶ Please see: <https://www.ecoboiler-review.eu/index.html>

⁷ The Primary Energy Factor (PEF) connects primary and final energy, indicating how much primary energy is used to generate a unit of electricity or a unit of useable thermal energy. The currently proposed PEF is based on CO₂-emitting hydrogen production, whilst renewable hydrogen will be the future norm. By comparison the PEF update of electricity is based on renewable electricity, whilst much of it is still CO₂-emitting today. A more neutral approach is needed for all carriers with a decarbonised future.

biofuels, bioliquids, biomass fuels and renewable fuels of non-biological origin). We stress the need to ensure consistency across the different pieces of legislation, notably considering that, under REDIII, RFNBOs are to be counted as renewable energy regardless of the sector in which they are consumed (hence, the building sector as well).

Ultimately, we believe that legislation must be forward-looking and should not neglect active hydrogen customers and energy communities, as well as those decentralised production solutions under development for households and energy communities.⁸ Consumers are at the core of the decarbonisation of buildings: To ensure that the decarbonisation of the building sector leaves no one behind, the EPBD needs to encourage consumers to become active participants in the market and join forces in dedicated citizen energy communities for hydrogen. This should be appropriately reflected in the current EPBD revision and the Hydrogen and decarbonised gas market package.

Recommendations:

- Replace the PEF value for hydrogen with a mandatory ecodesign requirement on hydrogen readiness by 2029. Additionally (though not in EPDB): rethink the rescaling of the energy labelling for heating appliances to ensure this does not damage hydrogen technologies.

- To fully recognise the role of renewable hydrogen, the definition of 'renewable energy' should be consistent across different pieces of legislation. We suggest including renewable fuels of non-biological origin (RFNBO) in the definition of 'energy from renewable sources' in Art. 2(13). Alternatively, RFNBO could be defined under a separate entry in Article 2.

2. Include transport of hydrogen through grids in the definition of zero-emission buildings

The current formulation of the zero-emission buildings' definition is the following: Art. 2(2) '*zero-emission building*' means a building with a very high energy performance, as determined in accordance with Annex I, where the very low amount of energy still required is fully covered by energy from renewable sources generated on-site, from a renewable energy community within the meaning of Directive (EU) 2018/2001 [amended RED] or from a district heating and cooling system, in accordance with the requirements set out in Annex III'.

This definition presents the following problems:

1. The proposed definition requires energy to be produced on-site, effectively excluding the transport of renewable electricity and renewable hydrogen via the extensive infrastructure, such as power grids and hydrogen grids (reconverted gas grids for heating purposes).

⁸ The development of domestic electrolyzers is already under way, and Enapter's hydrogen project for residential heating in Rozenburg is a case in point. <https://www.enapter.com/application/residential-heating-with-hydrogen#21930>

2. The definition allows energy production within renewable energy communities. Still, hydrogen is currently not covered by the definition of renewable energy communities, neither in the Renewable Energy Directive nor in the Hydrogen and decarbonised gas market package. As stated in paragraph 1 of this paper, energy production within renewable energy communities must be extended beyond power and biomethane to include hydrogen. There is no reason why energy communities could not own hydrogen production facilities.
3. The definition is not consistent with the key requirements for zero-emission buildings set in Annex III, paragraph 1, which allow for access to energy from the grid: *‘only where, due to the nature of the building or lack of access to renewable energy communities or eligible district heating and cooling systems, it is technically not feasible to fulfil the requirements under the first paragraph, the total annual primary energy use may also be covered by energy from the grid complying with criteria established at national level’*. To ensure consistency across the text, the approach in Annex III, paragraph 1 should be maintained in the respective definition of zero-emission buildings.

Recommendations:

- Article 2(2) should be amended as follows: ‘means a building with a very high energy performance where the very low amount of energy still required ~~is~~ **shall be** fully covered, **on a net annual basis**, by energy from renewable **and zero-emission** sources generated on-site, from a renewable energy community within the meaning of Directive (EU) 2018/2001 [amended RED], or from a district heating and cooling system in accordance with the requirements set out in Annex III, **or from renewable energy supplied from the energy grids in accordance with the requirements set out in Annex III.**’

- Article 3, Paragraph 1 should be amended as follows: ‘The total annual primary energy use of a new or renovated zero-emission building shall be fully covered, on a net annual basis, by energy from renewable **and zero-emission** sources generated on-site **or supplied via the grids**, and fulfilling the criteria of Article 7 of Directive (EU) 2018/2001 [amended RED]’

3. Be inclusive of clean hydrogen technologies that allow achieving net-zero buildings

Article 15 proposes removing incentives for installing boilers powered by fossil fuels from 2027. Yet, we believe it essential to underline that heating combustion technologies that are, or can be made, future-proof by design for hydrogen are not fossil fuel technologies and should be able to contribute to buildings’ decarbonisation. It is indeed essential to distinguish between technologies and the fuels they use: some manufacturers will bring 100% hydrogen appliances by 2024 to the market, and the industry

is calling for mandatory 100% hydrogen readiness⁹ by 2029. As these technologies represent a valuable option to move away from fossil fuels, it is critical that they remain eligible for meeting the specifications of zero-energy buildings and possible associated incentives.

Hydrogen based heating technologies can also help accelerate the decarbonisation of the worst-performing buildings. The new framework for Minimum Energy Performance Standards (MEPS) should ensure adequate support for the replacement of old and inefficient heating appliances with more efficient, clean, hydrogen-ready solutions.

Hydrogen-based heating technologies represent a competitive market for heating manufacturers and an efficient and cost-effective solution for consumers, with a wide range of applications, especially in the existing building stock and reasonable conversion costs. A future-proof legal framework for building modernisation should ensure that the deployment and access to these technologies is accelerated where relevant rather than excluded.

Recommendations:

- We suggest amending Article 15(10) as follows: ‘From 1 January 2027 at the latest, Member States shall not provide any financial incentives for the installation of boilers **that are not certified to run on hydrogen and are** powered by fossil fuels, with the exception of those selected for investment, before 2027, in accordance with Article 7(1)(h)(i) third hyphen of Regulation (EU) 2021/1058 of the European Parliament and the Council on the European Regional Development Fund and on the Cohesion Fund and with Article 73 of Regulation (EU) 2021/2115 of the European Parliament and the Council on the CAP Strategic Plans.’

- Article 9(3) should be amended as follows: ‘In accordance with Article 15, Member States shall support compliance with minimum energy performance standards by all the following measures: (a) providing appropriate financial measures, in particular those targeting vulnerable households, people affected by energy poverty or living in social housing, in line with Article 22 of Directive (EU) .../.... [recast EED]; (b) providing technical assistance, including through one-stop-shops; (c) designing integrated financing schemes; (d) removing non-economic barriers, including split incentives; **and** (e) monitoring social impacts, in particular on the most vulnerable **and (f) promoting and incentivising the cost-effective early replacement of old and inefficient heaters.**

- Similarly, Annex II (overview of implemented and planned policies and measures) should be amended as follows: ‘Mandatory indicators: Policies and measures with regard to the following elements: [...] **(f a new): the modernisation of the heating and cooling stock via the installation of technologies ready to work with hydrogen**’.

⁹ Prime Movers’ Group on Gas Quality and H2 Handling, Decarbonising the gas value chain: Challenges, solutions, and recommendations, 2021



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