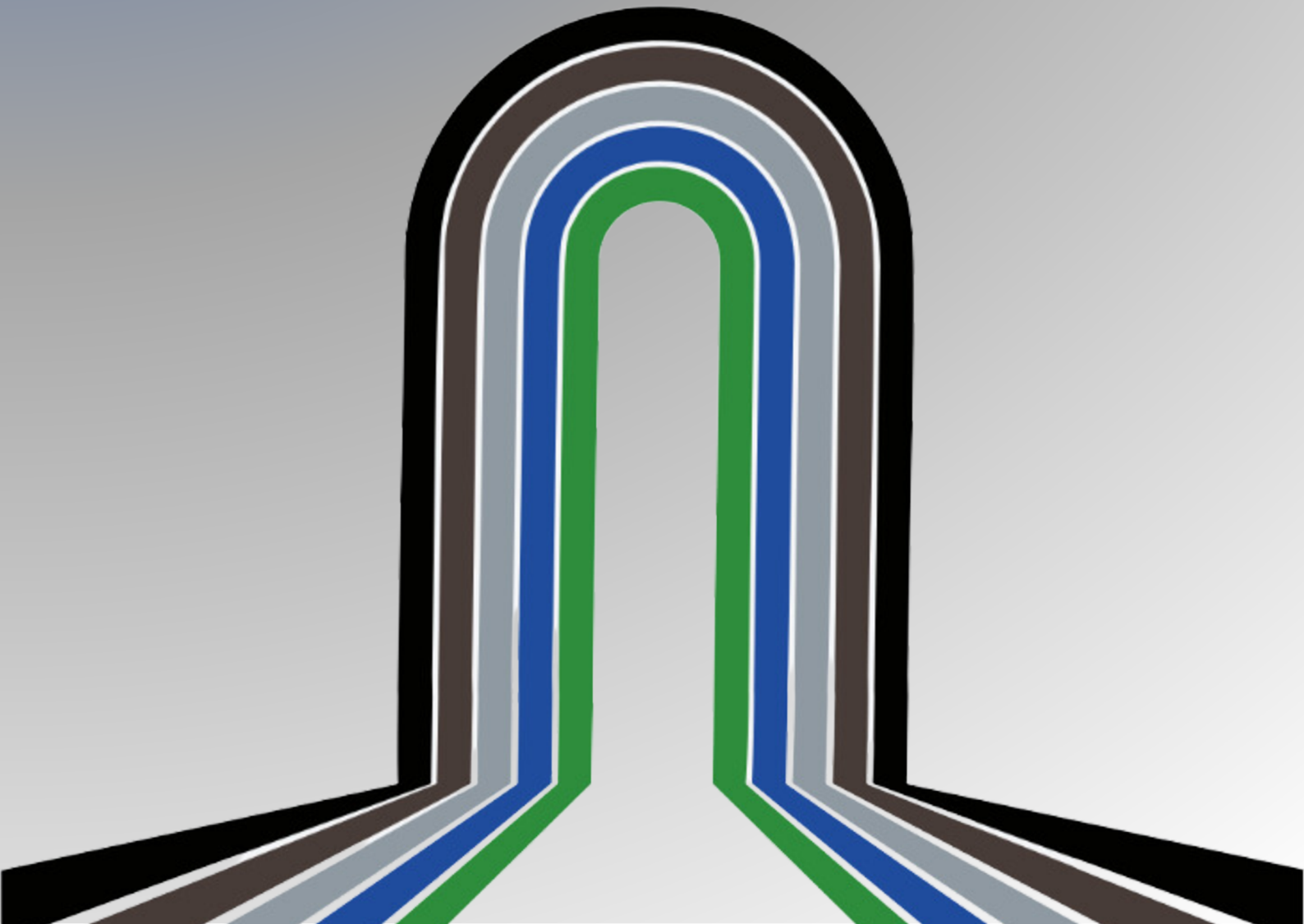
Friends of the Earth Europe

DON'T BE FOOLED BY THE HYDROGEN HYPE

A GUIDE TO NAVIGATING THE SMOKE AND MIRRORS SHOW



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A guide to navigating the smoke and mirrors show

For as long as scientists have been proving that climate change is real and caused by greenhouse gas emissions, the fossil fuel industry has tried to deflect attention away, putting on a smokescreen spectacle to keep themselves in business[1].

Hydrogen risks becoming just the latest trick up their sleeve. Whilst Europe needs to make a **decisive break from fossil fuels** in order to meet its climate targets and **become climate neutral**, the fossil fuel industry advocates for hydrogen in a last-ditch effort to ensure that their interests and profits are protected over the health of the people and the planet.

For Europe to be firmly on the path towards climate neutrality, it has **to decisively break free of its fossil fuel dependency. The hydrogen hype rolling across Europe threatens to keep us away** from our climate goals by making unsustained promises while extending the life of **polluting gas projects and benefiting from EU and national public money.** This short brief details what the **hype is all about** and why hydrogen cannot and will not be the answer to creating a sustainable and equitable energy system in Europe.

Hydrogen explained

There are two predominant ways to turn hydrogen into energy:

1. **Burning it directly in an electricity generating turbine or in industrial heating applications; a process that generates nitrogen oxides, air pollutants that are detrimental to human health[2].**

2. **Using it in fuel cells to generate electricity; a process that produces water vapour as a by-product.**

The use of hydrogen in itself does not create carbon emissions but that does not make it a clean or sustainable option.

The main problem is in the production of hydrogen. Hydrogen occurs naturally on earth almost only in compound form, mixed together with other elements. It must therefore be separated, or 'produced', before it can be used for energy. **The vast majority of hydrogen production today relies on fossil fuels that generate greenhouse gas (GHG) emissions** and worsen the climate crisis. These different processes have given rise to a colour-coded classification system, known as the hydrogen rainbow[3].

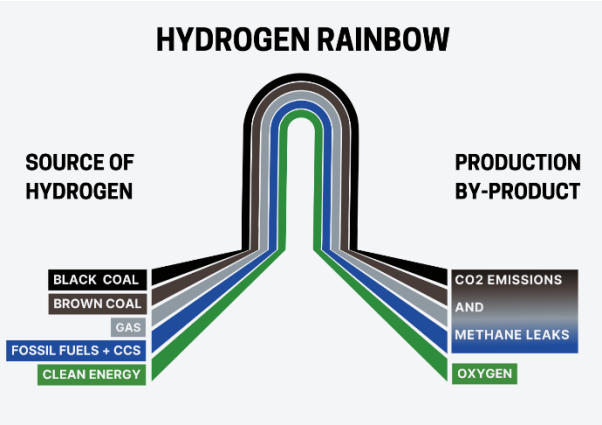
The conventional production method, called steam reforming, brings fossil gas and heated

[1] Milman, '"Smoking Gun Proof"'. https://www.theguardian.com/us-news/2024/jan/30/fossil-fuel-industry-air-pollution-fund-research-caltech-climate-change-denial

[2] Simkins, 'Scientist Warns of NOx Urban Pollution from Hydrogen Boilers'. https://www.endsreport.com/article/1723633/scientist-warns-nox-urban-pollution-hydrogen-boilers

[3] Erbach and Svensson, 'EU Rules for Renewable Hydrogen'. https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/747085/EPRS_BRI(2023)747085_EN.pdf

water together in the form of steam, resulting in grey hydrogen. It is also possible to produce hydrogen using coal through a gasification process. Meanwhile, only **0.1% of global hydrogen in 2022 was green[4].** This is a type of hydrogen that requires clean electricity from renewable energy sources, such as solar or wind power. It is produced by electrolysing water, splitting it into hydrogen and oxygen. It is the only method that does not result in CO2 emissions[5].



Hydrogen exposed

1. Most hydrogen is not renewable, nor low emission

Only one of the above processes can be considered as renewable, **whilst 96% of the hydrogen consumed in Europe comes from fossil gas.** By the Commission's own account, this hydrogen consumption has already resulted in "significant amounts of CO2 emissions"[6].

Blue hydrogen -fossil hydrogen with carbon capture and storage -only **represents 0.5% of the entire European 2022 hydrogen production** according to industry reports. The promise of these carbon capture technologies at large-scale remains unproven and **uneconomic, with existing projects continually underperforming[7].**

Even if CCS was to be successfully capturing some of the carbon emissions and keeping them captured, fossil-based blue hydrogen is **far from the promise of "low-emission"** and in some cases have an **even larger carbon footprint than** direct fossil gas burning[8]. This is largely due to **fugitive methane emissions** linked to an increased use of natural gas to power the carbon capture. **Methane is a powerful greenhouse gas,** and the **second-largest contributor to climate change**, after CO2. On a 20-year timeframe, it is 86 times more potent at warming the atmosphere than CO2[9].

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[4] International Energy Agency (IEA), 'Global Hydrogen Review 2023'. https://iea.blob.core.windows.net/assets/ecdfc3bb-d212-4a4c-9ff7-6ce5b1e19cef/GlobalHydrogenReview2023.pdf

[5] Hydrogen Europe, 'Clean Hydrogen Monitor 2023'. https://hydrogeneurope.eu/wp-content/uploads/2023/10/Clean_Hydrogen_Monitor_11-2023_DIGITAL.pdf

[6] European Commission, 'Hydrogen'. https://energy.ec.europa.eu/topics/energy-systems-integration/hydrogen_en

[7] Institute for Energy Economics and Financial Analysis, 'EU Bets on Unproven Technology with High-Risk Carbon Capture Plan'. https://ieefa.org/articles/eu-bets-unproven-technology-high-risk-carbon-capture-plan

[8] Howarth and Jacobson, 'How Green Is Blue Hydrogen?' https://onlinelibrary.wiley.com/doi/abs/10.1002/ese3.956

[9] European Commission, 'Methane Emissions'. https://energy.ec.europa.eu/topics/carbon-management-and-fossil-fuels/methane-emissions_en

2. Hydrogen is entangled with fossil fuel interests

The **influence** that the fossil fuel industry wields over hydrogen development has been **documented in independent academic studies[10].** EU Hydrogen lobby associations **include numerous gas companies and gas heavyweights**, such as BP, CEPSA, Eni, Equinor, Gasunie, GRTgaz, OMV - and the list goes on.

They propose initiatives such as **blending hydrogen with fossil gas, or repurposing - and even expanding - existing gas infrastructure.** This risks needlessly **delaying a European gas phase out**, which in turn endangers the EU's ability to achieve its climate targets. The EU's own Hydrogen Strategy identified a number of issues with blending: **it's inefficient, it diminishes the value of hydrogen, it poses challenges to connecting networks across borders and for the design of the gas infrastructure[11].** Yet projects are set in motion across Europe for retrofitting gas infrastructure to allow for a meagre 10% hydrogen blending (e.g., in Greece and Bulgaria)[12]. **Other projects even foresee an expansion of the infrastructure with no commitment to ever switch to 100% hydrogen**, much less so green hydrogen (e.g., in Romania).

3. Hydrogen gives the dangerous illusion of 'business as usual'

The narrative of repurposing existing gas infrastructure for hydrogen is **merely an illusion. The industry may think of it as a convenient tweak** that allows for the survival of an energy system built on fossil fuel dependency.

The availability of **green hydrogen is limited** and will most likely remain so for the foreseeable future. A recent report by the European Court of Auditors reveals that the import and production targets set by the Commission are unrealistic[13]. This scarcity means that having multiple industries bet on hydrogen for their path to decarbonisation is at best wishful thinking and at worst a list ditch attempt to extend their business-as-usual profiteering. **The focus on hydrogen diverts attention from other crucial measures, such as reducing overall energy consumption and improving energy efficiency.**

Hydrogen will not, cannot and should not replace fossil gas. **Direct electrification is the cleaner and more efficient solution for most energy needs in industrial processes, heating and the power sector.** Therefore, the production centres, as well as the end users of hydrogen are likely to be different - and fewer - than for gas. This means that relying on the existing infrastructure layout is not an efficient way of deploying hydrogen.

4. Where other solutions exist, hydrogen is inefficient and costly

Even if we create hydrogen from renewable electricity, this means redirecting "ready to use" renewable energy into the creation of a different kind of energy. Hydrogen's unique

[10] Vezzoni, 'How "Clean" Is the Hydrogen Economy?' https://www.sciencedirect.com/science/article/pii/S221042242400008X

[11] European Commission, 'A Hydrogen Strategy for a Climate-Neutral Europe'. https://energy.ec.europa.eu/system/files/2020-07/hydrogen_strategy_0.pdf

[12] 'Hydorgen Infrastructure Map Europe'. https://www.h2inframap.eu/

[13] European Court of Auditors (ECA), 'Special Report 11/2024: The EU's Industrial Policy on Renewable Hydrogen'. https://www.eca.europa.eu/en/publications/SR-2024-11

properties make it useful for industries where emissions are hard to abate and other mitigation measures may not be available, such as steel production. But for everything else, direct renewable electricity can do the job. In fact, **five times more wind or solar farms would be needed to heat our homes with hydrogen than if we were to heat them directly with electricity using a heat pump for example**[14], which is more efficient, less expensive, and less harmful for the environment than renewable alternatives[15]. Additionally, there are significant concerns that **hydrogen could deplete our renewable energy supplies** driving up the price, leaving many without access to energy, or delaying access to renewable energy for other sectors of the economy.

5. Hydrogen poses a threat to health and safety

Hydrogen is a **highly volatile and flammable gas, and its colourless and odourless nature makes it even more dangerous**. Applications such as hydrogen boilers are particularly concerning from a health and safety perspective. **Methane leaks have been historically difficult to spot, monitor and quantify**[16] - this problem will only be compounded for hydrogen, which has a smaller molecule and is therefore even more prone to leaking, while being impossible to detect with human senses. A peer-reviewed meta-analysis has found that estimates of leakage rates throughout the value chain can vary by a factor of 100[17].

6. Hydrogen can contribute to climate change

Hydrogen is not a greenhouse gas by itself, but its chemical reactions in the atmosphere **can increase the amount of greenhouse gases such as methane, ozone, and stratospheric water vapour.** A 2023 study measured that the global warming potential of **hydrogen over a 20-year time-horizon can be 40 times stronger than CO2[18].** In this way, hydrogen, if and when leaked, can worsen the climate crisis rather than being the solution it is touted to be.

The way forward

Europe must transform its energy system if it wants to become climate neutral and sustain a fair society in which everyone has access to clean and affordable energy. In regards to the use of hydrogen, this means:

1. The EU must commit to a clear phase-out date for fossil fuels, including fossil gas. **This should not leave any room for fossil-based hydrogen or for hydrogen blending.** Ending the EU's fossil addiction is crucial in addressing

[14] Rosenow, 'Is Heating Homes with Hydrogen All but a Pipe Dream?' https://www.cell.com/joule/fulltext/S2542-4351%2822%2900416-0

[15] Rosenow, 'A Meta-Review of 54 Studies on Hydrogen Heating'.https://www.cell.com/cell-reports-sustainability/pdf/S2949-7906(23)00010-1.pdf

[16] European Environment Agency, 'Methane Emissions in the EU'. https://www.eea.europa.eu/publications/methane-emissions-in-the-eu

[17] Martin, '"No One Knows" How Much Hydrogen Is Leaking into the Atmosphere'. https://www.hydrogeninsight.com/transport/no-one-knows-how-much-hydrogen-is-leaking-into-the-atmosphere-environmental-defense-fund/2-1-1503351

[18] Hauglustaine et al., 'Climate Benefit of a Future Hydrogen Economy'. https://www.nature.com/articles/s43247-022-00626-z

the climate crisis, and a phase-out date will assist in planning new energy infrastructures as well as decommissioning gas infrastructure. Committing to a specific date avoids getting trapped in a hydrogen infrastructure buildout, resulting in stranded assets or an artificial extension of the EU's gas reliance through fossil-based hydrogen, hydrogen blending or promises of hydrogen-ready applications.

2. **The EU must address all greenwashing attempts and potential conflicts of interest.** Seeing how intertwined the two industries currently are, it is necessary to have a clear differentiation in terms of industry, associations and EU dedicated instruments. The needs, structure and functioning of a potential hydrogen infrastructure have to be considered for their own merit, disentangled from fossil fuel industry interests. Initiatives such as repurposing gas infrastructure should be critically scrutinised through independent environmental needs and prioritisation studies as well as full-lifecycle environmental impact assessments.

3. The EU **must explicitly exclude fossil-based hydrogen from its funding instruments.** Projects that only ever aim at blending hydrogen should never be funded, as this is an ineffective and polluting pathway. The definition of green hydrogen must be protected, and only credibly green projects should be eligible for funding - i.e. projects linked to specific sources of green hydrogen.

4. Hydrogen must **not be allowed to distract from existing solutions that are 100% renewable and community driven**. Seeing the limited role that hydrogen can play in the energy transition, it is important that funding and support tools are primarily directed towards clean, proven and affordable solutions.

5. Guarantees of **respecting the rights and needs of local communities must be a prerequisite for considering any hydrogen imports.** The green transition cannot be based on further exploitation of vulnerable population groups.

"As Members of the European Parliament, your leadership and commitment are crucial in shaping policies that prioritise environmental integrity and social justice. We call on you to steer Europe towards a truly sustainable and equitable energy future, where hydrogen use does not lead us down the devastating path of continued fossil fuel dependency."

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Written by Cristina Pricop, Anti-fossil gas campaigner

Rue d'Edimbourg 26 | 1050 Brussels | Belgium

www.friendsoftheearth.eu

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