E3G HYDROGEN FACTSHEET: **INFRASTRUCTURE**

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Key political questions

- **How to plan infrastructure so that hydrogen can make the biggest positive impact?** The majority of scenarios show that sustainable hydrogen will be available in limited quantities in the short-term, while underlining that it is a key decarbonisation option in processes where alternatives such as electrification or material and energy efficiency improvements are not available. This points to the importance of planning infrastructure to channel hydrogen to centralised demand areas, such as industrial clusters. In addition, **planning hydrogen infrastructure in close proximity to renewable energy generation sites reduces costs.**
- **Who makes hydrogen infrastructure decisions?** Europe has an extensive gas grid, and transitioning to a future hydrogen grid will be a considerable technical, economic and political undertaking. Important decisions on hydrogen infrastructure will have to be taken, including on the priority production routes, volumes and end use. As the transition from fossil gas to renewable hydrogen progresses, hydrogen infrastructure will increasingly become a subsidiary to the electricity grid and strong economic interests due to existing investments in the natural gas grid will have to be managed.
- **Who should pay for the development of hydrogen infrastructure?** Not all current gas consumers are likely to benefit from future hydrogen availability. A mismatch between the costs and benefits of hydrogen infrastructure deployment would pose a significant social legitimacy risk.

Key facts affecting the political choice

Technical

- **Today's gas infrastructure is not ready for hydrogen.** Existing European gas networks can only integrate very low amounts of hydrogen, and blending high amounts of hydrogen would damage existing infrastructure. Safely integrating hydrogen into the gas grid would require costly infrastructure retrofitting, including for end-use appliances.
- **The EU will need less gas infrastructure in the future.** The EU has an extensive gas grid and will likely be using less gas to meet its energy demands in a climate neutral world. Forecasts show a modest potential for 'green gases' including hydrogen in the EU by 2050, ranging from **one-tenth to one-quarter of current EU gas demand.** Hydrogen development scenarios indicate that even the most optimistic hydrogen deployment cases could make do **with a gas network smaller than the one Europe currently has**.
- **Gas infrastructure will need to be structured differently to maximise efficiency.** The future hydrogen grid is likely to have different production centres and serve different end users to today's gas grid. Planning hydrogen production in close geographic proximity to renewable energy generation offers the potential to **reduce the amount of hydrogen infrastructure needed by up to 60%.** To match the logic of **deploying hydrogen to where it would have the most impact**, hydrogen infrastructure development would need to be centred on **demand pillars** such as industrial clusters, and as a function of electricity rather than gas planning.
- **Meeting infrastructure needs for large-scale hydrogen imports will be challenging.** Many EU countries plan to rely on large amounts of imported hydrogen. While hydrogen imports are likely in the future, they **will be challenging to realise**, in part due to technical constraints on developing

	transportation infrastructure. Hydrogen import infrastructure options include pipelines and shipping. Obstacles to importing hydrogen through pipelines today include the costs of **building and upgrading** pipelines, as well as the limitation on distance that can be covered, while obstacles to importing hydrogen through shipping include **high costs and inefficiency from the very low temperatures and additional conversion processes required**. In addition, the geographic distribution of hydrogen production has energy security implications, which would need to be addressed for the **EU to ensure its competitiveness.**
Economic and political	• **The cost to end users will depend on the approach taken for deploying hydrogen infrastructure.** The stakeholders that will benefit the most from hydrogen infrastructure should be the main parties responsible for financing it. This is likely to not be the case if a decentralised approach to hydrogen deployment is adopted, with the financial burden for converting and building hydrogen infrastructure **likely to fall on all current gas consumers due to their connection to the current grid**. As not all current gas consumers will benefit from the availability of hydrogen in the future this mismatch between costs and benefits would potentially pose a legitimacy risk to the transition to climate neutrality. • **Managing interests from existing infrastructure.** In the transition from fossil gas to renewable hydrogen, strong economic interests due to existing investments will have to be managed, and the risks inherent to this process should not be put on the consumer. This points to the importance of ensuring infrastructure decisions are made following independent, science-based assessments. • **Implications of prioritising 'green' or 'blue' hydrogen production infrastructure.** 'Green' and 'blue' hydrogen are produced **using different technologies**. As a result, the production infrastructure needed for the two processes is also different: 'green' hydrogen production would rely on electrolysis capacity; 'blue' hydrogen production requires methane reforming and carbon capture, transport and storage capacity. Prioritising one production method over the other will therefore also have implications on infrastructure development.

*This factsheet is part of an **E3G series of factsheets on hydrogen and the gas transition**. It has been written by Eleonora Moro and Felix Heilmann. For questions and feedback on this factsheet, please contact **Eleonora.moro@e3g.org**.*

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