

New Study: sufficient hydrogen available within reach of the European Hydrogen backbone

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- **New study by the European Hydrogen Backbone initiative estimates 2,300 TWh of hydrogen demand in EU+UK by 2050 corresponding to 20-25% of future EU and UK energy demand**
- **Sufficient potential exists to produce this quantity as green and blue hydrogen within the EU and UK, hydrogen imports from neighbouring regions are likely**
- **Pipeline transport more cost-effective than seaborne transport and powerlines**

Today, the European Hydrogen Backbone (EHB) initiative presents an analysis on future demand, supply, and transport of hydrogen across Europe. This study complements the recently published EHB maps, which showed a hydrogen pipeline network of nearly 40,000 km by 2040, connecting 19 EU Member States plus the United Kingdom and Switzerland.

Large future hydrogen demand to make Europe a climate-neutral continent

The EU and UK could see a hydrogen demand of around 2,300 TWh (of which 2,000 TWh in the EU) by 2050. This equals about 45% of EU+UK natural gas consumption in 2019. Hydrogen is crucial to decarbonise industry, in particular chemicals (ammonia and high-value chemicals), iron and steel, and fuel production. Hydrogen is also expected to play an important role in providing dispatchable electricity, as a heavy transport fuel and in some countries in the heating of buildings.

Europe can be self-sufficient in green and blue hydrogen, imports are likely

The total expected hydrogen demand could potentially be met by green hydrogen produced in the EU and UK, using renewable electricity. Yet producing such quantities of green hydrogen domestically is subject to public acceptance of an accelerated expansion of renewable installed capacity, financing, regulation and quality standard setting. It is anticipated that the economics of green hydrogen production costs will improve, allowing a rapid scale-up. In addition to green hydrogen, large quantities of relatively cheap blue hydrogen can be produced in Europe to quickly drive emission reductions and accelerate the pace of the transition. The study also shows that hydrogen imports by pipeline can provide an attractive complement to domestic supply.

Hydrogen Backbone is cost-effective and essential to create a European cross-border hydrogen market

Repurposed existing gas infrastructure plays a crucial role in connecting hydrogen supply and demand locations. Hydrogen pipelines are the most cost-efficient option for long-distance, high-volume transport at €0.11-0.21/kg per 1,000 km, outcompeting transport by ship for all reasonable distances within Europe and neighbouring regions. Also, the study shows that for high-volume transport of energy when the desired end-product is hydrogen, even without including flexibility costs such as energy storage, pipelines are more cost-effective than powerlines delivering the same amount of energy.

“Our new study shows that hydrogen will be crucial in multiple energy demand sectors. And the Backbone will be an enabler to connect supply with demand within Europe as well as allowing for cost-competitive imports”, says Daniel Muthmann, Coordinator of the EHB initiative and Head of corporate development, strategy, policy and communication at OGE.



The report can be found here: www.gasforclimate2050.eu/publications. For more information, please contact:

Creos Luxembourg

Jean-François SCHNEIDERS

+352 2624 8505

jean-francois.schneiders@creos.net

DESFA (Greece)

Natasha Chatziantoniou

+30 213 088 4058

a.chatziantoniou@DESFA.GR

Elering (Estonia)

Siim limre

+372 7151 222

Siim.limre@elering.ee

Enagás (Spain)

Alexandra Issacovitch

+34 629858493

vaissacovitch@enagas.es

Energinet (Denmark)

Tine Lindgren

+4523338715

TIL@energinet.dk

Eustream (Slovakia)

Pavol Kubík

+421262507134

pavol.kubik@eustream.sk

FGSZ (Hungary)

Dorottya Jászay

+36208260176

DJaszay@fgsz.hu

Fluxys (Belgium)

Laurent Remy

+32 479 65 92 29

laurent.remy@fluxys.com

Gas Connect Austria

Laura Veits-Pedarnig

Tel.: +43 (1) 27500 8100

laura.veits-pedarnig@gasconnect.at

Gasgrid Finland

Sara Kärki
+358 40 158 1722
sara.karki@gasgrid.fi

Gas Networks Ireland

Brian Murphy
+353 87 601 5577
Brian.Murphy@ervia.ie

Paul O'Donoghue
Paul.ODonoghue@ervia.ie

Gasunie (the Netherlands)

Marie-Lou Gregoire
+31 6 2043 0070
M.H.Gregoire@gasunie.nl

GAZ SYSTEM (Poland)

Iwona Dominiak
+48502200081
rzecznik@gaz-system.pl

GRTgaz (France)

Jean-Marc Brimont
jeanmarc.brimont@grtgaz.com

National Grid (United Kingdom)

Surinder Sian
+44 (0)7812 485 153
surinder.sian@nationalgrid.com

NET4GAS (Czech Republic)

Karin Stehlík
+420 604 223 577
karin.stehlik@net4gas.cz

Nordion (Sweden)

Saila Horttainen
+46706227606
Saila.Horttanainen@nordionenergi.se

ONTRAS (Germany)

Dirk Manske
+49 341 27111 2095
dirk.manske@ontras.com

OGE (Germany)

Christian Page
+49 175 1877392
christian.page@oge.net

Plinovodi (Slovenia)

Franc Cimerman
+38615820628
franc.cimerman@plinovodi.si

Teréga (France)

Ms. Mathilde Woringer
+33 5 59 13 32 52
mathilde.woringer@terega.fr

Trans Austria Gasleitung GmbH (Austria)

Mr Roberto TEBALDI
+43 (1) 5975116 - 58145
r.tebaldi@taggmbh.at

Snam (Italy)

Roberta Vivenzio
+39 342 7719117
roberta.vivenzio@snam.it

Creos Luxembourg owns and operates electricity (high, medium and low voltage) and natural gas (high, medium and low pressure) networks in Luxembourg. Its mission is to viably ensure energy transportation and distribution via electricity and natural gas grids at transparent rates in the Grand Duchy of Luxembourg. This role is executed equally with respect to all suppliers and by respecting the company's public service and environment protection obligations. Aside from developing and operating its infrastructure, Creos is also committed to bringing markets closer together through more intensive cooperation at the regional level.

Elering is an autonomous and independent integrated electricity and gas system operator whose primary task is to ensure the security of supply of energy to Estonian consumers. For this purpose, the company manages, administers and develops

domestic and cross-border energy infrastructure. With its activities, Elering ensures the conditions for the functioning of the energy market and for the development of the economy.

Enagás is a European Transmission System Operator with 50 years' experience in the development, operation and maintenance of energy infrastructures, operating in eight countries. The company has more than 12,000 kilometres of gas pipelines, three strategic storage facilities and nine regasification terminals. In Spain, it is the main natural gas transporter and the Technical Manager of the Gas System. The company has committed to be carbon neutral by 2040 and to developing projects promoting renewable gases - hydrogen and biomethane - sustainable mobility and energy efficiency, among other areas. For more information, go to www.enagas.es

Energinet was founded in 2004 as an independent public enterprise owned by the Danish Ministry of Climate, Energy and Utilities. Energinet owns, operate and develop the transmission systems for both electricity and natural gas in Denmark. Energinet's aim is to enable a cost-effective transition of the energy system to 100 % renewable energy while maintaining the high level of security of supply. For more information, go to www.energinet.dk.

Eustream is the operator of the high-pressure transmission system in the Slovak Republic whose main mission is the transmission of natural gas to Slovakia and through its territory to the European markets. Eustream operates a robust system of 4-5 parallel pipelines, representing an important energy connection between the Russian Federation and the European Union. It is connected to the primary transmission routes in Ukraine, Czech Republic, Austria and Hungary. A new gas interconnection pipeline with Poland will be commissioned in 2022.

FGSZ Ltd. is the owner and operator of the Hungarian high-pressure natural gas pipeline system servicing gas distribution companies, power plants and large industrial consumers. The company operates interconnectors with Austria, Slovakia, Ukraine, Romania, Serbia and Croatia, while planning to extend its network towards Slovenia as well. The company is committed to further enhancing its regional connections as well as the security of supply of the Hungarian national gas market, while also investigating the use of hydrogen in natural gas pipelines and reducing its GHG emissions, in line with our currently updated strategic vision. For more information, visit <https://fgsz.hu/>

Fluxys Belgium is a Euronext listed subsidiary of gas infrastructure group Fluxys headquartered in Belgium. With 900 employees the company operates 4,000 kilometres of pipeline, a liquefied natural gas terminal totalling a yearly regasification capacity of 9 billion cubic meters and an underground storage facility. As a purpose-led company Fluxys Belgium together with its stakeholders contributes to a better society by shaping a bright energy future. Building on the unique assets of gas infrastructure and its commercial and technical expertise, Fluxys Belgium is committed to transport hydrogen, biomethane or any other carbon-neutral energy carrier as well as carbon dioxide and to accommodate the capture, usage and storage of the latter.

Gas Connect Austria GmbH is a natural gas transmission system and distribution system operator, based in Vienna. With 280 employees, Gas Connect Austria operates a modern and powerful high-pressure network centred on the Baumgarten hub, with connections to Germany, Hungary, Slovakia and Slovenia, as well as to storage and production facilities. As a logistics services provider with a strong customer focus, the company is constantly developing its products and services in line with market requirements. Gas Connect Austria is intensively engaged with the issues of the energy transition at national and European level and is actively working on solutions for decarbonising the grids.

Gasgrid Finland Oy is a Finnish state-owned company and transmission system operator with system responsibility. We offer our customers safe, reliable and cost-efficient transmission of gases. We actively develop our transmission platform, services and the gas market in a customer-oriented manner to promote the carbon-neutral energy and raw material system of the future. Find out more: www.gasgrid.fi/

Gas Networks Ireland operates and maintains Ireland's €2.7bn, 14,500km national gas network. The modern network powers 30% of Ireland's primary energy needs, 40% of the country's heating and 50% of the nation's electricity – more than 85% at peak times. A vital national energy asset, over 705,000 Irish homes and businesses rely on the gas network to provide safe, reliable and affordable energy to meet their heating, cooking, transport and power needs, while the whole country relies on its flexibility and responsiveness to meet electricity demand. By gradually replacing natural gas with renewable, carbon neutral and ultimately zero carbon gases, such as biomethane and hydrogen, Gas Network Ireland is on a journey to delivering a net-zero carbon gas network.

Gasunie is a European energy infrastructure company. The company provides the transport of natural gas and green gas via its subsidiaries Gasunie Transport Services B.V. (GTS) in the Netherlands and Gasunie Deutschland in Germany. The company also offers other services in the energy infrastructure field, including hydrogen, heat, CCS, gas storage and LNG. Gasunie commits itself to accelerating the energy transition and to the realisation of a climate neutral energy supply. For more information, go to www.gasunie.nl.

GAZ-SYSTEM is a key player in the natural gas market in Poland as a company of strategic importance to the national economy and energy security. The Company is responsible, inter alia, for the management of the transmission network (11 056 km long) and for the transport of natural gas throughout the country (18.1 bcm without UGS in 2020) together with the LNG terminal in Swinoujscie in order to supply the fuel to distribution networks and to final customers. For more information, please visit the website <https://en.gaz-system.pl>

GRTgaz is gas transmission system operator which owns and operates more than 35,000 km of buried pipes and 26 compression stations. GRTgaz is committed to ensuring security of supply to consumers, connecting territories and communities with great care for the environment. GRTgaz delivers innovative and accessible solutions to accelerate and secure a successful energy transition by connecting the energies of tomorrow, driving the growth of renewables and new uses for gas while fostering synergy between electricity and gas systems. For more information, go to www.grtgaz.com

Hellenic Gas Transmission System Operator (DESFA) S.A. is responsible for the operation, management, use and development of the Hellenic National Natural Gas System. DESFA is a reliable partner in the framework of the ongoing international energy projects in Southeastern Europe. DESFA is committed to support the fulfilment of the National Energy & Climate Plans targets, by planning its energy transition towards the decarbonize economy. For additional information, please visit the following website: www.desfa.gr

National Grid Gas Transmission owns and operates the gas National Transmission System in Great Britain, with day-to-day responsibility for balancing supply and demand. Our network comprises approximately 7,660 kilometres (4,760 miles) of high-pressure pipe, 23 compressor stations and 618 above-ground installations. Today, natural gas keeps 85 per cent of the UK's 28 million homes warm and comfortable, generates electricity and fuels industrial and manufacturing processes. We aim to serve customers well and efficiently, supporting the communities in which we operate and making possible the energy systems of the future. For more information, please visit <https://www.nationalgrid.com/uk/gas-transmission/>.

NET4GAS, s.r.o. is the gas transmission system operator in the Czech Republic. Through its network of almost 4,000 km of pipelines, NET4GAS transports around 50 billion m³ of natural gas per year. As a Central European gas transmission system operator, NET4GAS plays an active role in connecting and integrating European energy markets to the benefit of Czech and other European customers. At the same time, the company participates in shaping the European energy market in the context of the transition to a low carbon economy. For more information, visit www.net4gas.cz/en.

Nordion Energi, is specialized in gas infrastructure with the aim to drive the energy transition and becoming the first gas grid in Europe with 100% green gas. We operate the gas grid in Sweden, which extends from Dragör in Denmark to Stenungsund in Sweden and transports energy to distributors and customers with direct links. The gas grid supplies 33 municipal areas and several combined heat and power plants and is also used in more than 34,000 households and in the transport sector. For more information, go to www.swedegas.com or www.nordionenergi.se/en.

OGE, seated in Essen, operates the largest German gas transmission system spanning 12,000 kilometres. Two thirds of natural gas consumed in Germany flows through OGE's pipeline system, comprising about 100 compressor units and about 1100 exit points. The OGE strategy 2030+ aims to secure OGE's transmission business for the long run and prepares pipeline network and numerous compressor stations for new gaseous energy carriers OGE actively support the European gas market and work together with the European distribution network operators to create the prerequisites for transnational gas transportation and trading. For more information, go to <https://oge.net/enwww.oge.net/en>.

ONTRAS Gastransport GmbH is a national gas transmission system operator in the European gas transport system based in Leipzig. ONTRAS operates Germany's second-largest gas transmission system, with approximately 7,500 km of pipelines and about 450 interconnection points, to ensure the seamless transport of natural gas to our customers. To do so, we link the interests of transport customers, dealers, regional network operators and producers of regenerative gases. For more information, please visit <https://www.ontras.com/de/>.

Plinovodi d.o.o. is the natural gas transmission system operator in Slovenia. The main operational goal and activity of the company is provision of long-term, reliable, high quality, price competitive and environmentally acceptable transmission of gas. The gas transmission system consists of almost 1,2 thousand km of pipelines. It connects most of the large industry and urban centres with distribution systems in Slovenia. By constantly developing the system and introducing sustainable solutions and technologies, company Plinovodi d.o.o. enables users to access different sources of gas through various transmission routes. For more information, go to <http://www.plinovodi.si/en/>.

Snam is an energy infrastructure operator and ranks among Italy's largest listed companies, by market capitalization. The Group has Europe's largest natural gas transportation network (over 41,000 km including its international footprint), a storage capacity of approx. 20 bcm and is a leading player in regasification. In its 2020-2024 strategic plan, Snam has planned 7.4 billion euros in investments and more focus on energy transition businesses such as biomethane, energy efficiency sustainable mobility and hydrogen. The company is committed to achieving carbon neutrality by 2040. For more information, please visit <https://www.snam.it/en>.

Trans Austria Gasleitung GmbH is a transmission system operator in Austria. Its pipeline system connects Baumgarten in Austria with Tarvisio in Italy over a distance of 380 km and has an annual transport capacity to Italy of 30 billion cubic meters of natural gas. The TAG pipeline network consists of around 1,140 km of high-pressure natural gas pipelines from the Slovakian-Austrian to the Austrian-Italian border. Along the route in Austria, the natural gas pipeline also supplies natural gas for consumption. TAG also transports natural gas to Slovenia via the SOL pipeline. For more information, please visit <https://www.taggmbh.at/>.

Teréga is established in South-West France and has over 75 years of experience in gas transport and storage infrastructure and continues today developing innovative solutions. A true accelerator of the energy transition in France and in Europe, Teréga operates over 5,000 km of pipelines and 2 underground storage reservoirs representing 16% of the French gas transport network and 26% of national storage capacities. Teréga enjoys a strategic position in Europe, thanks to its interconnections with Spain. Teréga aims at accelerating the green revolution enabled by renewable gas, through increasing its involvement in biomethane and hydrogen (including Power-to-Gas). For more information, visit www.terega.fr