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■ DNV Study shows high offshore hydrogen infrastructure potential for Europe

Increasing security of supply: DNV sees potential 300 TWh/a of green hydrogen

■ **Kassel/Brussels/Oslo.** Offshore hydrogen production is paramount to meet the substantial increase expected in European hydrogen demand. Hydrogen is due to play a significant role as a low-carbon energy carrier, not only to decarbonize hard-to-abate sectors, but also to boost security of energy supply in Europe. The "Specification of a European Offshore Hydrogen Backbone" study, commissioned to DNV by infrastructure system operators GASCADE and Fluxys, highlights the significant advantages of an offshore hydrogen backbone in the North and Baltic Seas.

■ The potential energy generation from offshore wind in the North Sea and Baltic Sea is immense, and possible greater than what the electricity system alone can handle. The DNV study finds that offshore hydrogen production connected by pipeline is cheaper than onshore hydrogen production.

"The EU expects demand for climate-neutral hydrogen to reach 2,000 terawatt hours (TWh) by 2050, and DNV sees the potential to produce 300 TWh of hydrogen using electricity from offshore wind farms in the North Sea by 2050. This would make a significant contribution to reducing dependence on energy imports. This positive aspect for increasing supply security can hardly be valued highly enough after the experiences of the recent past," says GASCADE Managing Director Ulrich Benterbusch.

Given the lower costs of hydrogen transmission compared to electricity and the possibility for large pipelines to aggregate offshore hydrogen production from several windfarms, the report assesses that offshore hydrogen production is an attractive option for offshore wind production, certainly at distances of more than 100km from shore.

With regards to transport infrastructure, the study draws two different pictures based on location:

- For the North Sea, a large area and production potential meet the 100 km criterion. To bring the hydrogen produced offshore to land, a meshed pipeline connection - a European backbone - could sensibly connect production sites to the existing onshore pipeline network.
- The situation is somewhat different in the Baltic Sea region, where fewer areas currently meet the 100-km criterion. However, if Sweden and Finland decide to produce hydrogen on a large scale and transport it to demand centers in southern Europe, a combined pipeline is likely to make sense there as well.

The spatial distribution of the potential offshore hydrogen production sites shows that the sea areas of different countries are involved. "This suggests that transnational coordination will be necessary to develop the full identified hydrogen generation potential", says Christoph von dem Bussche, Managing



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Director of GASCADE. It will be equally important to strike the right balance between the potential use of wind for electricity generation and the potential generation of hydrogen across countries.

To further optimize this hydrogen supply chain, the study suggests storing up to 30% of the produced hydrogen in salt caverns to efficiently increase the flexibility of the system. To support the political discussion, the study also contains an initial cost estimate: In the North Sea, the cost of pipelines and compressors for the offshore hydrogen backbone is estimated to account for 10% of the total cost of hydrogen produced offshore. According to initial calculations, a hydrogen system costs for the North Sea of €4.69-4.97/kg can be achieved with an investment in offshore hydrogen transport infrastructure of €35-52 billion (including underground storage).

■ AquaDuctus project part of the contemplated offshore backbone

The study strengthens GASCADE and Fluxys in their conviction that the AquaDuctus project is a key building block to achieve a green transition and meet the decarbonization targets of the EU Green Deal and Repower EU package.

This large-scale offshore pipeline project, conceived to efficiently carry hydrogen produced from wind farms in the North Sea onto the German onshore hydrogen grid, is indeed designed as a backbone able to collect hydrogen from multiple production sites while also offering the potential to link up with other international hydrogen flows through the North Sea.

Pascal De Buck, CEO of Fluxys, says: “The AquaDuctus offshore pipeline, thought as an open access infrastructure available to all future operators of hydrogen wind farms, will make a substantial contribution to security of supply by diversifying Europe's hydrogen supply sources.”

■ About GASCADE

GASCADE Gastransport GmbH independently operates a gas pipeline network throughout Germany. Based in Kassel, the company offers its customers state-of-the-art and competitive transport services for hydrogen and other gases in the heart of Europe via the company's own high-pressure pipeline network, which is around 3,200 kilometres long. GASCADE is pursuing the goal of converting its transmission network to the transport of hydrogen and is therefore active in several specific onshore and offshore hydrogen projects.

■ About Fluxys

Headquartered in Belgium, Fluxys is a fully independent infrastructure group with 1,300 employees active in gas transmission & storage and liquefied natural gas terminalling. Through its associated companies across the world, Fluxys operates 12,000 kilometres of pipeline and liquefied natural gas terminals totalling a yearly regasification capacity of 380 TWh. Among Fluxys' subsidiaries is Euronext listed Fluxys Belgium, owner and operator of the infrastructure for gas transmission & storage and liquefied natural gas terminalling in Belgium.

As a purpose-led company, Fluxys together with its stakeholders contributes to a better society by shaping a bright energy future. Building on the unique assets of its infrastructure and its commercial and technical expertise, Fluxys is committed to transporting hydrogen, biomethane or any other carbon-neutral energy carrier as well as CO₂, accommodating the capture, usage and storage of the latter.

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About DNV

DNV is the independent expert in risk management and assurance, operating in more than 100 countries. Through its broad experience and deep expertise DNV advances safety and sustainable performance, sets industry benchmarks, and inspires and invents solutions.

Whether assessing a new ship design, optimizing the performance of a wind farm, analyzing sensor data from a gas pipeline or certifying a food company's supply chain, DNV enables its customers and their stakeholders to make critical decisions with confidence.

Driven by its purpose, to safeguard life, property, and the environment, DNV helps tackle the challenges and global transformations facing its customers and the world today and is a trusted voice for many of the world's most successful and forward-thinking companies.

In the energy industry

DNV provides assurance to the entire energy value chain through its advisory, monitoring, verification, and certification services. As the world's leading resource of independent energy experts and technical advisors, the assurance provider helps industries and governments to navigate the many complex, interrelated transitions taking place globally and regionally, in the energy industry. DNV is committed to realizing the goals of the Paris Agreement and supports customers to transition faster to a deeply decarbonized energy system.

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