



Norwegian Ministry
of Petroleum and Energy

Norway's policy for hydrogen

William Christensen – Deputy Director General

Bergen, 30 June 2022

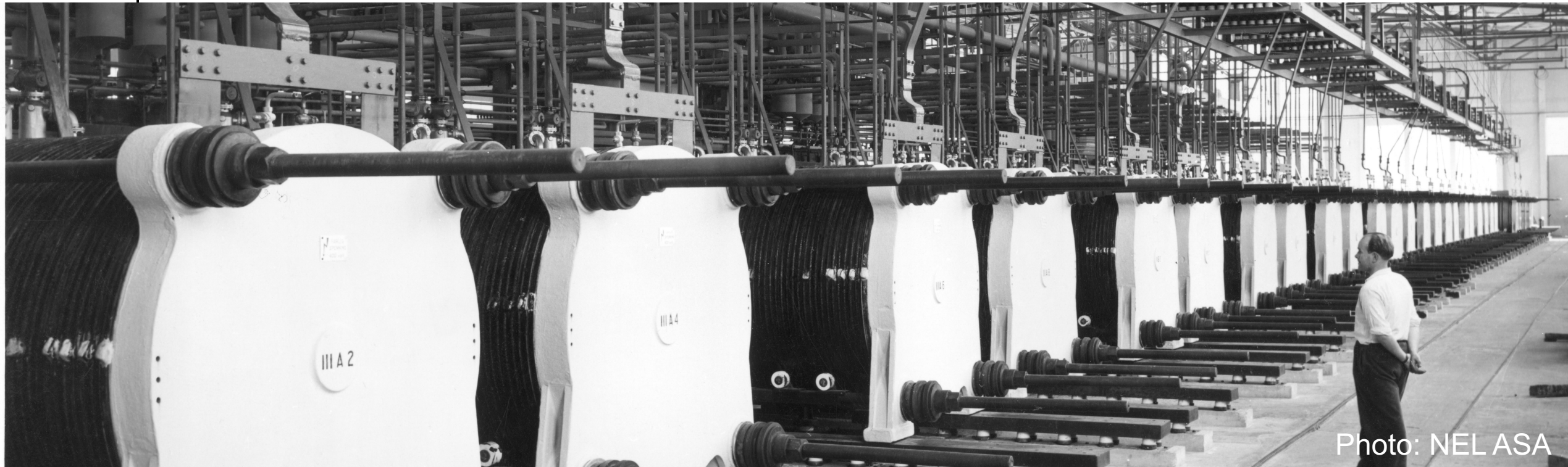


Photo: NEL ASA

Roadmap and ambitions



Roadmap for hydrogen

- By 2025, the Government will cooperate with the private sector to enable the development of:
 - Five maritime hydrogen hubs
 - One-to-two industrial projects with associated production
 - Five-to-ten pilot projects for the development and demonstration of new and more cost-efficient hydrogen solutions and technologies

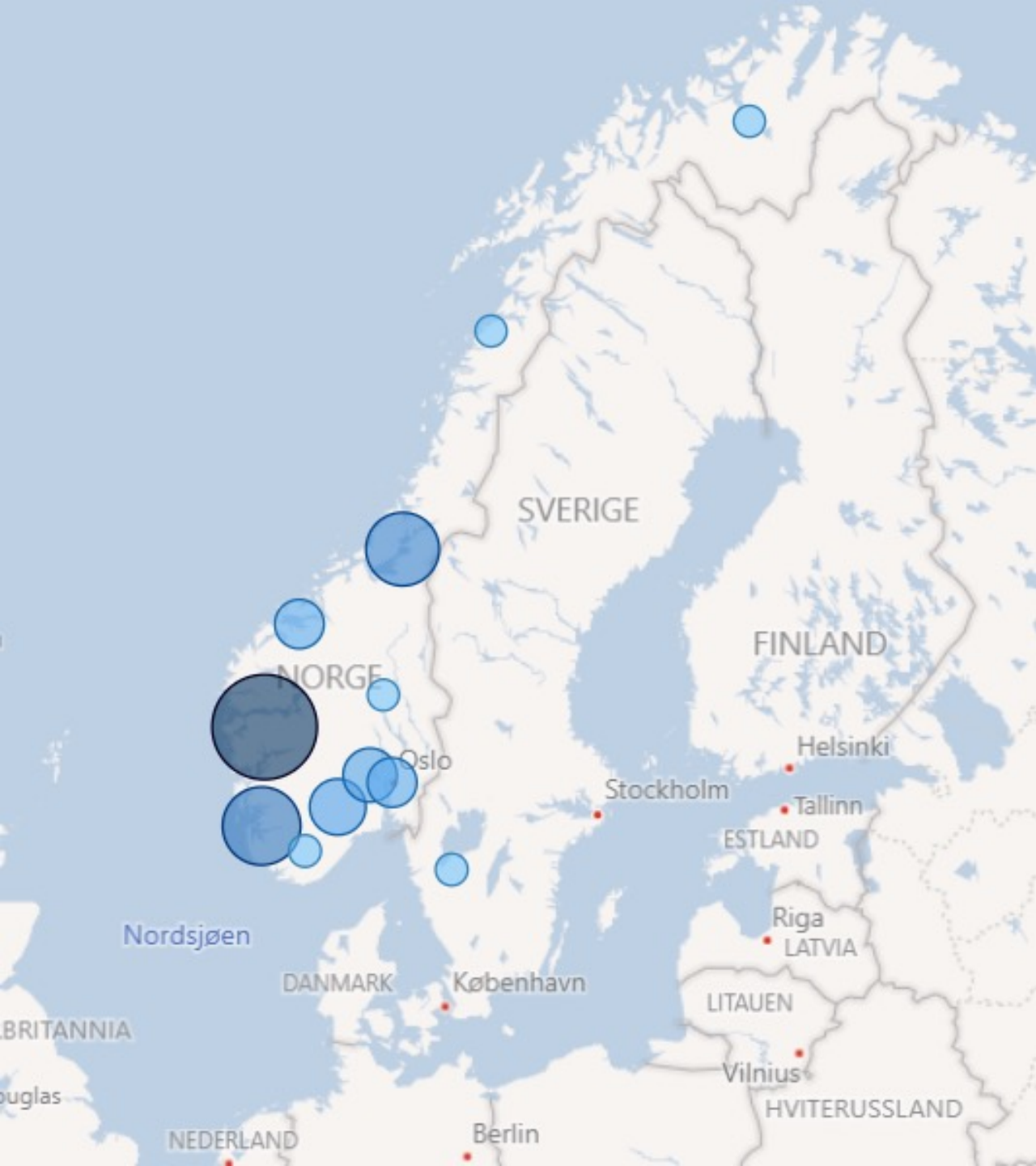
Additional ambitions

- The Government will accommodate for the establishment of economic production of blue hydrogen through Gassco, by granting areas for CO₂-storage and process applications for development in accordance with the carbon storage regulation.
- The Government will accommodate for the production of hydrogen with low- to zero emissions to cover the national demand in order to reduce greenhouse gas emissions.

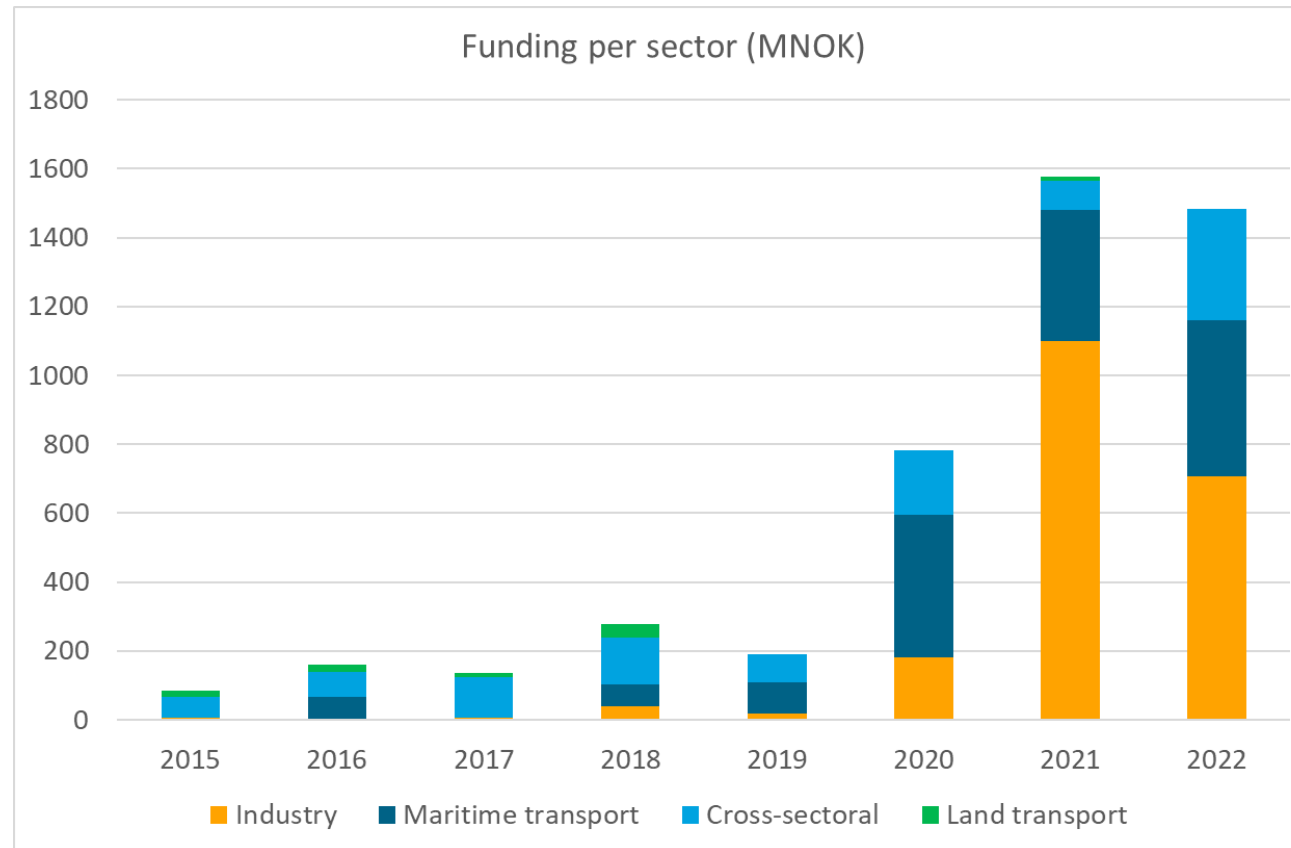


HEILO

- Funding mechanisms for hydrogen, from basic research to innovation projects and investments in environmentally friendly technologies
- Cooperation between
 - The Research Council of Norway (R&D)
 - Innovation Norway (R&D)
 - Enova (R&D and investments)
 - Gassnova (R&D CO₂ capture and handling)
- Website: www.enova.no/heilo



Support for hydrogen research and development



Norwegian Ministry
of Petroleum and Energy

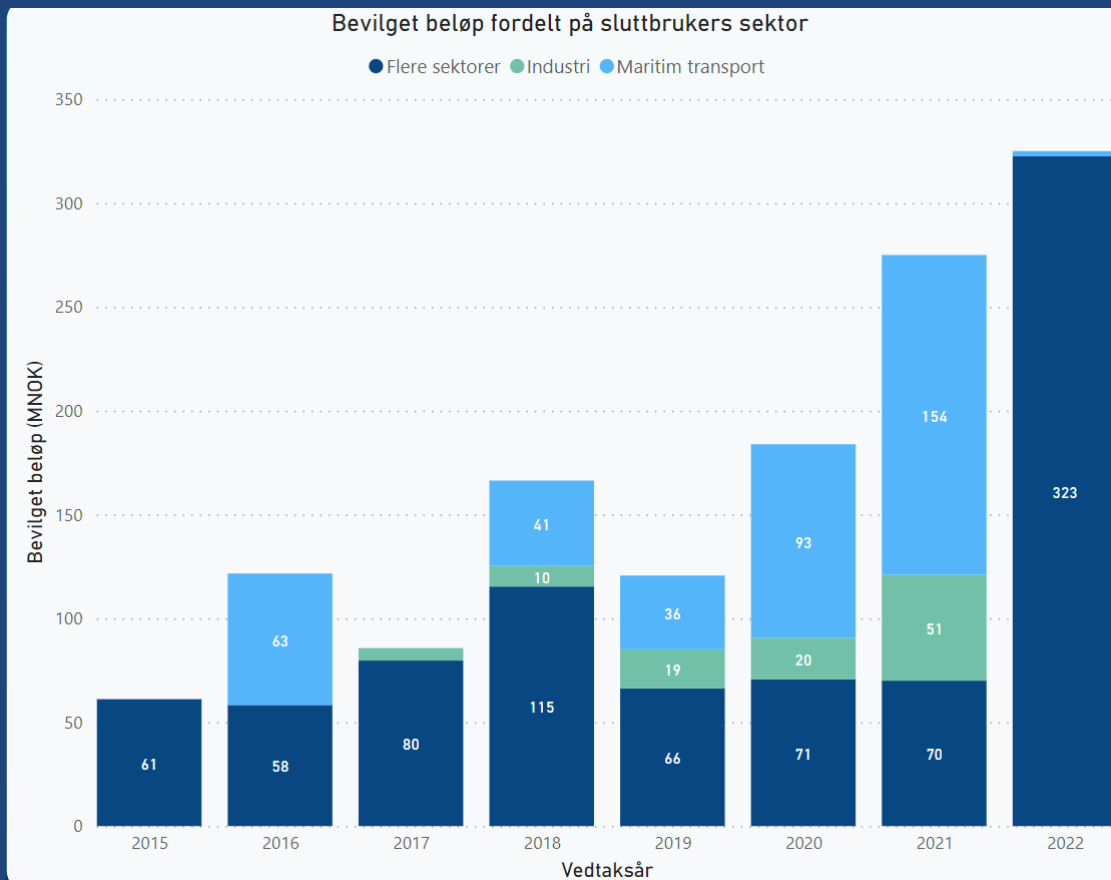


ENOVA



The Research Council
of Norway

The Research Council's focus on hydrogen research



Investment in hydrogen projects from the Research Council of Norway

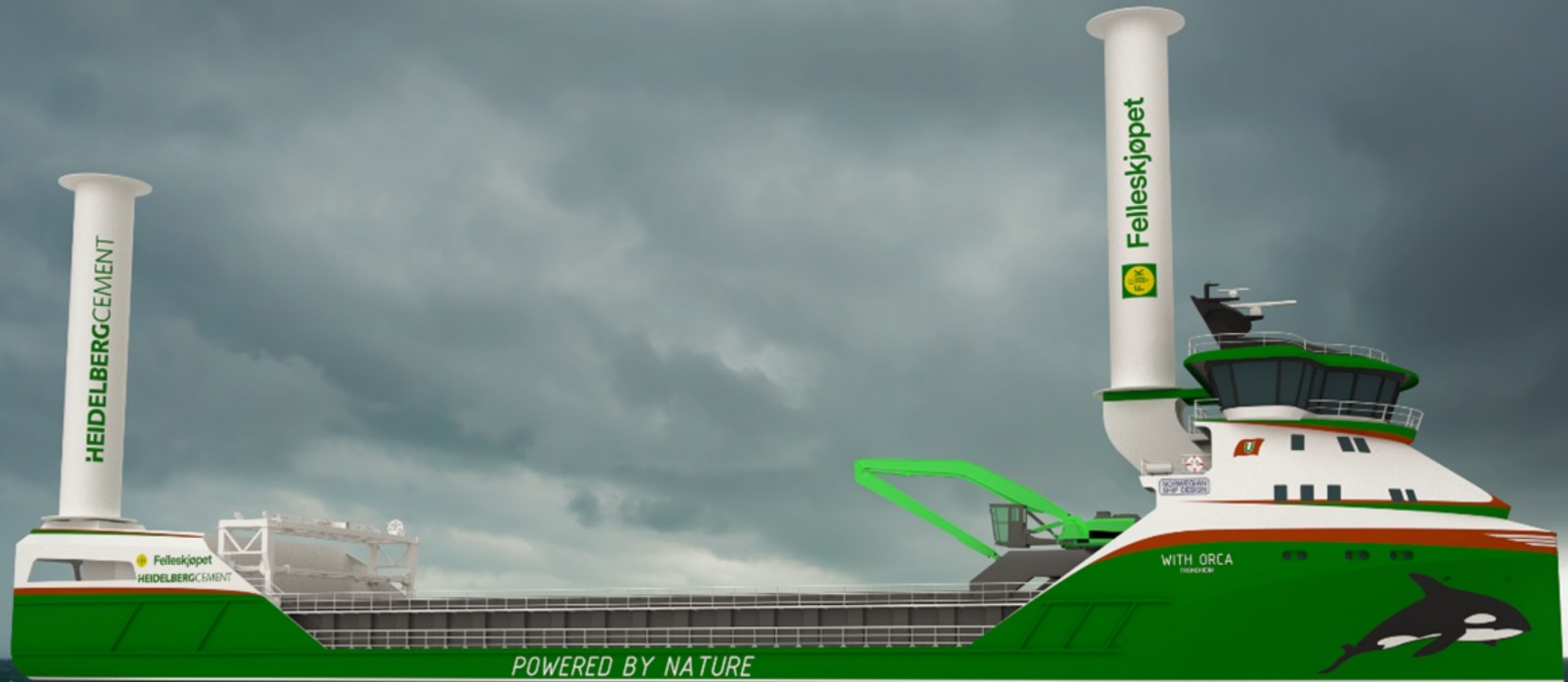
Safe, sustainable and cost-effective development along the whole value chain and in areas where hydrogen has an opportunity to become a competitive solution in the future

- Production of hydrogen
- Storage, transport and distribution of hydrogen
- Use of pure hydrogen in industrial processes
- Long range transport; especially maritime industry
- Other aspects related to hydrogen as an energy carrier such as safety, sustainability, business models and regulations

Two new Centers for Environment-friendly Energy Research on Hydrogen

- HYDROGENi: Norwegian centre for hydrogen and ammonia research and innovation, NOK 25 mill/year 5-8 years 2022-2030
 - Host SINTEF Energy
 - R&D partners; SINTEF, SINTEF Ocean, NTNU, IFE, UiO, USN, UiT
 - 50 user partners
- HyValue - Norwegian centre for hydrogen research, NOK 15 mill/year 5-8 years 2022-2030
 - Host; NORCE
 - R&D Partners; UiB, UiS, NHH, Western Norway University of Applied Science, SNF, FNI, TØI
 - 45 user partners





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Development of markets for hydrogen in industry and maritime transport

Anita Fossdal, senior advisor, Enova

The hydrogen market in general

Production and use of hydrogen and hydrogen-based energy carriers have a major focus in the market. This is especially true in industry and maritime transport.

Common to most of the initiatives is that the cost barrier is high compared to fossil alternatives. This applies to both investments and operations.

Barriers:

- High price of input factors for hydrogen production
- Efficiency / loss of energy in the production of hydrogen
- Expensive transport and (intermediate) storage
- Lack of value chain for transport and storage of carbon dioxide (blue hydrogen)
- Partly lacking and expensive end-user technology



Enova støtter tre industriprosjekter med over 1 milliard norske kroner. Yara på Herøya utenfor Porsgrunn er ett av de tre (Foto: Frode Heiland)

PRESSEMELDING - 17. DESEMBER 2021 08:05

Enova støtter tre industriprosjekter med over 1 milliard norske kroner. Hydrogen er klimaløsningen i alle prosjektene.



H₂ as reducing agent to replace coal

“Blue” ammonia

“Green” fertilizer

ENOVA

Competitive price for hydrogen?

The "right price" for hydrogen varies greatly between the different markets. The willingness to pay is mainly governed by the price of an alternative fossil energy carrier. In some cases, the price of an alternative renewable energy carrier is also decisive.

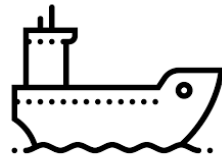
Gray: 10-15 kr/kg

Blue: 20-25 kr/kg

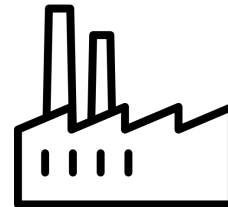
Green: 40-60 kr/kg



~60 NOK/kg



~35 NOK/kg



~5 – 15 NOK/kg

Five hydrogen hubs under establishment

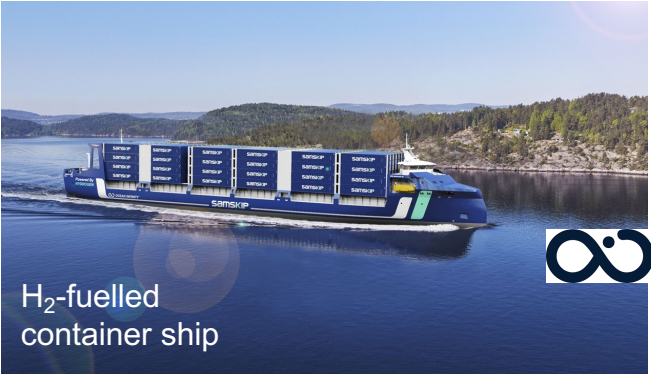
Capacity to fuel 40 ships with compressed hydrogen

In operation by July 2025

669 MNOK aid in total



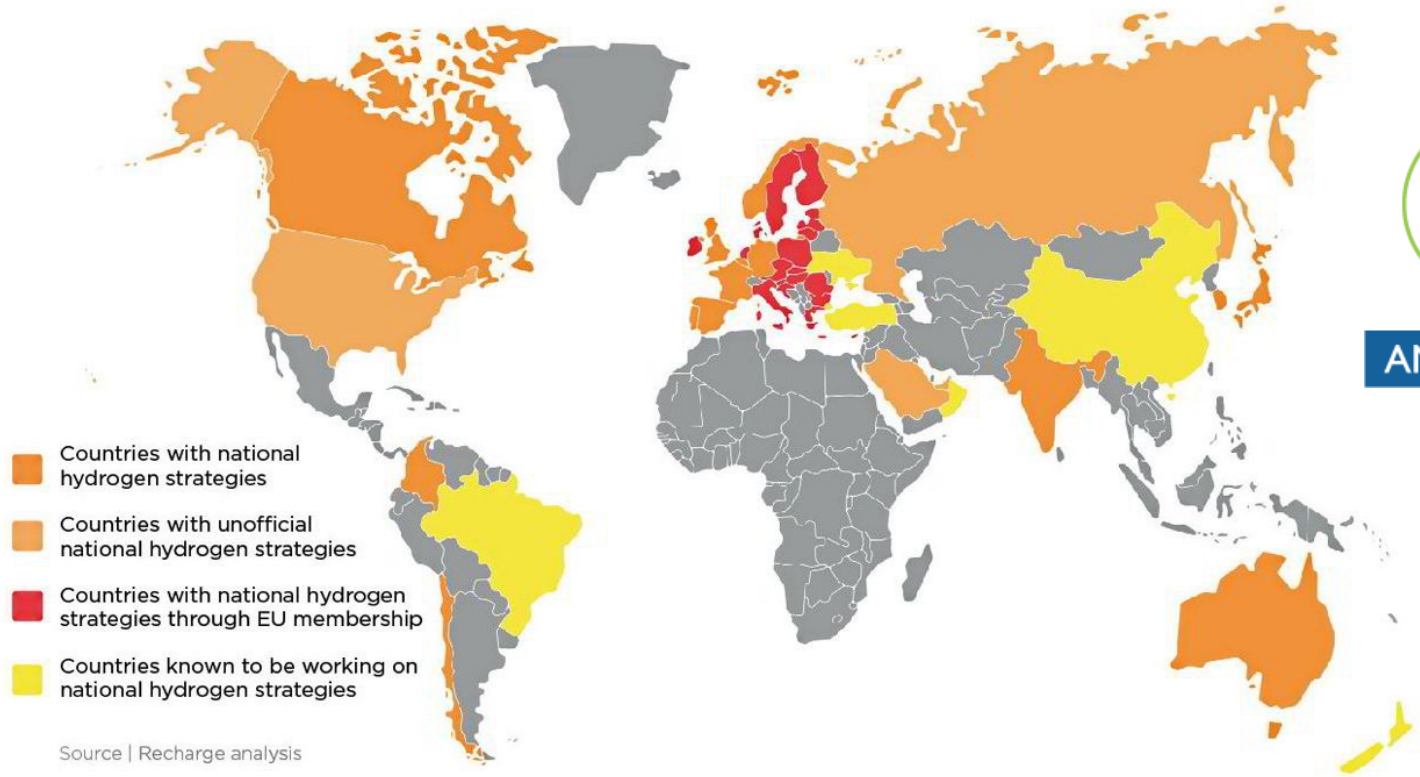
Parallel build-up of supply and demand



- Thank you for your attention!



International activity on hydrogen



European Clean
Hydrogen Alliance



HYDROGEN INITIATIVE

AN INITIATIVE OF THE CLEAN ENERGY MINISTERIAL



MISSION INNOVATION

accelerating the clean energy revolution

