



The Nordic Hydrogen Industry

Collaboration synergies and complements of the Nordic hydrogen ecosystem

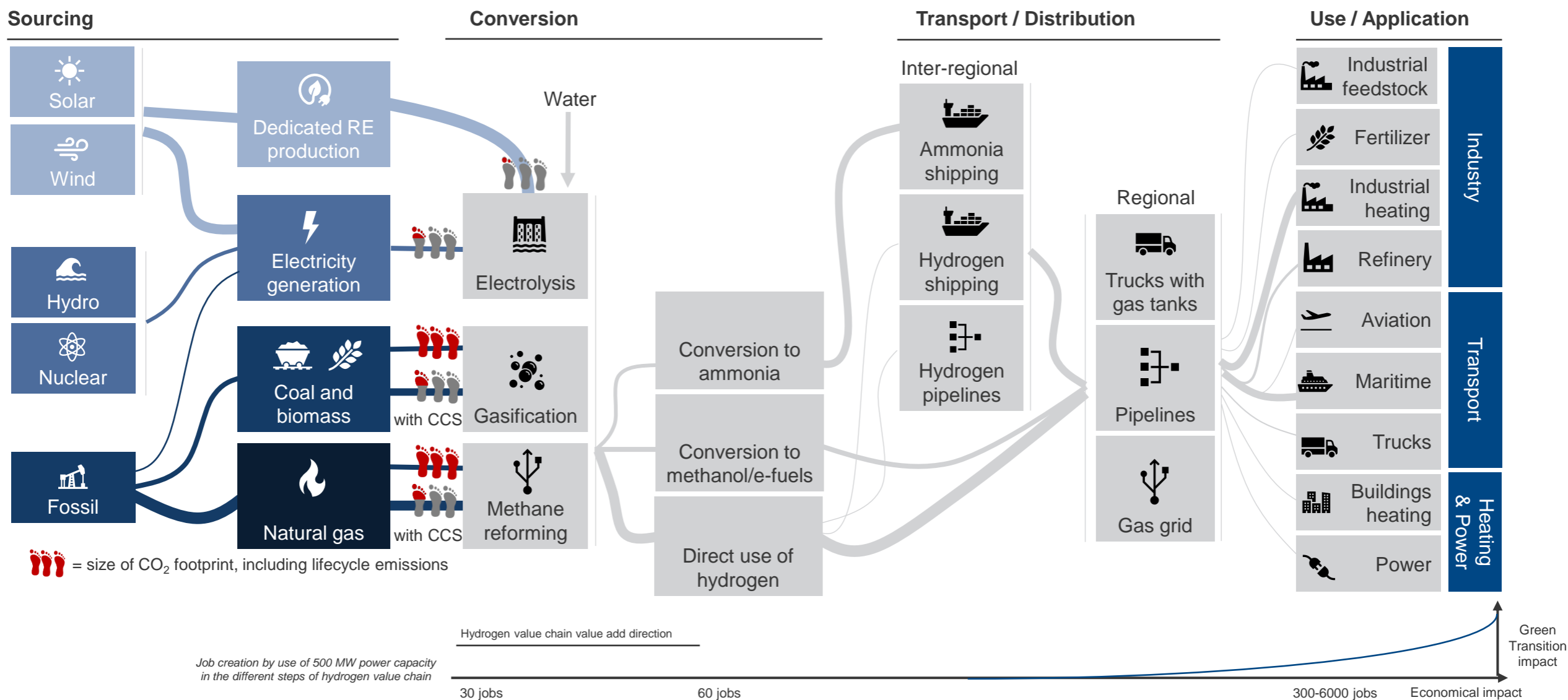
Vätgaskonferensen, 2023
Anna Liberg, Business Sweden



**BUSINESS
FINLAND**



A schematic model of the Hydrogen Value Chain is applied for the analysis of the Nordics hydrogen ecosystem highlighting societal and economic value addition



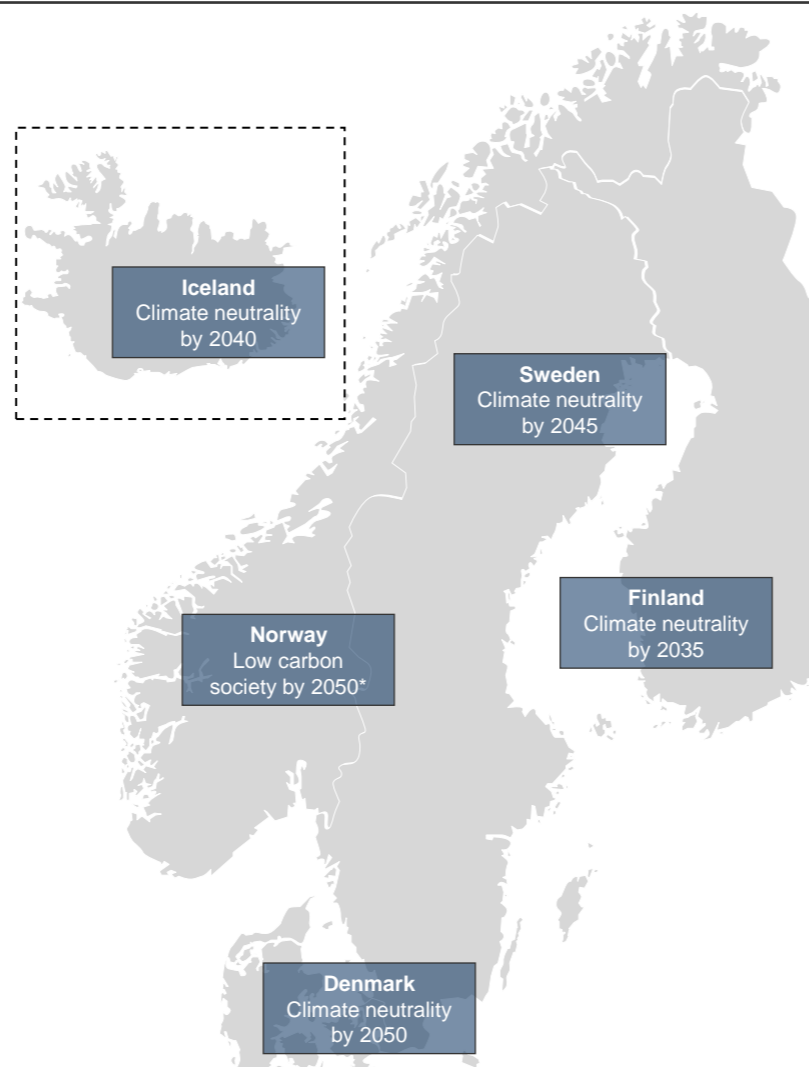
The low carbon value chain is intertwined, spans over and make use of major natural resources and impacts all parts of industry, transport, power system and housing

Source: Hydrogen value chain DNV Hydrogen Forecast 2022 to 2050, Report analysis

The story of the Nordics builds on leadership sustainability and complementary industrial and energy legacy

A joint point of departure

- The Nordic markets have a joint point of departure as global climate leaders
 - Hydrogen is identified to play a key roll in the Nordic markets green transition
 - The Nordics have access to fossil free cost efficient energy
 - Rank at the top of innovation and collaboration leaders in the world
- In parallel, the Nordics offer a complementary aspects as
 - Access to natural resources such as natural gas, forest and farmland
 - Industrial legacy – all key industries in need of decarbonisation where low carbon hydrogen can be key
 - Gas legacy, such as pipeline infrastructure
- Together, the Nordics offer favourable preconditions throughout the value chain, from sourcing of green energy supply, conversion initiatives for low carbon hydrogen, and potential offtakers such as steel and maritime

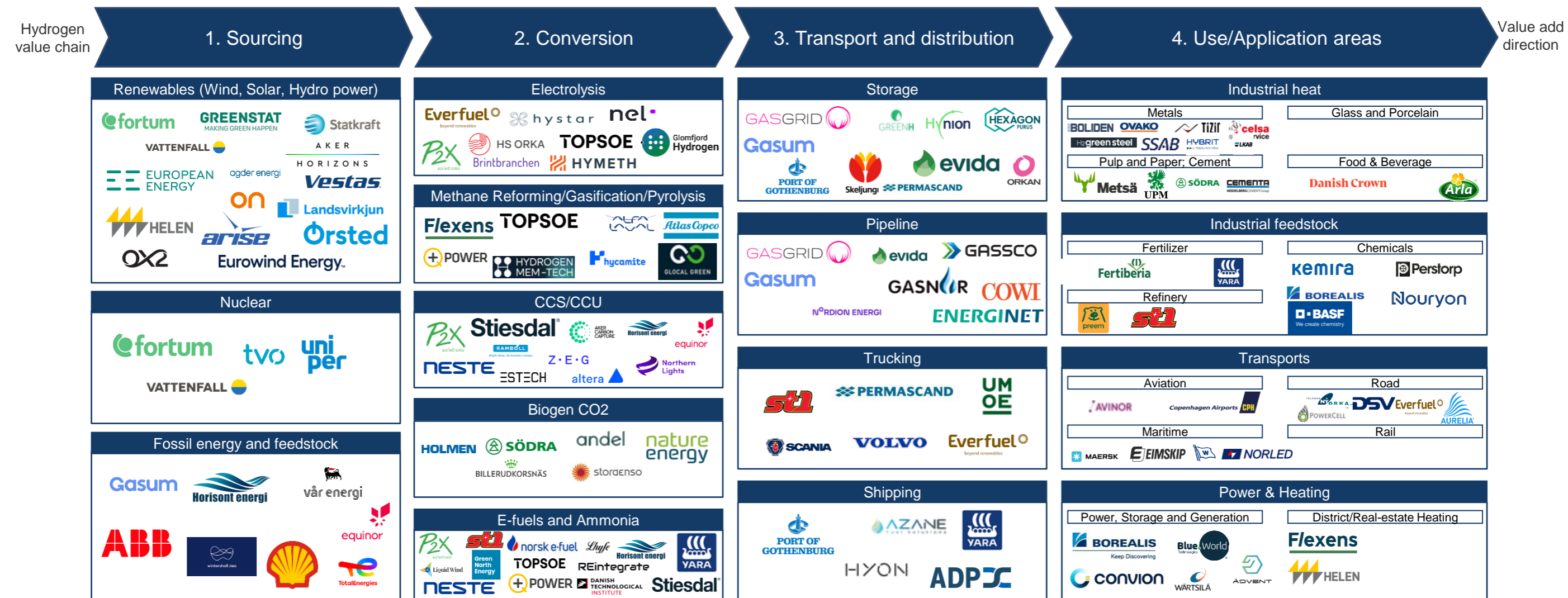


The Nordic prerequisites					
Low carbon hydrogen identified to play key roll in the green transition	✓	✓	✓	✓	✓
Access to fossil free cost efficient energy	✓	✓	✓	✓	✓
Natural gas legacy	✓	✓		✓	
Natural resources	✓	✓	✓	✓	✓
Industrial heritage					
Steel industry	✓		✓		
Maritime		✓		✓	✓
Refinery	✓	✓	✓		
Pulp and Paper	✓		✓		
Fertiliser		✓		✓	
EU member state	✓		✓	✓	✓
Atlantic / Baltic sea access	✓	✓	✓	✓	✓

The Nordic offer in hard-to-abate industries provides an opportunity for climate impact both in the extended home market, in Europe and globally

Source: Report analysis; EHB.eu; government.is; FN.no; Global Innovation Index 2022 * Climate emissions reduced by 90-95% compared to 1990

Together the Nordics form an offer throughout the value chain for global growth through export and an attractive invest in offer



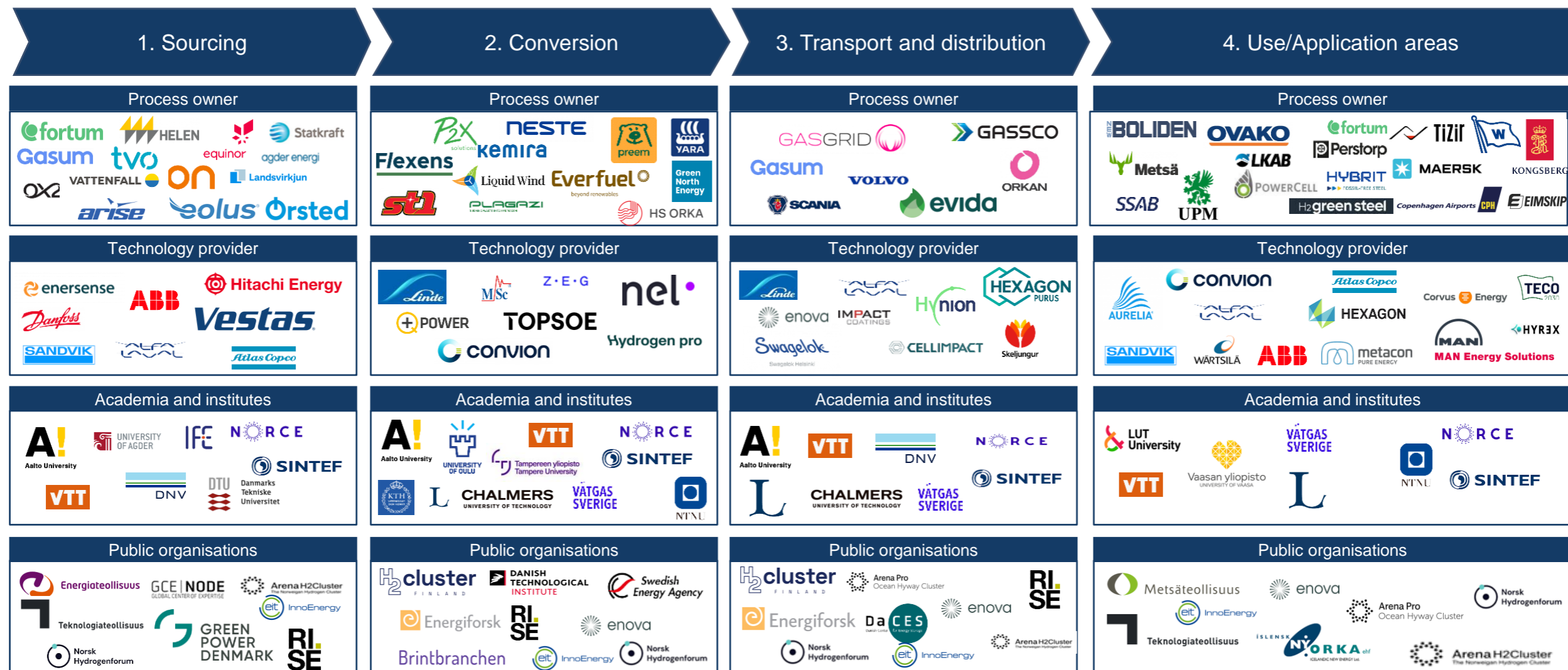
Through collaborative innovation and first-in-the-world lighthouse projects the Nordics has the potential to establish leadership in the hydrogen value chain

Source: Report analysis; Company websites

Note: The overview is illustrative and not exhaustive

The Nordics multiple-helix offer throughout the value chain created a basis for innovation through collaboration, global growth and attractive invest-in offer

Hydrogen value chain



The extensive Nordic low-carbon hydrogen value chain shows opportunity for both enabling technology and lowcarbon based products exports

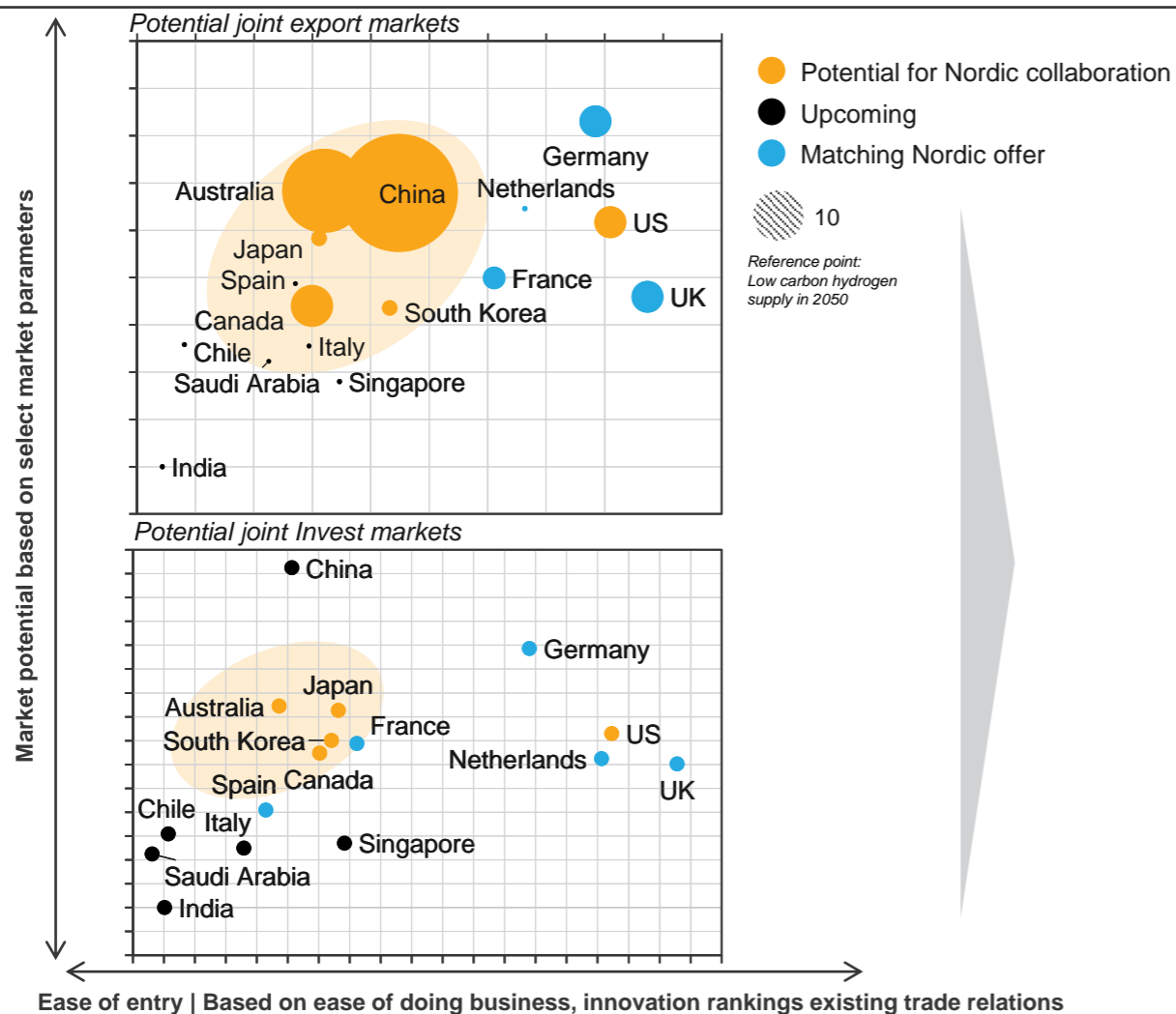
Source: Report analysis; Company websites

Note: The overview is illustrative and not exhaustive

While market prerequisites show European markets as favorable for export and invest – support to the industry might be more valuable in far away markets

Distribution of potential markets for Nordic export and invest focus

Comments



- **Key European markets are relevant for the Nordics from both export and invest perspectives**
 - This is largely due to:
 - Several markets providing key market prerequisites, such as being both a supply and demand hub to varying degrees
 - Strong existing Nordic trade relations from both export and FDI perspective
 - High rankings in key rankings on innovation, ease of doing business, corruption perception
 - Indications from the industry
- **As TPOs and key ecosystem actors such as Swedish Energy Agency might have more impact on far away markets, global key markets such as Australia, China and the US could be relevant for further joint collaboration**
 - Key focus markets to be further evaluated and agreed upon with TPOs and foreign offices
- **Key markets explore both green and blue hydrogen opportunities, which could offer an opportunity for the broader Nordic hydrogen value chain**
- **National R&D initiatives identified in all top markets - could provide good prerequisites for increased R&D collaboration**

Several markets within Europe and globally show potential for business and collaboration within low carbon hydrogen and end use application

Source: UN Comtrade 2021; Statistics Norway; Statistics Sweden; H2I.2021; WB Ease of Doing Business 2020; Transparency International Corruption Perception Index 2021; Report analysis

The industry is convinced that the Nordics have role to play in globally booming hydrogen market based on the right strategic choices

Recommendations from the Nordic industry

Complementary low carbon hydrogen offer	Nordic collaboration	Export focus	Investment focus
<ul style="list-style-type: none"> ➤ The low carbon value chain is intertwined, spans over and make use of major natural resources and impacts all parts of industry, transport, power system and housing ➤ Hydrogen will play a key role for Nordics from green transition and business potential ➤ It is a strength of the Nordics to offer blue and green hydrogen – complementing one another on carbon footprint, volume and price over time 	<ul style="list-style-type: none"> ➤ Nordic has potential to build leading solutions based on complementary capacity of low carbon products (e.g. low carbon windmills, low carbon shipping), and core enabling technology (such as electrolyzers, CCS/CCU, fuel cells, storage technology) ➤ Nordic can be a global testbed by speeding and scaling up first-in-the-world hydrogen enabled lighthouse projects based on areas of industrial capacity and first mover attitude 	<ul style="list-style-type: none"> ➤ As a free-trade region, Nordics will export from all steps of hydrogen value chain (hydrogen, hydrogen derivatives as fuels, low carbon material, products based on low carbon material and fuels, as well as enabling technology for all steps) ➤ However, the proactive export strategy should be targeted towards high value addition exports e.g. by development of market segment for low carbon products through regulations and demand creation 	<ul style="list-style-type: none"> ➤ Investment strategy should be targeted to fill gaps in the Nordic offer rigged towards high value addition (both in enabling technology and process ownership) ➤ Nordics has a strong investment business case but Nordics need to work for creating an incentive level playing field within EU and other key markets as US ➤ Development and attraction of competence and global key R&D&I arenas to Nordics will be crucial

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We need to get investments to the Nordics; all governments need to focus on this

[Finnish company]

“

We need more Nordic pilots where we have a chance to test our solutions together

[Norwegian company]

“

As soon as it was illustrated that green premium products is a reality, demand is popping up from all kinds of sectors

[Swedish company]

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The industry suggests that Nordic export and investment strategy should aim at value addition within Nordics, climate neutrality and resilience



Thank you!