



HEXAGON

Status and R&D Needs of Hydrogen Distribution Technologies in Scandinavia

Kevin Harris

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DRIVING ENERGY TRANSFORMATION

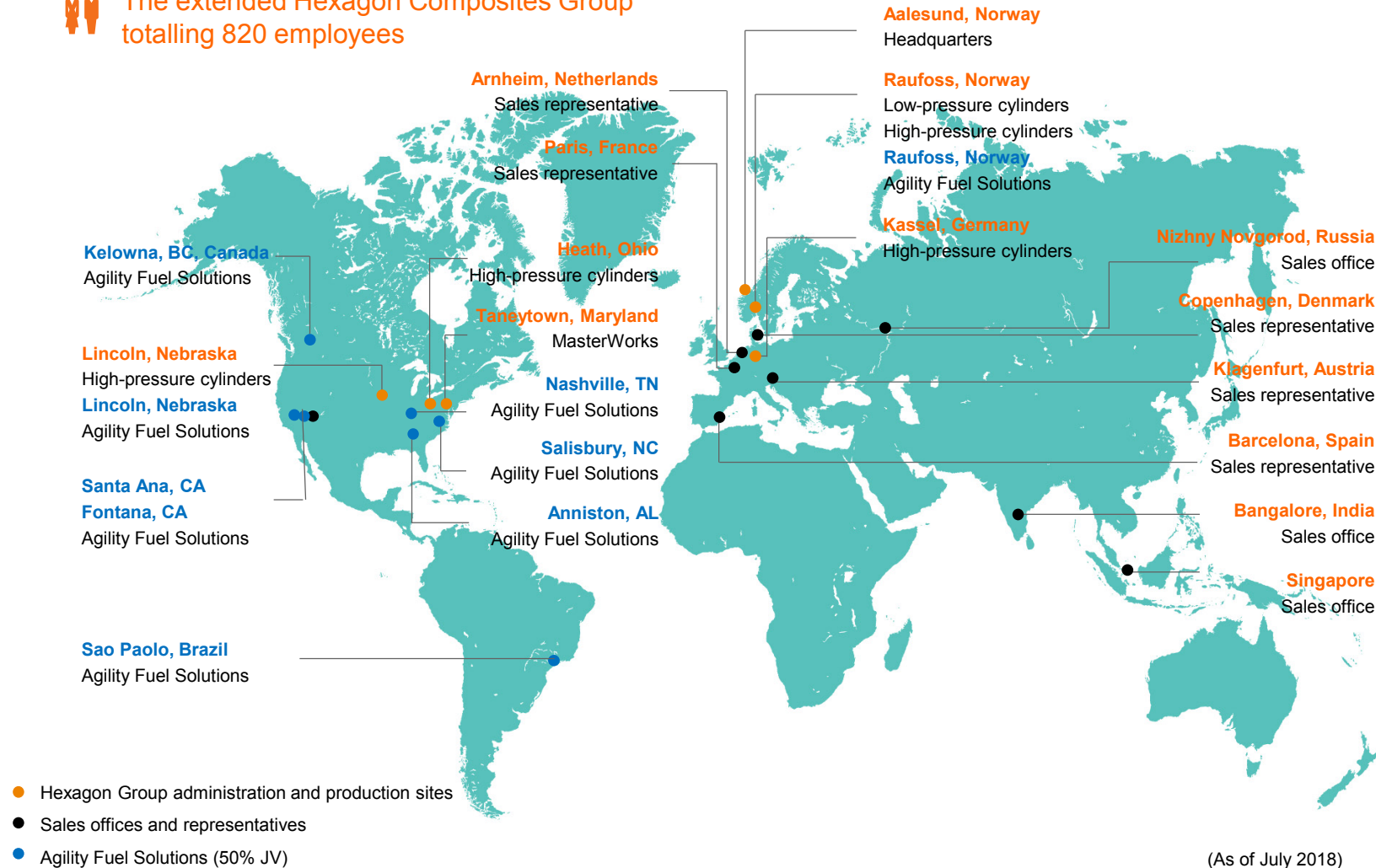
Hexagon Composites delivers safe and innovative solutions for a cleaner energy future.

We are adapting our leading composite pressure vessel technology for a wide range of mobility and storage applications.

EXPANDING OUR GEOGRAPHICAL FOOTPRINT

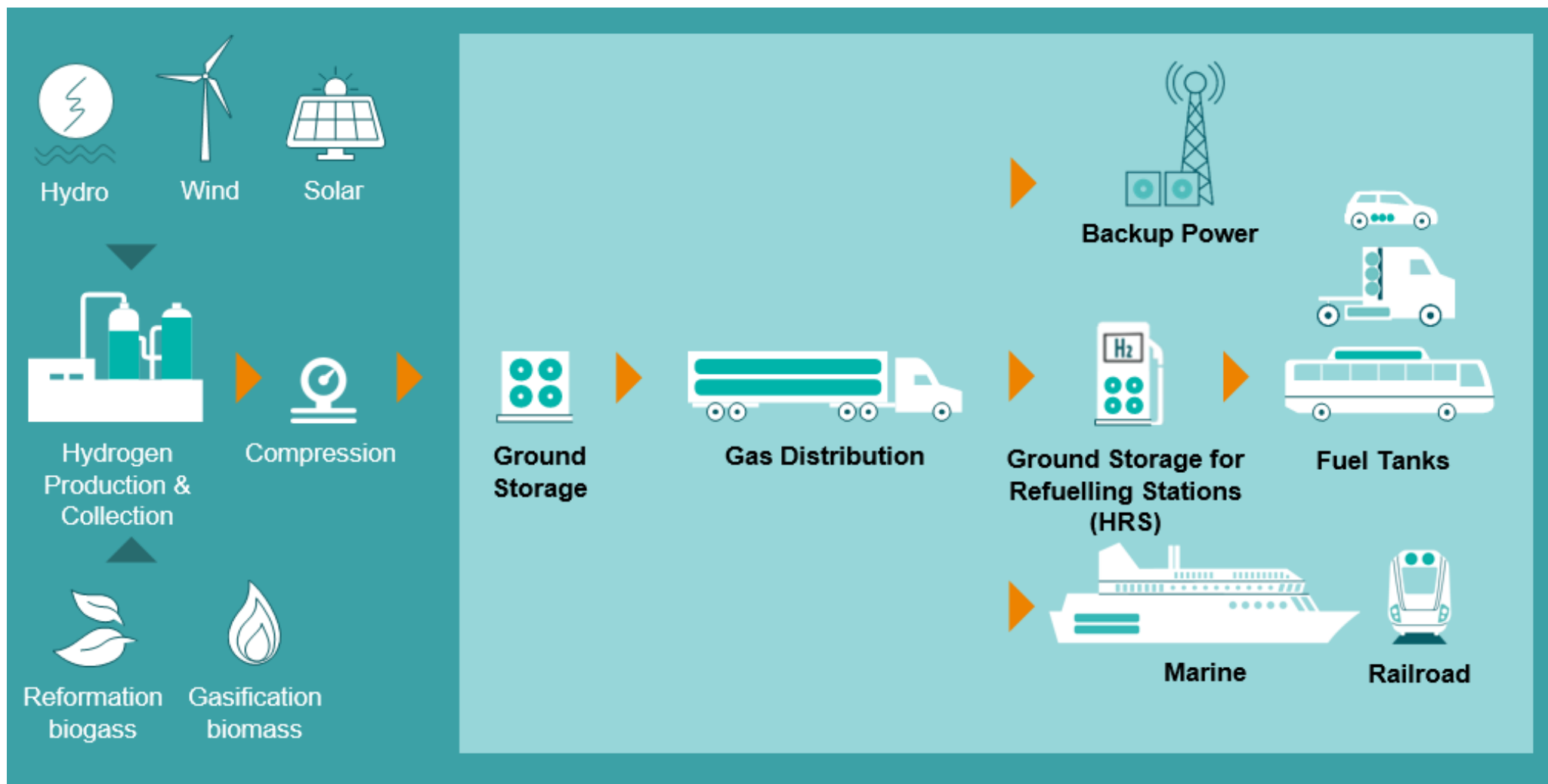


The extended Hexagon Composites Group
totalling 820 employees



(As of July 2018)

HEXAGON IS WELL POSITIONED ALONG THE H2 VALUE CHAIN





HEXAGON

BUSINESS AREAS IN HEXAGON GROUP

LOW-PRESSURE LPG



HEXAGON RAGASCO

MOBILE PIPELINE®



HEXAGON XPERION
HEXAGON LINCOLN
HEXAGON RAUFOSS

HYDROGEN & LIGHT-DUTY VEHICLES



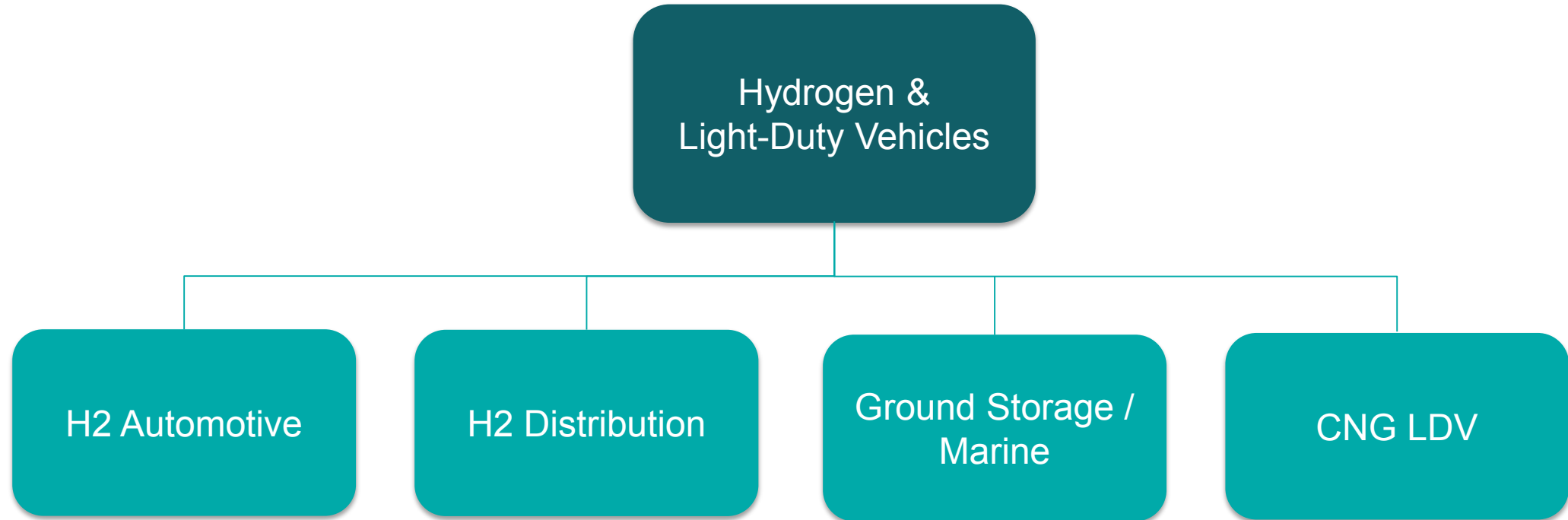
HEAVY-DUTY VEHICLES



AGILITY FUEL SOLUTIONS
(50% JOINT VENTURE)

HYDROGEN & LIGHT-DUTY VEHICLES

CUSTOMER FACING BUSINESS UNITS (CFBU)



Composite cylinder Type 4 – Safe and proven track record

- Storing hydrogen at high pressure requires sophisticated technology and experience
 - Hexagon has manufactured nearly 0.5 million high pressure tanks
- Hexagon's proprietary software and approach to tank design meet the highest industry standards, e.g. at global car manufacturers
 - Made of light weight plastic materials that do not corrode
 - Passed extreme temperature testing
 - Patented “metal to plastic” interface surpasses regulatory requirements
 - The only Type 4 tank producer that combines technical success with significant manufacturing capacity



X-STORE®

The ADR solution for Europe

- Fast exchange of container modules
- Capacity adjustable to customer demands – range from 10ft to 45ft
- Different options on pressure – 250bar – 300bar – 500bar
- Full capacity range from 150 kg to 1000+ kg payload of Hydrogen



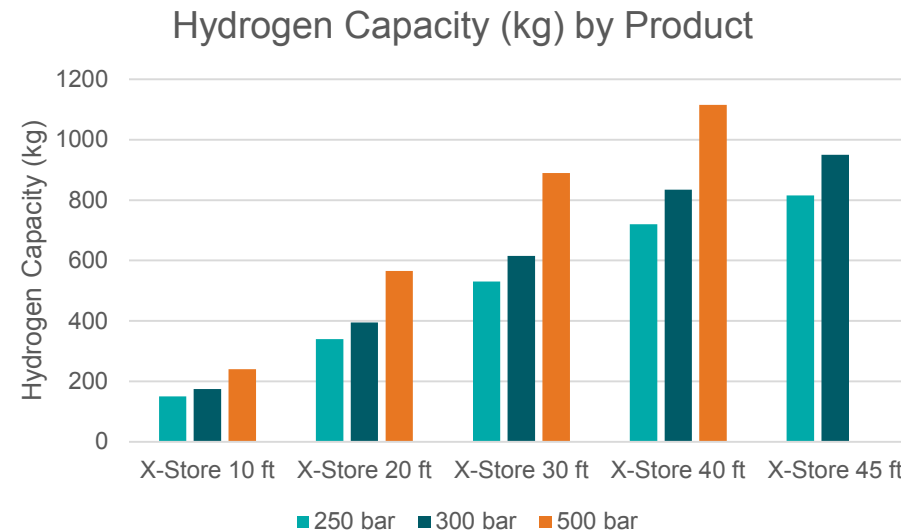
300 bar 45ft in the field



500 bar battery vehicle in the field

X-Store Transport Module Hydrogen Capacities

H2 Capacity	10 ft	20 ft	30 ft	40 ft	45 ft
250 bar	150 kg	340 kg	530 kg	720 kg	815 kg
300 bar	175	395	615	835	950
500 bar	240	565	890	1115	tbd



Distribution Solutions for Hydrogen

Global Footprint

- Already established for CNG/CBG – more than 1000 units worldwide
- **Expanding into hydrogen with over 30 units on the road in Europe**





HEXAGON

General Status

- Infrastructure in Scandinavia
 - 23 hydrogen stations; 11 require refueling card from station operator
 - Plans are in place to build up the hydrogen refueling network but funding is low and slow.
 - Last week, 4 Hyop stations in Norway were put out of service as the owner is out of working capital to keep them open!
- Hydrogen users
 - Approximately 150 fuel cell vehicles currently in Norway
 - Telecom back-up power in Denmark
 - Hydrogen/battery car ferry in Norway for operation in 2021
 - Asko/Scania: First truck in operation end of this year. 3 more to come
- Codes and standards
 - Hexagon is actively involved in this pursuit; working with Standards Norway
- R&D
 - Through SINTEF, joint effort and collaboration across nations (example HYON)

Needs

- **Steady stream of funds**
 - Like executed in California, a predictable stream of funds allow a stable foundation for investors/businesses to plan a multi-year endeavor
 - Like infrastructure projects of the past: railway system, electrical grid, interstate highways
 - While these have continental benefits, hydrogen technology also has planetary benefits
- **Harmonized codes and standards**
 - This is a bottleneck in the product development, sales, and deployment process
 - Getting an approval from Authorities Having Jurisdiction is a wildcard whose process, timeline, and outcome is difficult to predict
 - What is approved for one territory should be satisfactory for all territories
 - Hexagon is actively involved in this pursuit; working with Standards Norway and others
- **Reduced cost on carbon fiber**
 - Not Scandinavian specific, but still applicable
 - Support R&D to develop lower cost carbon fiber, e.g. hollow carbon fibers



Thank you!

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