

Hydrogen Storage & Distribution Modules

DRIVING ENERGY TRANSFORMATION

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Hydrogen Infrastructure

DOE Bulk Storage of Gaseous Hydrogen Workshop
February 10, 2022

AGENDA

- Company Overview
- Stationary Hydrogen Storage
- Hydrogen Distribution Modules
- Drop and Swap Operation

HEXAGON COMPOSITES ASA

GROUP KEY FIGURES



GROUP KEY FIGURES

Exchange rate: 1 € = 10,9 NOK; 1 US\$ = 9,3 NOK

**3 bn
NOK**

REVENUES 2020

**~ 10 bn
NOK**

MARKET CAP
HEX:OL

1.000 +

EMPLOYEES

Mitsui

STRATEGIC ALLIANCE
PARTNER AND MAJOR
SHARE-HOLDER

~ 600.000

TYPE 4 HIGH-PRESSURE
CYLINDERS

~ 65.000

TYPE 4 VEHICLE FUEL
SYSTEMS

~ 1.500

TYPE 4 DISTRIBUTION
SYSTEMS

~ 19mn

TYPE 4 LPG CYLINDERS



75%

G-Mobility

E-Mobility

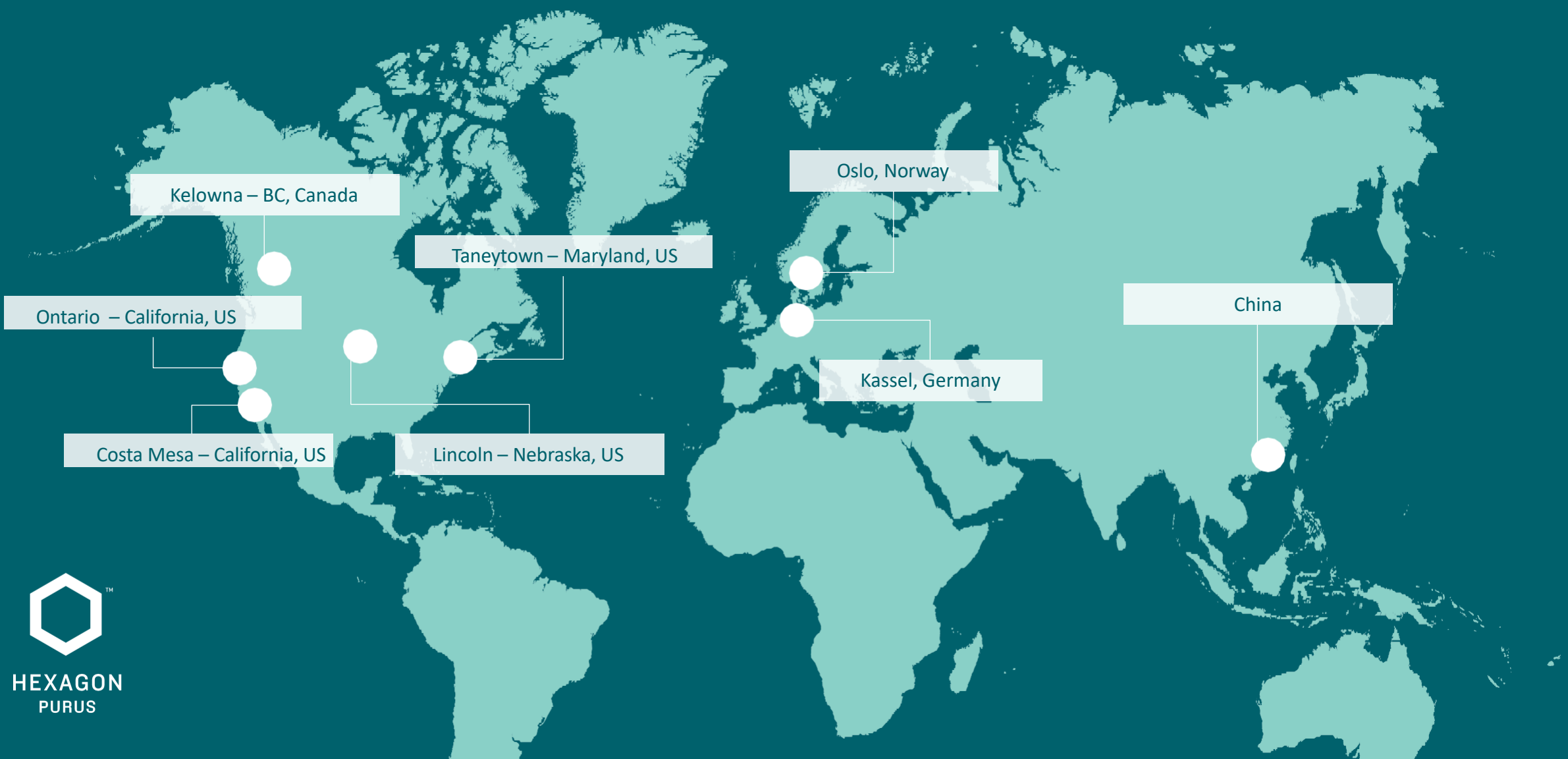




AT A GLANCE

HEXAGON PURUS

INTERNATIONAL ORGANISATION WITH LEADING PARTNERSHIPS, MANUFACTURING AND R&D CAPABILITIES



PRODUCT AREAS

HYDROGEN

BATTERY ELECTRIC

HIGH PRESSURE
VESSELS

FUEL STORAGE
SYSTEMS

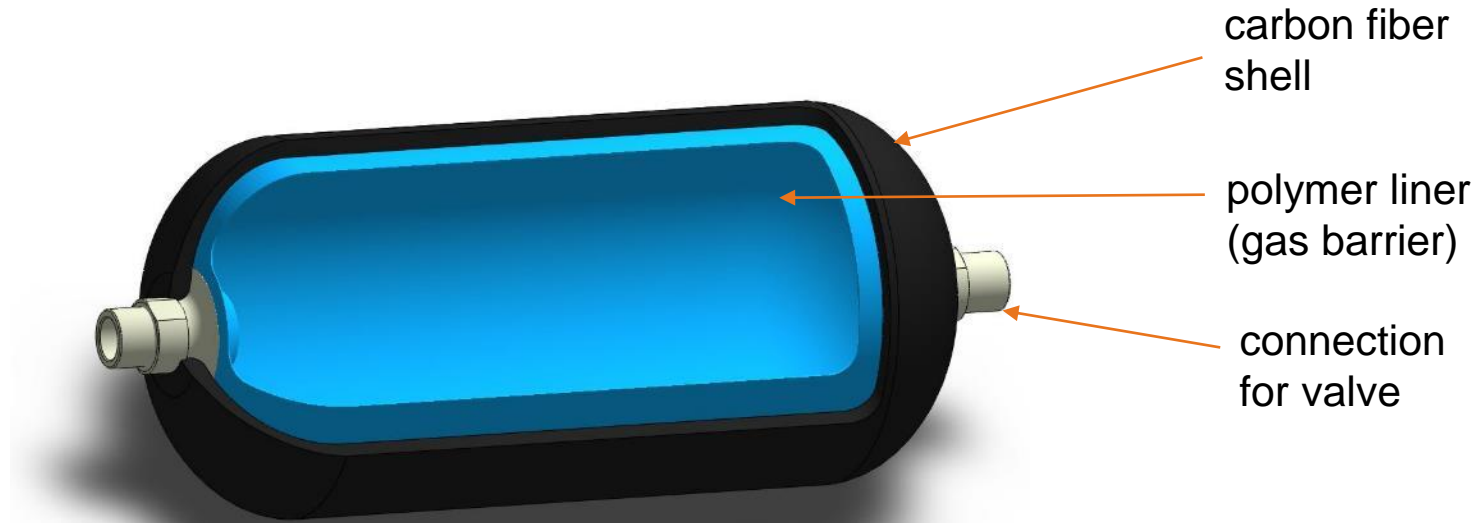
DISTRIBUTION
SYSTEMS

ELECTRIC VEHICLE
SYSTEMS



TECHNICAL CONCEPT OF FULL CARBON CYLINDERS

Hexagon's Type 4 high-pressure vessels for hydrogen developed to date, are made of full carbon fiber and are available in the pressure levels 250, 300, 350, 500, 700 and 950+ bar.



Global leader in type 4 cylinder technology

Light-weight

High-pressure

Durable

Corrosion-proof

STRONG CUSTOMER RELATIONSHIPS



1st iteration Toyota truck
(Photo: Toyota)



350 bar cylinders for the Xcelsior
transit bus – operating in
California, US



700 bar cylinders to Mercedes
GLC-FCELL
(Photo: Daimler AG)

STRONG CUSTOMER RELATIONSHIPS



1st hydrogen vessel in the U.S.;
70 ft hybrid hydrogen fuel cell battery
catamaran to be sailing
(Photo: Golden Gate Zero Emission Marine)



World's 1st hydrogen-powered
regional train Coradia iLint from
Alstom, Germany
(Photo: Alstom)



300, 500, and 950 bar gas
distribution cylinders for Linde,
Air Liquide, Air Products
(Photo: Linde AG)

STRONG CUSTOMER RELATIONSHIPS



950 bar cylinders in use at
Western Canada's first retail
hydrogen refuelling station
(Photo: HTEC)

950/1034 BAR HEXAGON GROUND STORAGE

- Now available for use in California. Already in use in Canada and Europe.
- 20-year life
- Proven 10,000s of beyond-full cycles. Estimated 100,000s of shallow cycles.
- Light and short
 - Allows for placement in container, and for container to be lifted into place during installation
 - Light enough to be installed above the compression equipment, the convenience store, or the dispensing island canopy
- No corrosion



DISTRIBUTION SYSTEMS



HEXAGON



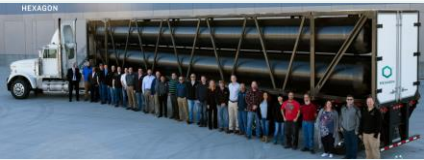
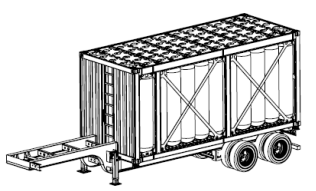

HYDROGEN

DISTRIBUTION
SYSTEMS

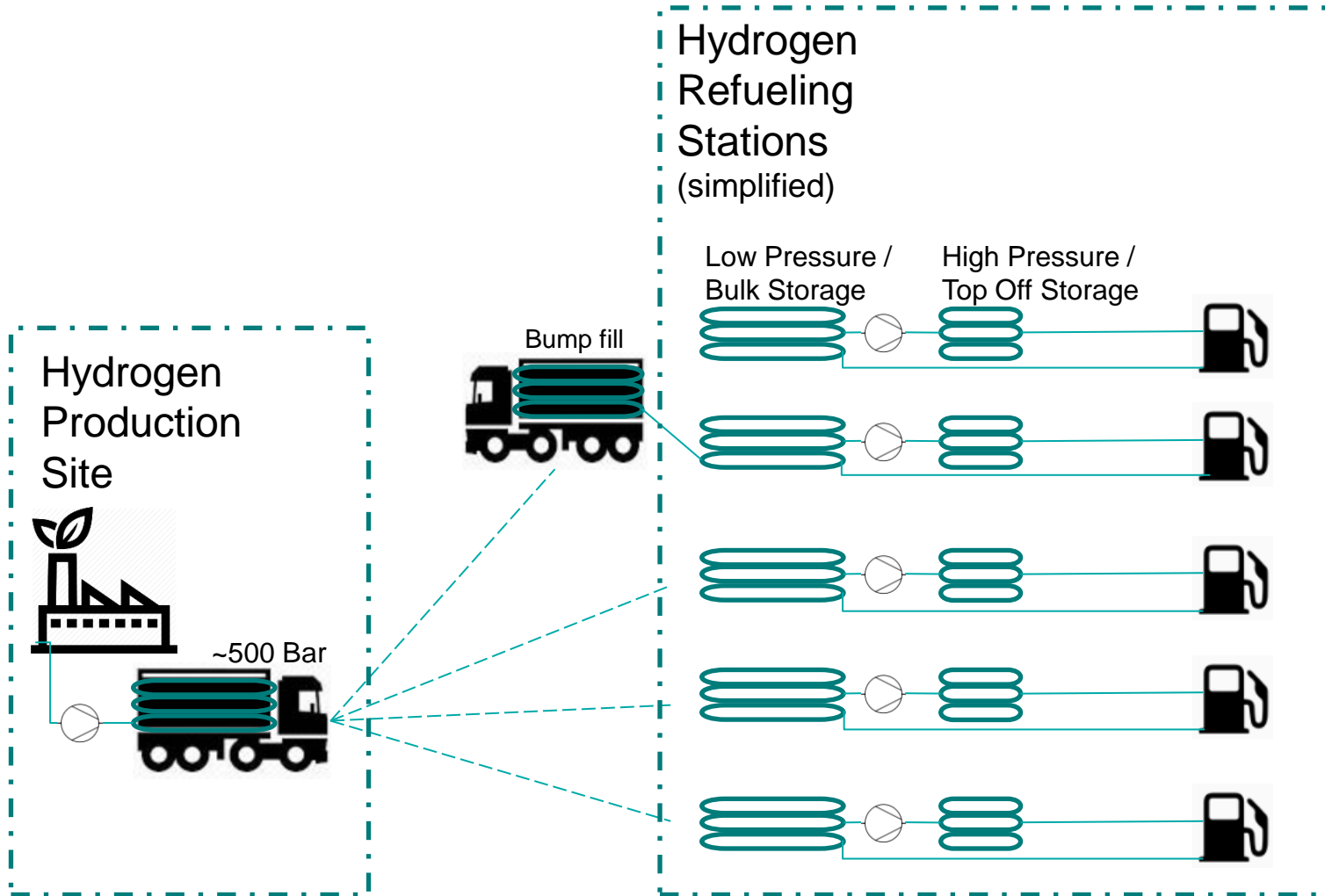


CONTAINER
RANGING
FROM 10 TO 53 FEET

HYDROGEN DISTRIBUTION SOLUTIONS FOR NORTH AMERICA

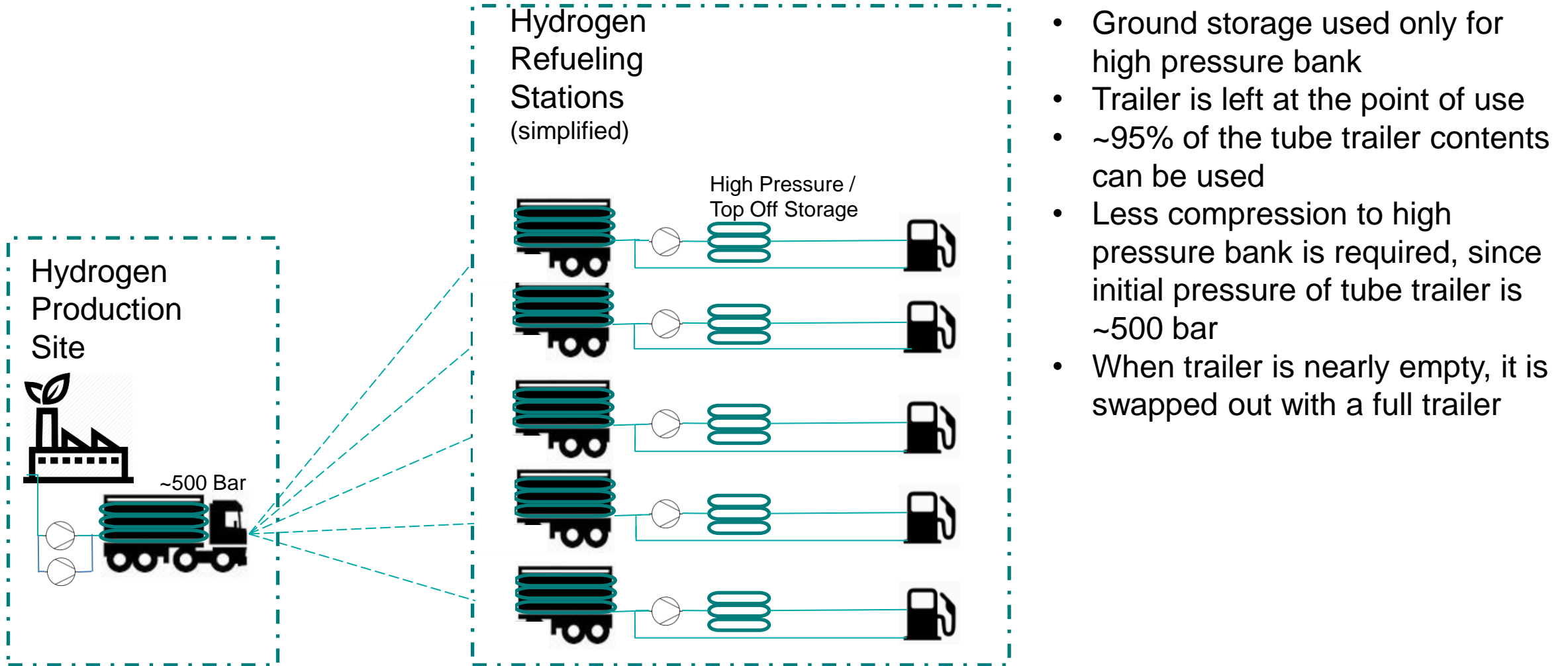
Product Series	Pressure (bar)	Hydrogen capacity (kg)	Container Length (ft)	DOT Special Permit	
SMARTSTORE	250	380	20	SP14951	
Titan	250	774	40	SP14951	
Titan	250	867	40	SP14951	
Titan	250	1000	53	SP14951	
X-STORE DOT	517	600	20	SP20391	
Mini-container	950	25	10.5	SP20391	

BUMP FILL TRANSFER OPERATION

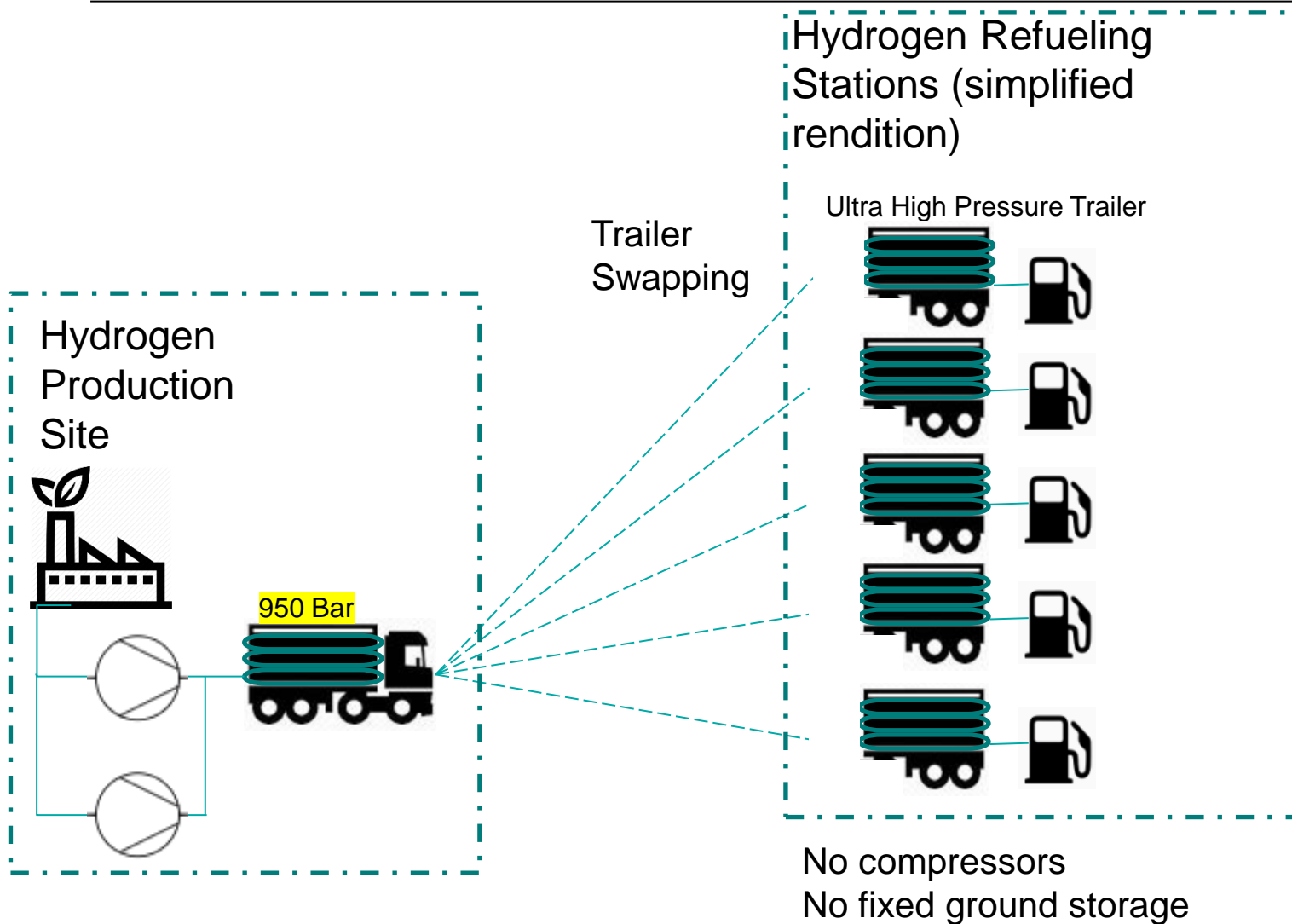


- Ground storage used for low and high pressure banks
- Truck-trailer combination temporarily parks at station for approximately 1 hour
- Hydrogen flows from higher pressure tube trailer to lower pressure ground storage
- 50 to 60% of the hydrogen is transferred, due to pressure equilibrium being reached

DROP AND SWAP OPERATION



REFUELING FOR SHORT TERM DEMONSTRATIONS USING 950 BAR DISTRIBUTION MODULES



- Trailer remains at station until spent, then swapped with full one
- Simple set-up
- No compressor at station; only at hydrogen production site
- No need for fixed ground storage
- Aimed at smaller throughput and/or temporary stations

950 BAR HYDROGEN DISTRIBUTION SOLUTION

950 bar Mini-container

- 24.8 kg of hydrogen
- 2759 lb (1247 kg) tare weight
- 52" W x 127" L x 30" H
- DOT certified
- Fire protection system included
- Twistlock corners



950 BAR MINI-CONTAINERS FOR SHORT TERM/DEMONSTRATION REFUELING

- For Short Term, Small Fleet Demonstrations/Tests



Target customer:

- Fuel cell vehicle OEMs
- Customers with demonstration projects





HEXAGON HOLDS HYDROGEN



**THANK YOU
FOR YOUR
ATTENTION!**

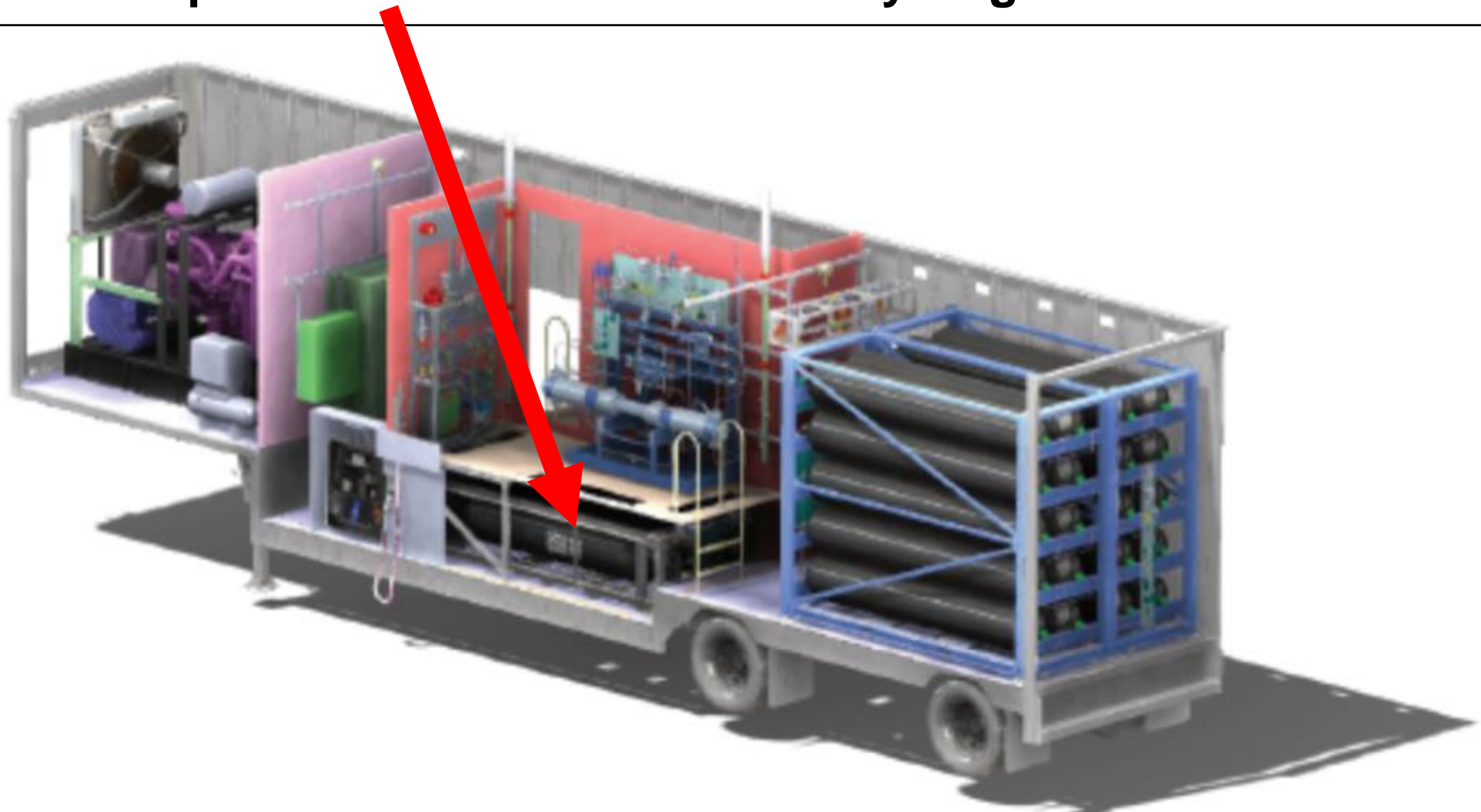
CLEAN AIR EVERYWHERE

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950 Bar Transport Module Used in Mobile Hydrogen Refueler



The 950 bar tanks are used to top off the 700 bar tank(s) onboard the vehicles being refueled.

Leading the industry in innovation, R&D and product development

Creating value through innovation, large scale and strong track record



High product quality

Hydraulic Cycle up to 875 bar
Hydraulic Burst up to 2000 bar



Advanced production technology



Large scale production

19 million LPG cylinders
600k high pressure cylinders



Technical expertise & know-how

Mechanical, electrical,
chemical, industrial engineers



Global footprint

1000+ employees in
13 countries



Strong track record

Global customer base covering 5
continents



Long experience in regulatory compliance



Strong roots – expanding out of Norway



HEXAGON

2000

Hexagon Composites (NO)
Norwegian Applied Technology
ASA was merged with Devold AMT
AS. The group changed its name
to Hexagon Composites.

2003

Raufoss Fuel Systems (NO)
Type 4 CNG cylinders

2014

Masterworks (US)
Type 3 and 4 cylinders

2016

Mitsui & Co., Ltd. (JP)
acquired 25.01% of Hexagon and a strategic
alliance agreement was signed
xperion Energy & Environment (GE)
Type 4 CNG & H2 cylinders

2020

G-mobility and E-mobility
Spin-off and listing of
Hexagon Purus

2000

2005

2010

2015

2020

**Driving energy
transformation**

1999

Flakk Group
became the largest owner of
publicly listed Norwegian Applied
Technology ASA

2001

Ragasco (NO)
LPG cylinders

2005

Lincoln Composites (US)
Type 3 and 4 cylinders

2018

Digital Wave (US)
Testing and requalification
technology

2019

Agility Fuel Solutions (US)
Fuel systems and Type 4 CNG &
H2 cylinders

2020

CIMC ENRIC
Joint Venture

Heritage: Hydrogen Transport Solutions from Europe – 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 gas transport module (photo: Air Products)



X-STORE European 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	---

