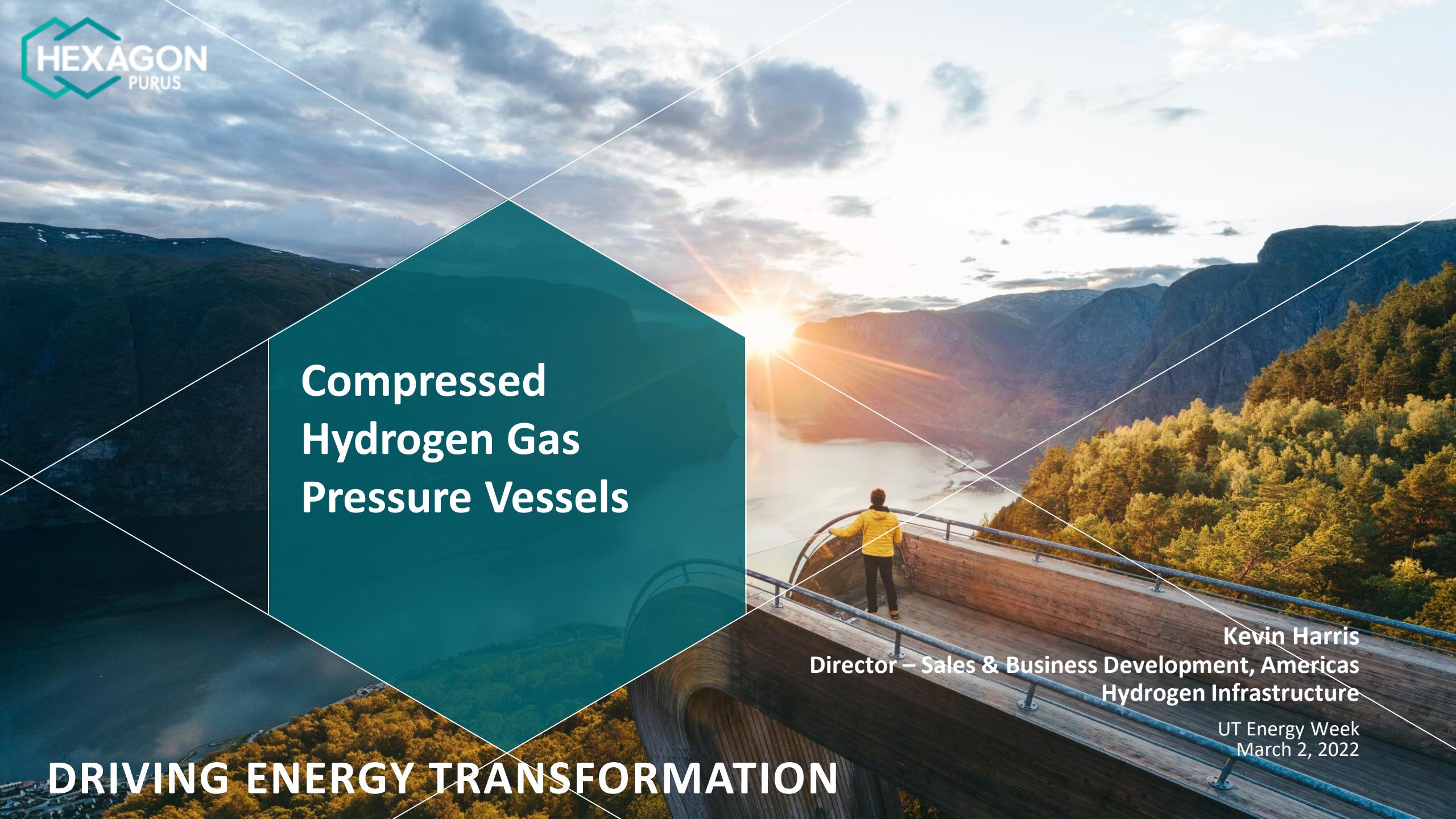


# Compressed Hydrogen Gas Pressure Vessels

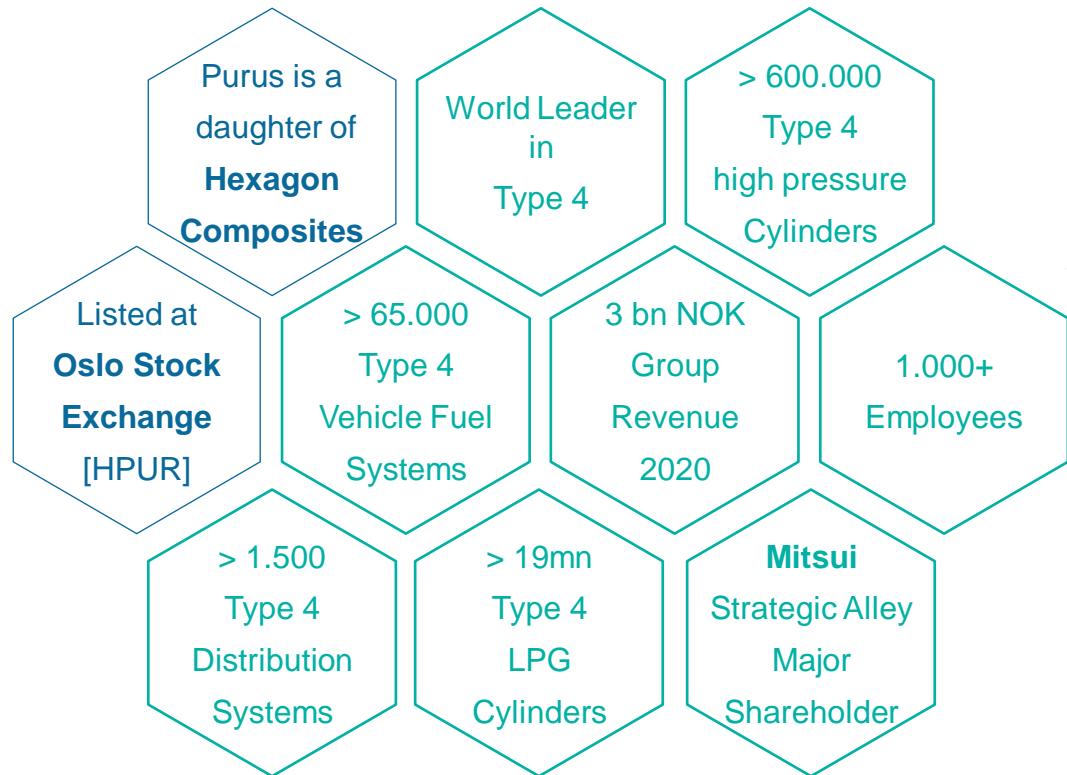
DRIVING ENERGY TRANSFORMATION



Kevin Harris  
Director – Sales & Business Development, Americas  
Hydrogen Infrastructure

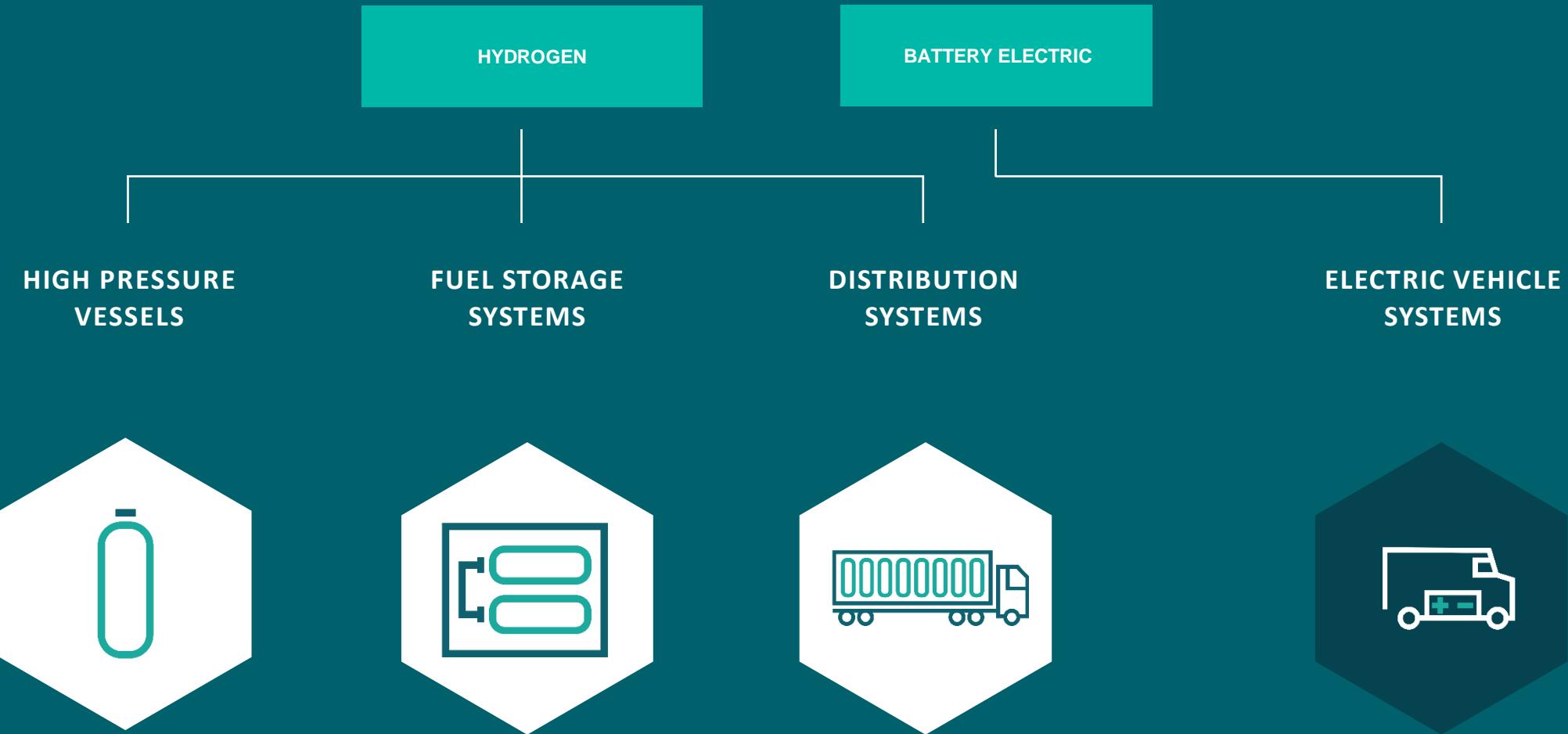
UT Energy Week  
March 2, 2022

# Hexagon Purus as a Global Technology Company

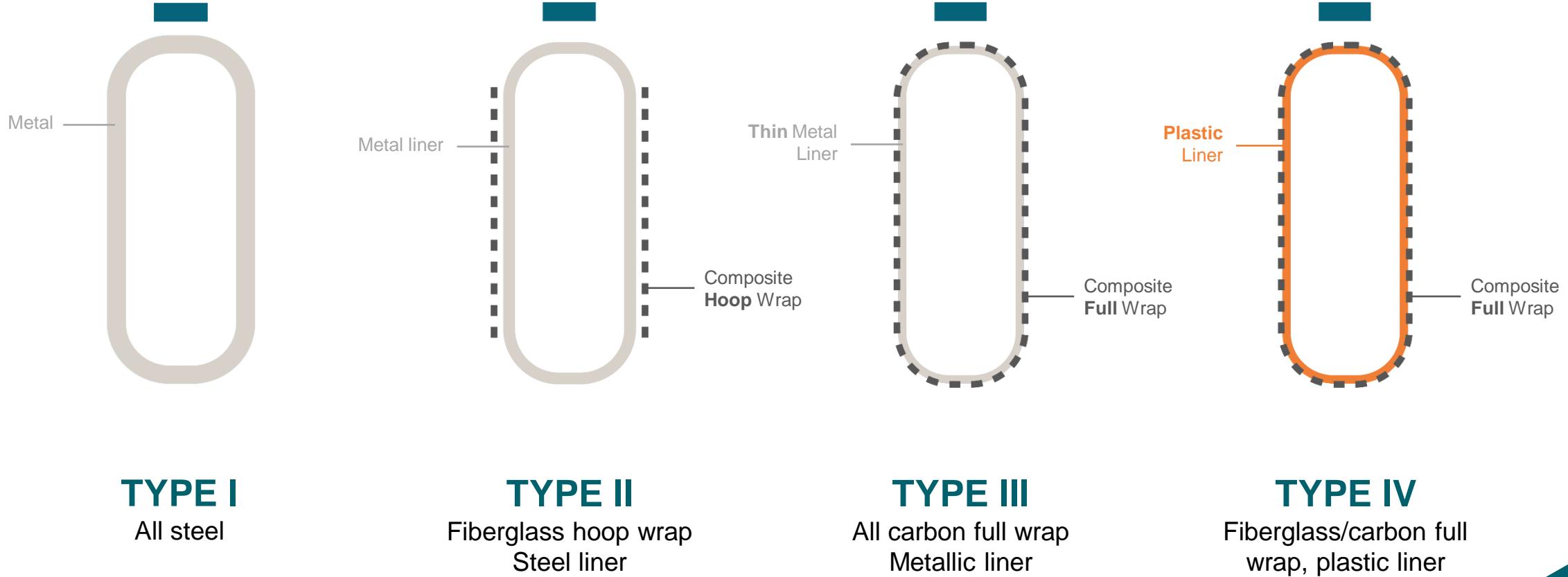


- Hexagon Composites Headquarters: Ålesund (Norway)
- Purus Development and Production Sites in Europe: Weeze and Kassel (both Germany)
- Purus Development and Production Sites in the Americas: Kelowna (Canada), Lincoln and Taneytown (both US)

# Product Areas



# Types Of Pressure Vessels





Global leader in  
type 4 cylinder  
technology

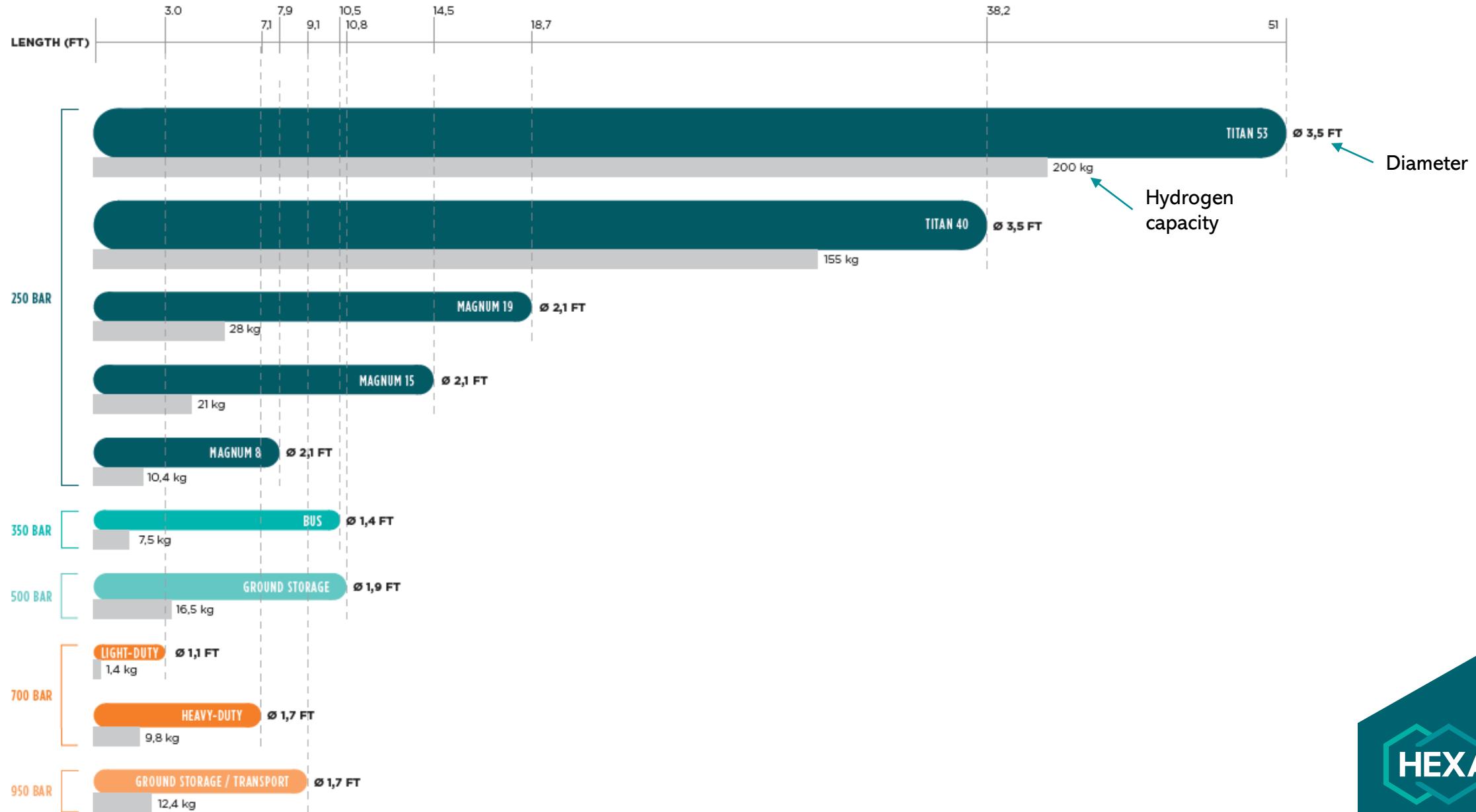
Light-weight

High-pressure

High cycle life

Corrosion-proof

# Sample of Hexagon Hydrogen Cylinders



# Strong customer relationships across a variety of end-use applications



Toyota fuel cell electric heavy-duty truck  
(Photo: Toyota)



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



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



300 bar and 500 bar gas distribution modules for Linde  
(Photo: Linde AG)

## Adjacent markets



Construction & mining



Agriculture



Drones



Aviation



Other applications



1st hydrogen vessel in the US; 70 ft hybrid hydrogen fuel cell electric catamaran  
(Photo: Golden Gate Zero Emission Marine)



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



950 bar cylinders for Western Canada's first retail hydrogen refueling station  
(Photo: HTEC Hydrogen Technology & Energy Corporation)



Battery packs for Daimler's two new battery electric truck models eCascadia and eM2, and additional system components for the eM2

# Heritage: Hydrogen Transport Solutions from Europe – X-STORE®

## The ADR solution for Europe

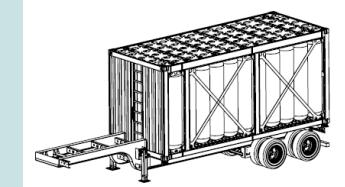
- Fast exchange of container modules
- Capacity adjustable to customer demands – range from 10ft to 45ft
- Different options on pressure – 250bar – 300bar – 500bar
- Full capacity range from 150 kg to 1000+ kg payload of Hydrogen



300 bar gas transport module (photo: Air Products)



# Hydrogen Distribution Solutions for North America

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

**Kevin Harris, P.Eng**

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# Clean air everywhere



Thank You

HEXAGON HOLDS HYDROGEN

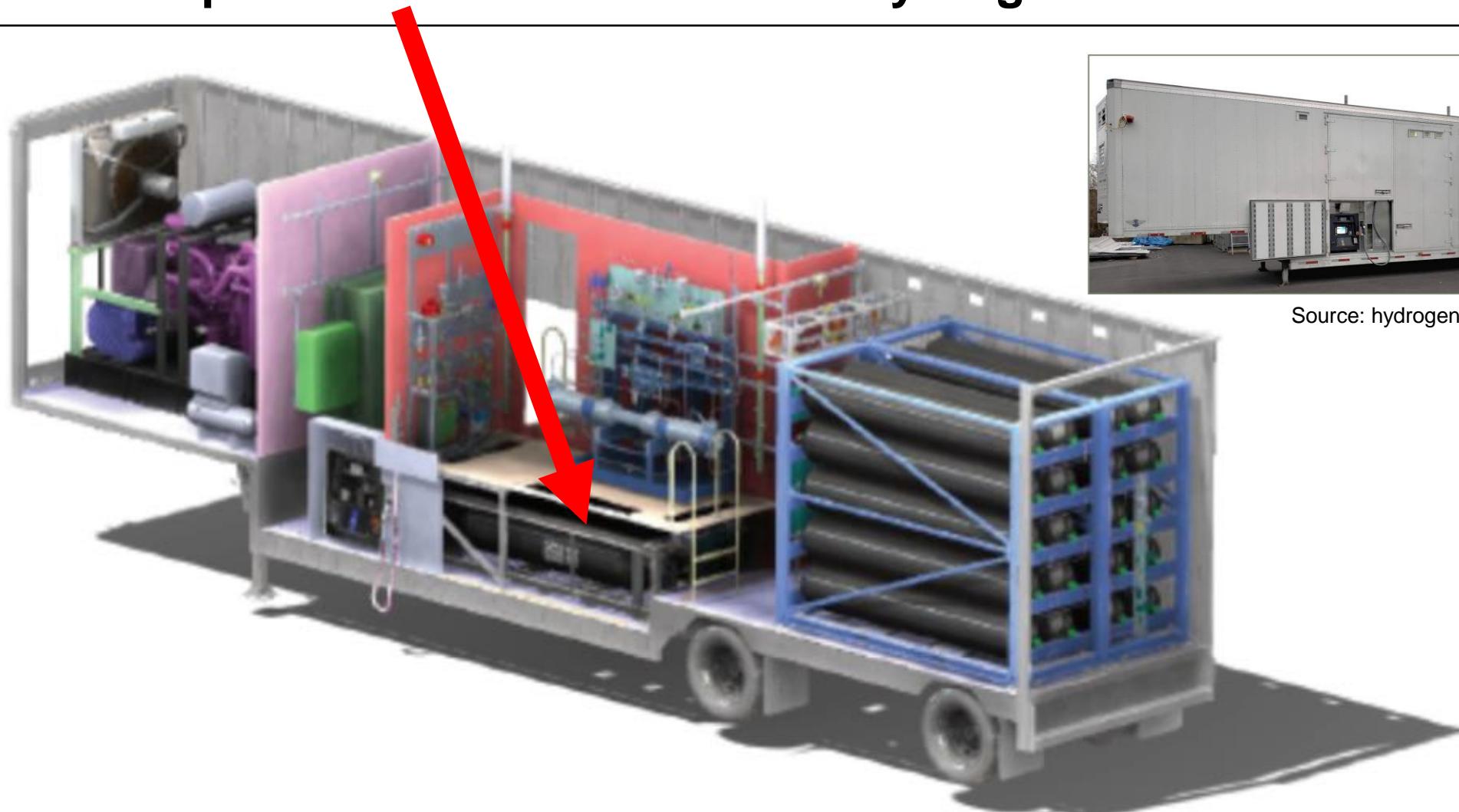
# 950 Bar Hydrogen Transport Solution

- **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 Transport Module Used in Mobile Hydrogen Refueler



Source: [hydrogen.energy.gov](http://hydrogen.energy.gov)

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

# 1034 bar Hexagon Ground Storage Approved for California

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## CALIFORNIA ALLOWS HEXAGON'S ULTRA-HIGH-PRESSURE COMPOSITE VESSELS FOR HYDROGEN GROUND STORAGE INSTALLATIONS

24.09.2019 PRESS RELEASE

Hexagon has been granted approval for its ultra-high-pressure hydrogen ground storage tanks by the California Occupational Safety and Health Standards Board (CalOSHA).

The approval allows Hexagon's 1034 bar (15,000 psi) composite pressure tanks to be used as hydrogen ground storage in California. These pressure vessels are typically used as the high-pressure bank in hydrogen refueling stations. After vehicles with 700 bar tanks are filled from the medium storage (~500 bar) the 1034 bar tanks will ensure the top filling up to 700 bar.

"We are glad to see the supplier base of hydrogen ground storage equipment expanding particularly for the California market," said Tim Brown, Chief Operations Officer of FirstElement Fuel, the market leader for hydrogen refueling stations in North America. "The introduction of such a lightweight product as this one can be especially useful in urban settings where equipment footprint is critical. Lightweight tanks can be installed above grade; for example, above the hydrogen



# 1034 bar Hexagon Ground Storage Approved for California

- Already in use in Canada and Europe
- 20-year life with only 1 required requalification test at year 15
- Requalification via Modal Acoustic Emissions test
  - In-situ test, tank removal not required
  - A few days, not a few weeks
- Calculated 2.4 million cycles allowed between 950 and 750 bar, recommended limit of 240,000 cycles (10X safety factor)
- 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, above the convenience store, or above the dispensing island canopy
- No corrosion
- Same pressure vessel as the 950 bar DOT application

