



HYDROGEN

ENERGY WEEK – LIQUID HYDROGEN STORAGE

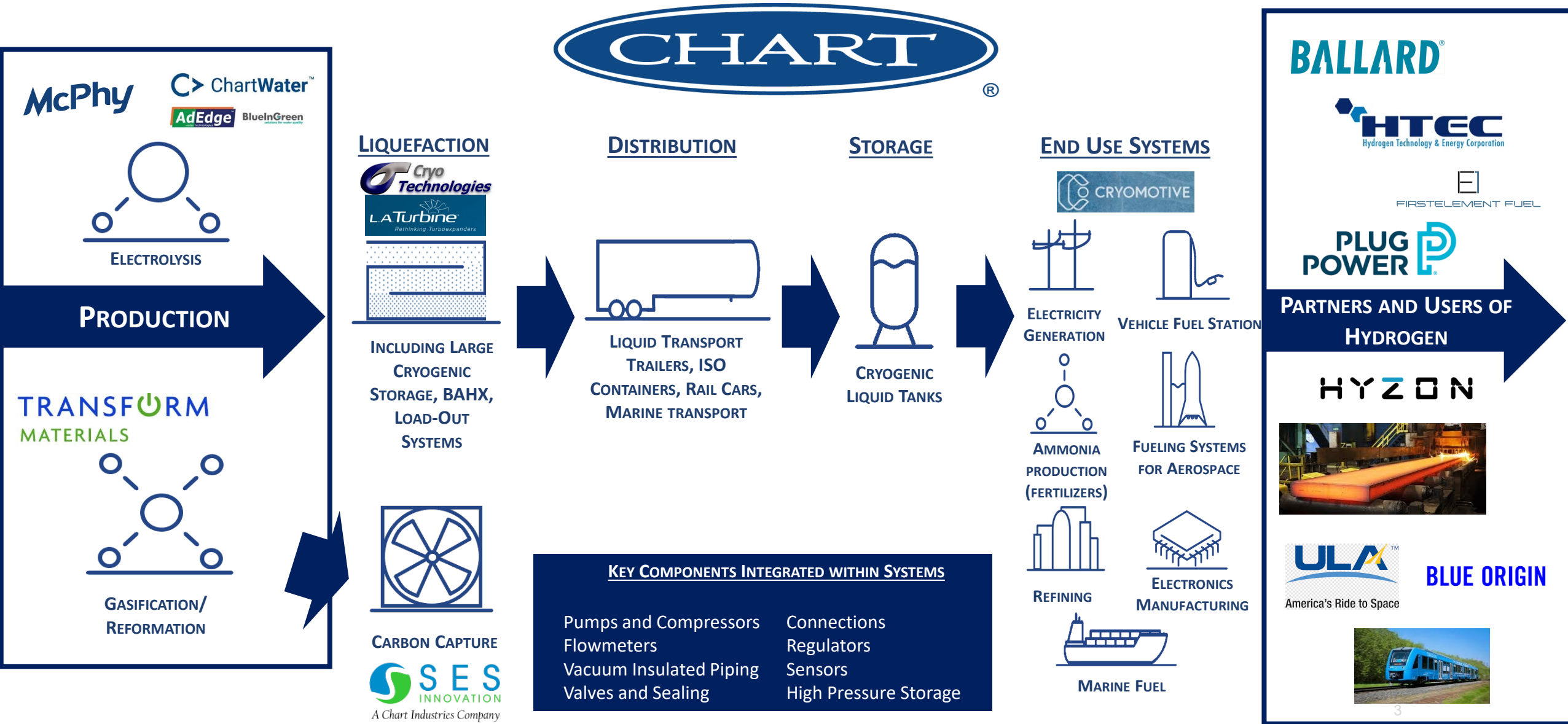
Global Leader in Hydrogen Tanks



- The leader in liquid hydrogen storage tanks globally
 - FCEV fuel stations, FC forklift fueling, liquefaction, aerospace and industrial applications
 - >900 LH2 bulk tanks built
 - Complete line of liquid hydrogen storage tanks – 3,000 to 175,000 gallons (11 to 662 m³) and up
 - Engineering expertise for unique applications
- Superior performance and quality
 - Chart Super Insulation
 - Pipe layouts designed with operations and maintenance in mind
 - Helium Mass-Spectrometer leak test detection used on all tanks
 - ASME Section IX certified welders



Where We Play In the Hydrogen Supply Chain



H2 Storage Bullet Sizes

Shop-built “bullet” storage tanks come in standard and custom sizes

From 3,000 to 250,000 gallons

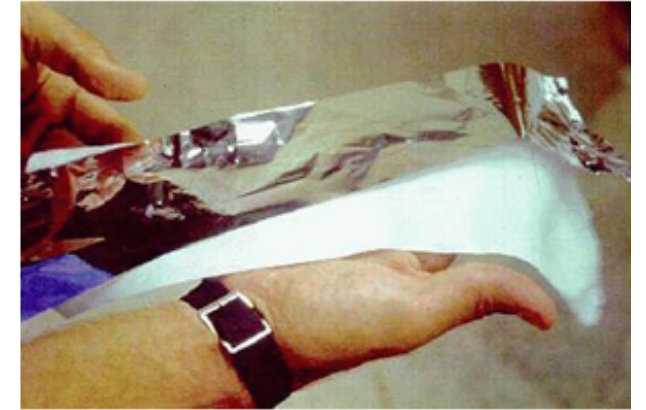
Largest vertical up to 50,000 gallons volume

Largest shop-built LH2 tank to-date is 170,000 gallons



Cryogenic tank insulation systems

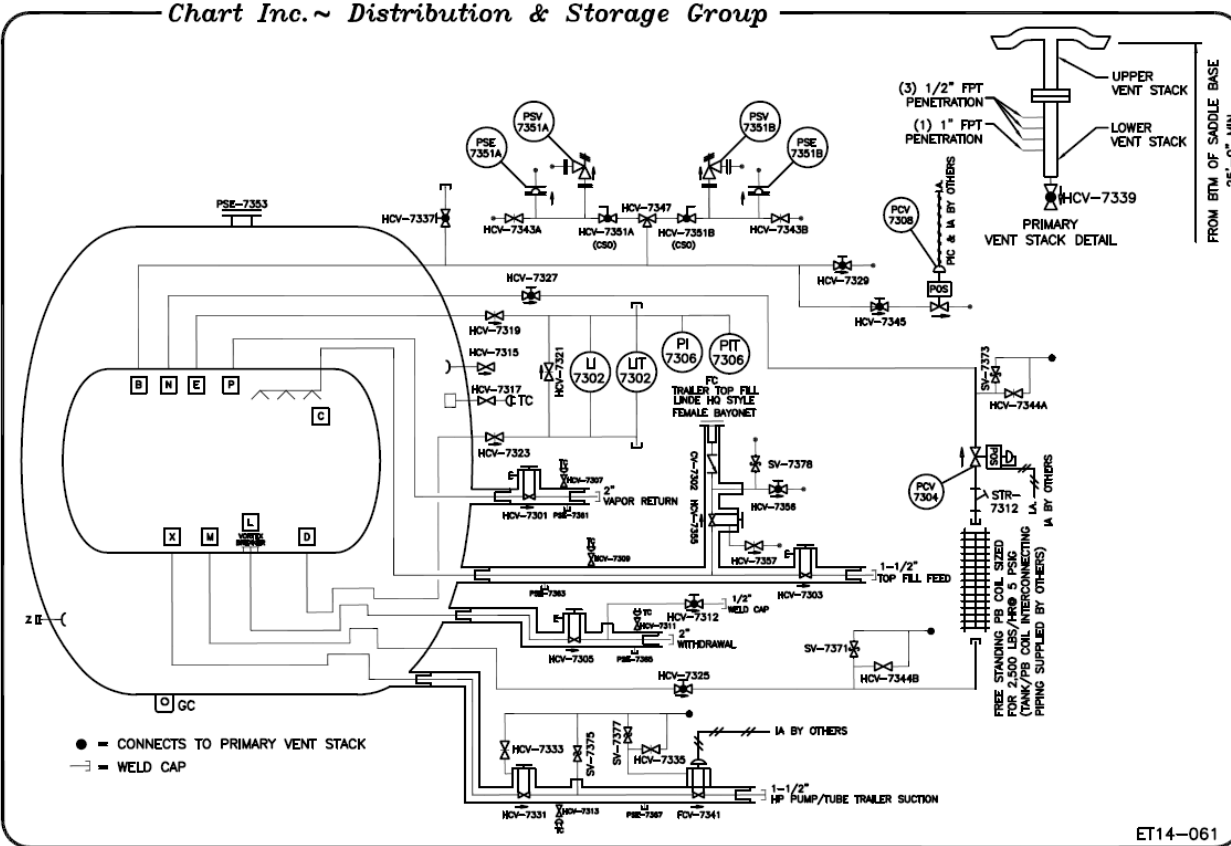
- OXY/NIT/AR tanks usually have perlite
- H₂ tanks usually have multi layer insulation (MLI): aluminum foil and glass fiber material
- Lower vacuum levels maintained for MLI as compared to perlite
- Use of Mylar should be prohibited
- Thermal performance noted in %/day
 - Roughly 5-6 times higher for a given tank nitrogen: hydrogen
 - Tested by venting Normal Evaporation Rate (NER)



Multi Layer insulation(MLI)
is sometimes referred to as
superinsulation (SI)



Reference PFD for bullet H2 plant tanks



Shipping Considerations



Thank you!