Cryogenic Thermal Management:
Liquid Hydrogen Mobility Platforms

Thermal Management Expo

Huntington Convention Center,

Cleveland, Ohio, USA

May 5, 2026

Matt Moran*

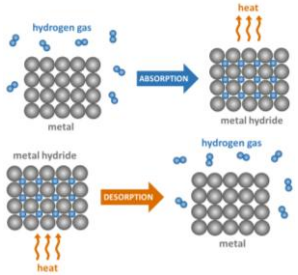
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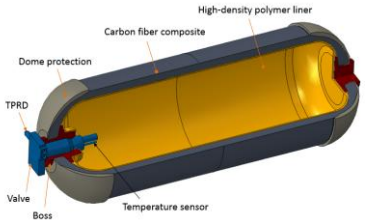
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*Matt has been developing liquid, densified, and gas hydrogen technologies and systems for over 40 years

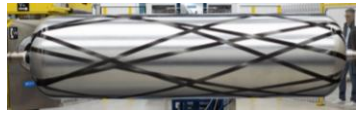
Hydrogen Storage Options

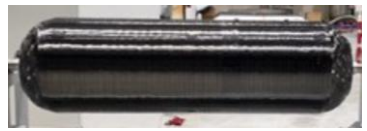












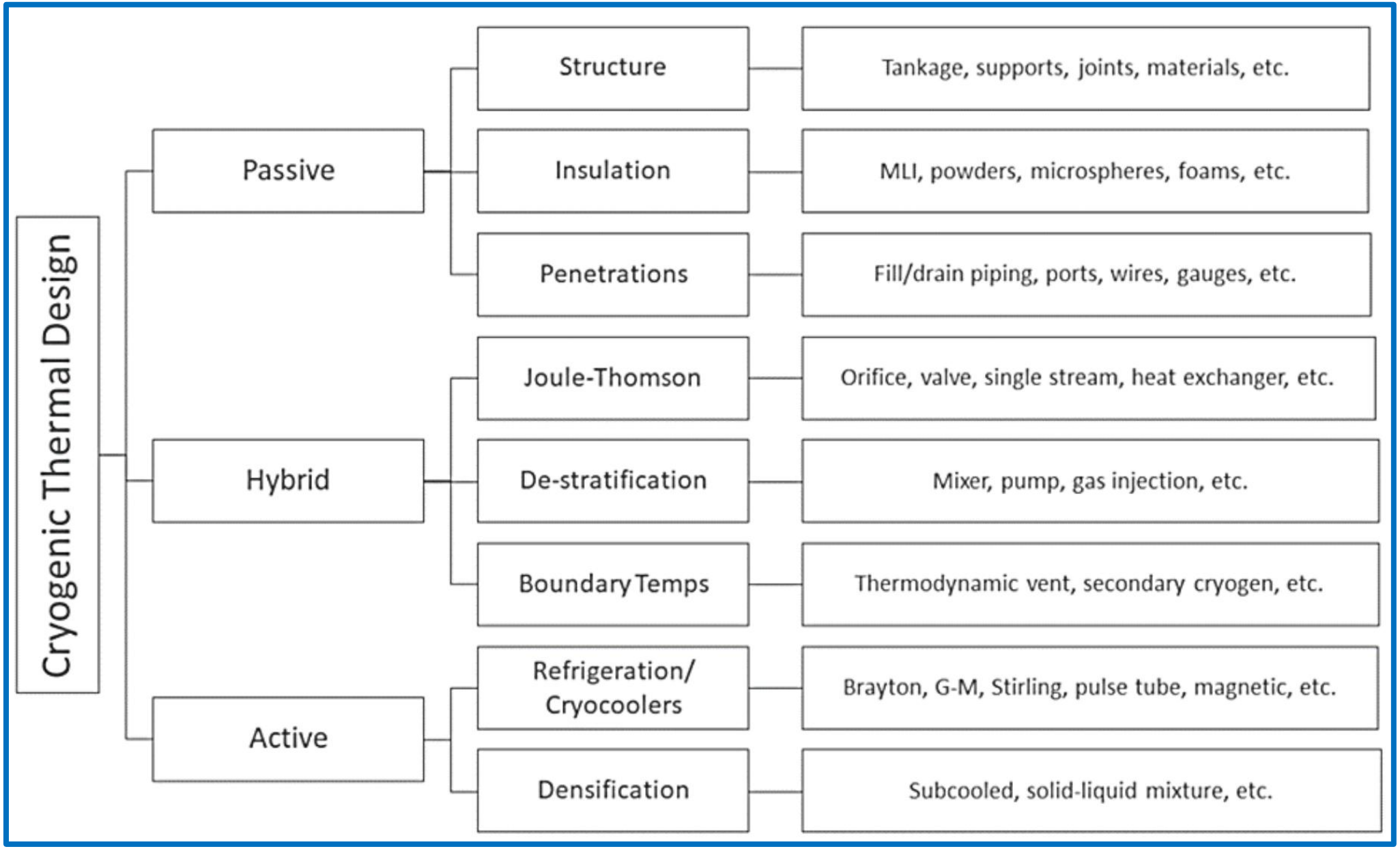
	Underground Storage	Material-Based (Solid State)	Compressed Gas	Cryogenic Liquid	Cryo-compressed
Conditions:	moderate pressures; 15 C	Various	Up to 700 bar; 27 C	Low pressure; -253 C	Up to 450 bar; cryogenic
Energy Input:	Blower or compressor	Various	Compressor; cooler	Liquefaction	Depends on process
Supply Method:	Piping delivery	Onsite	Tubers or onsite	Transport or onsite	Onboard fueling
H2 Density:	15 kg/m^3 at 200 bar[(b)]	n/a	39 kg/m^3 at 700 bar	71 kg/m^3 at 1 bar	> 80 kg/m^3 possible
Mass Fraction[(a)]:	n/a	< 2% (metal hydride)	< 10%	Up to 80%	10% or more

(a) Hydrogen mass divided by hydrogen plus storage vessel mass. (b) Not accounting for roughly one-third buffer gas requirement.

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Image credits: FuelCellWorks, Hystorsys, DOE, ANL, NASA, Cryomotive

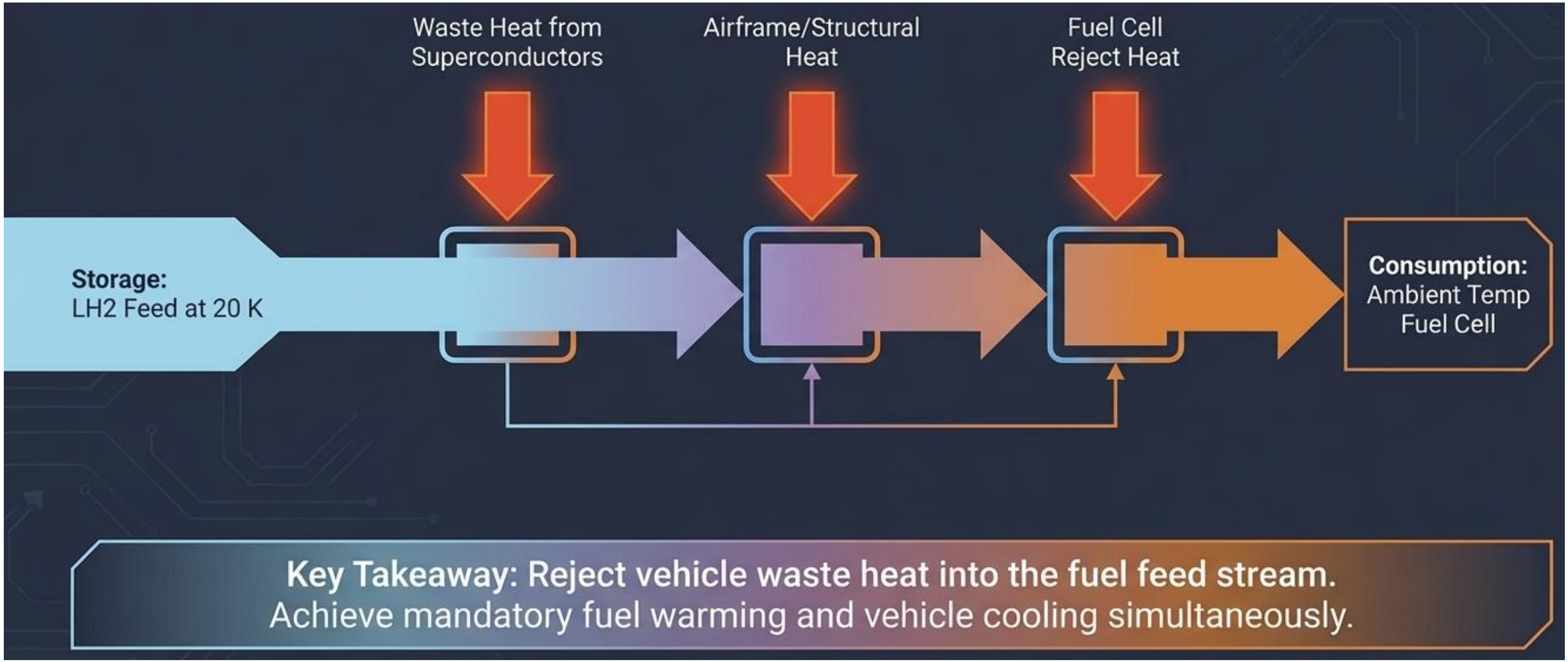
Cryogenic Thermal Design Options



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For more information: see Section 1.0, ***Cryogenic Fluid Management…***, Moran Innovation LLC, 2023

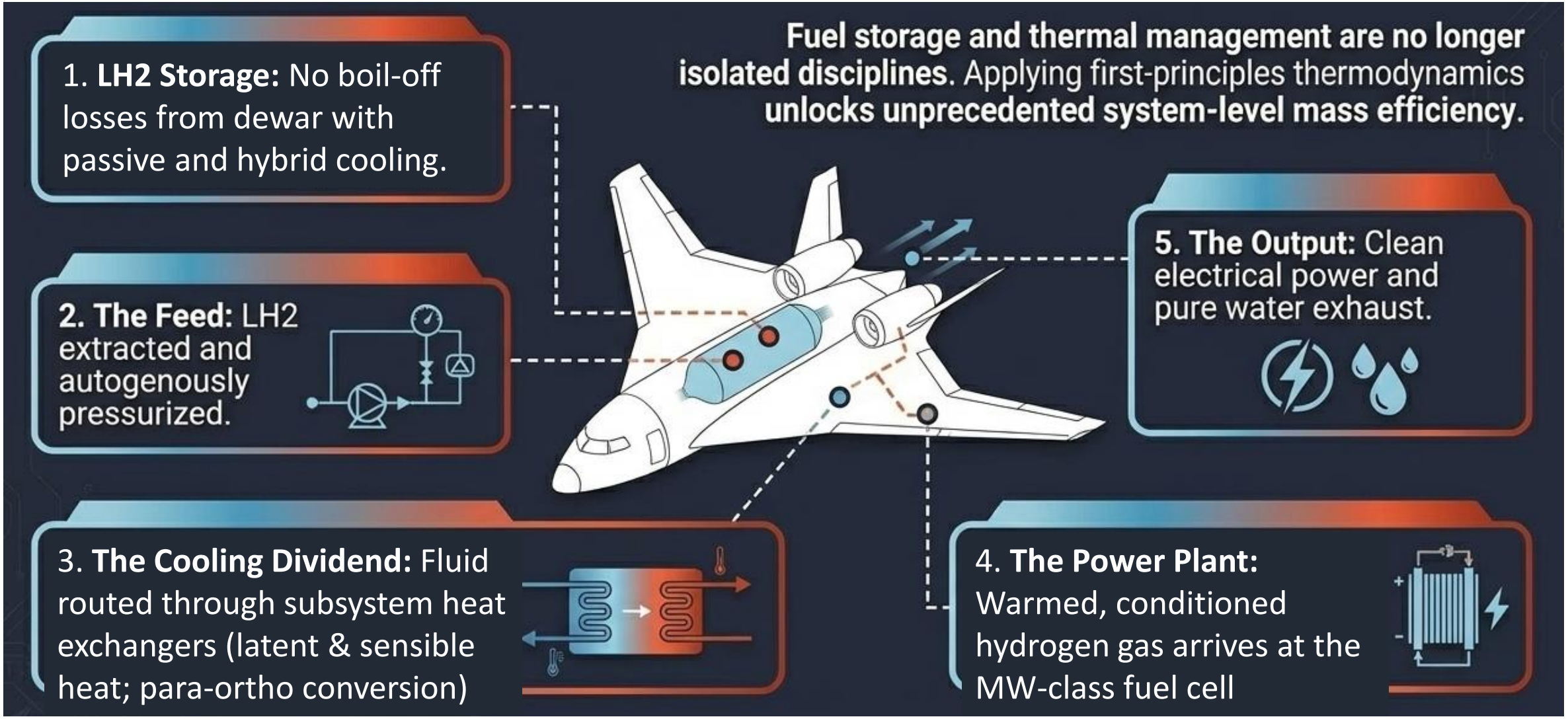
Mobility Platforms: Synergistic Thermal Management



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Integrated Thermofluid Architecture Approach



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Questions?



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- ✓Interactive tools
- ✓Online courses
- ✓Briefings (by topic)
- ✓Cryogenic fluid mgmt
- ✓Insights & news
- ✓Other resources

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