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## **M2Or1D-03: [Invited] Considerations for commercial adoption of cryogenic hydrogen for propulsion applications**

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Hydrogen is often cited as a potential fuel alternative to enable carbon reduction in hard to abate sectors, such as in aviation propulsion. However, hydrogen's low volumetric energy density while in gaseous form makes it impractical for many transport applications. To overcome this challenge, storage in a liquid form has been identified as a potential solution to unlock carbon-free hydrogen as a viable fuel source. While there has been significant funding and research to significantly reduce the cost of hydrogen to less than one to two dollars per kilogram, this work frequently does not address detailed adoption characteristics and total switching costs related to end-use markets. In the recently released report from the U.S. Department of Energy, "Pathways to Commercial Liftoff: Clean Hydrogen," it is acknowledged that "...hydrogen powered flight for long-haul aviation...may remain decades away..." highlighting the need for significant infrastructure development and the turnover of the existing aircraft fleet.

To address these end use market adoption hurdles, a variety of market adoption characteristics must be considered and addressed. This presentation will discuss a framework for assessing commercial adoption factors for cryogenic hydrogen applications and identify some key risk factors for future consideration of technologists and commercial practitioners as these technologies are moved to market.

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