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C1Or3C-01: [Invited] Simulation test platform for LH2 controlled storage/transfer

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Clean-energy propulsion machines, including trucks, tractors, ships, and aircraft, for heavy-duty and long-range mobility have moved, by necessity, to onboard liquid hydrogen (LH2). However, the established method of storage and transfer is problematic due to losses and for any duty-cycle of a sporadic or on/off nature. Integral servicing system methodology is needed for both safety and cost effectiveness in the key drivers of time savings, product savings, and venting exposures. Modern controlled storage technology enables quick and effective vehicle servicing at the point of use. Simulations of controlled storage/transfer (CS/T) methodologies are performed using a multi-purpose LH2 simulation test platform comprised of two primary systems: Cryostat CS900 tank and transfer system and the LS20 liquefaction/refrigeration and storage system. Testing includes both steady-state and transient modes of operation to demonstrate both zero boiloff (ZBO) and zero-loss transfer (ZLT) modes. Technical areas of use include product development for tanks, refrigeration, transfer systems (lines, dispensers, pumps, valves); experimental validation of analytical models and thermofluidic properties; thermal insulation performance test data under relevant conditions; thermophysical characterization of materials and structures; and instrumentation and sensors development, and tank boiloff and heat flux engineering design data. Descriptions and preliminary test results are given along with thermal performance analyses from real-world testing and experimentation.

Author: Mr FESMIRE, James (GenH2 Corp.)

Co-authors: Mr GUERRERO, Marco (GenH2 Corp.); WILLIAMS, Martha (GenH2 Corp.); Mr GLENN, Mark (GenH2 Corp.); Mr COLEMAN, Brian (GenH2 Corp.)

Presenter: Mr FESMIRE, James (GenH2 Corp.)

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