Fuel Cell Component Durability for Million Mile Fuel Cell Trucks

Rod Borup[1], Adam Weber[2], Deborah Myers[3], K.C. Neyerlin[4], Ahmet Kusoglu[2], Rajesh Ahluwalia[3], Rangachary Mukundan[2], David Cullen[5], Jacob Spendelow[1] and Greg Kleen[6]

[1]Los Alamos National Laboratory (LANL), Los Alamos, NM
[2]Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA
[3]Argonne National Laboratory (ANL), Lemont, IL
[4]National Renewable Energy Laboratory (NREL) , Golden, CO
[5]Oak Ridge National Laboratory (ORNL), Oak Ridge, TN
[6]U.S. Department of Energy, Energy Efficiency and Renewable Energy, Hydrogen Fuel Cell Technologies Office, Washington, DC

ABSTRACT

While significant advances have been made and early commercial fuel cell light-duty vehicles (LDVs) are starting to be produced, fuel cells in the heavy-duty-vehicle (HDV) transportation sector (including trucks, long-haul semitrailers, maritime, trains, etc.) are nascent, despite the fact that advantages of fuel cells compared to both diesel and electric powertrains are very compelling in terms of emissions, charging time, efficiency, power-to-weight ratio, among others. However, the fuel-cell technology for HDVs requires a paradigm shift in fuel-cell research and development compared to LDVs, where the emphasis becomes efficiency and improvements in durability instead of a focus on increased power densities and lower cell costs.

Heavy-duty applications require significantly longer vehicle lifetimes (>25,000 hours/1,000,000 miles for heavy-duty trucks), and therefore require improved fuel cell durability compared to light-duty vehicles. In 2020, HFTO formed the Million Mile Fuel Cell Truck Consortium (M2FCT) that includes a core team of five national laboratories to overcome durability and efficiency challenges in PEMFCs for heavy-duty applications with an initial focus on long-haul trucks.

While targets and testing protocols have been developed for light-duty vehicles, the same level of targets and testing protocols have not been established for heavy-duty transportation. With operational times of greater than > 25,000 hours required, the need for well-developed accelerated stress tests (ASTs) is amplified. Results from these ASTs demonstrate the need for more durable electrode layers and well-controlled potential variations. This presentation will provide an overview of the DOE's Fuel Cell R&D approach, highlighting past and current activities, as well as strategies to enable fuel cell competiveness for heavy-duty applications.

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