Fuel Cell Electric Vehicle (FCEV): Operations, Parking, and Labeling

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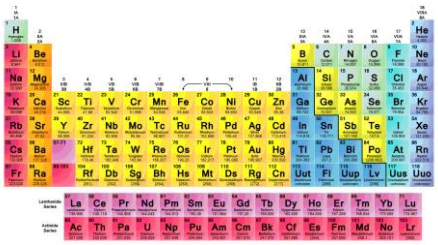
Introduction

The fuel cell electric vehicles (FCEV) is an electric vehicle that utilizes a fuel cell and hydrogen to generate electricity onboard, eliminating the need for heavy batteries and long periods of time for recharging. FCEVs are expected to be commercially released by automotive companies (original equipment manufacturers (OEMs) including Toyota, Hyundai, Honda) for public and fleet use to meet zero emission vehicle (ZEV) mandates beginning in 2016. As a consequence of this deployment, there may be questions regarding regulations and standards for FCEV operations, parking in below grade structures, and vehicle labeling. These questions require attention and should be addressed consistent with federal codes and standards, regulations in other states, and OEM protocol.

2016 Toyota Mirai production FCEV

Background

Hydrogen (element number one) is abundant in many natural compounds, and when present as a gaseous element is lighter than air. If released, hydrogen will rise and dissipate without toxic effects. Hydrogen is currently used commercially for food production, metals manufacturing, industrial cooling, electric generation, and in the petrochemical industry to reformulate fuels. Hydrogen is typically separated from other elements to form pure hydrogen through electrolysis of water (H2O) or steam reformation of natural gas (CH4). Gaseous hydrogen is best characterized as an energy carrier, similar to electricity that can produce power without harmful air emissions, and can also be stored like conventional fuels, such as propane and natural gas. Consequently, gaseous and liquefied hydrogen is being considered for energy storage when coupled with intermittent renewable energy, including wind and solar generation.



Fuel cell technology has been in use since 1836 (William Grove) and more recently has been commercially used for stationary power and transportation applications. FCEVs with hydrogen refueling have been demonstrated in Japan, Europe, and the United States, including California and the Northeast states. The technology currently in use has been developed, tested, and refueled consistent with an array of codes and standards to insure safety, durability, and reliability.

Hyundai Tucson production FCEV at Wallingford CT hydrogen fueling station

Codes and Standards

Applicable industry codes and standards for FCEV operation and supporting infrastructure include but are not limited to[1]:

- SAE J1766 – Recommended Practice for Electric and Hybrid Electric Vehicle Battery Systems Crash Integrity Testing (January 2014)
- SAE J2572 – Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fueled by Compressed Gaseous Hydrogen (October 2014)
- SAE J2574 – Fuel Cell Vehicle Terminology (September 2011)
- SAE J2578 – Recommended Practice for General Fuel Cell Vehicle Safety (August 2014)
- SAE J2579 – Technical Information Report for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles" (March 2013)
- SAE J2594 – Recommended Practice to Design for Recycling Proton Exchange Membrane (PEM) Fuel Cell Systems (September 2011)
- SAE J2600 – Compressed Hydrogen Surface Vehicle Refueling Connection Devices (November 2012)
- SAE J2615 – Testing Performance of Fuel Cell Systems for Automotive Applications (Stabilized Oct 2011)
- SAE J2616 – Testing Performance of the Fuel Processor Subsystem of an Automotive Fuel Cell System (August 2011)
- SAE J2719 – Hydrogen Fuel Quality for Fuel Cell Vehicles (September 2011)
- SAE J2760 – Pressure Terminology Used in Fuel Cells and Other Hydrogen Vehicle Applications (June 2011)
- SAE J2601 – Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles (July 2014)
- SAE J2799 – Hydrogen Surface Vehicle to Station Communications Hardware and Software (April 2014)
- SAE J27990-1 – Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice (in progress)
- SAE J2601-2 – Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles (September 2014)
- NFPA 1 - National Fire Code (2015)[2]
- NFPA 2 - Hydrogen Technologies Code (2nd edition 2016)[3]
- ICC-IFC - International Fire Code (2015)[4]

Conclusion

FCEVs are currently regulated through federal codes and standards, and have safety restrictions consistent with gasoline fueled vehicles to protect the public health and safety. The use of FCEVs in/on garages, tunnels, bridges, or below grade locations are currently regulated through federal codes and standards, have safety restrictions consistent with gasoline fueled vehicles to protect the public health and safety, and additional regulation by individual states is not required for public safety. Pressurized tanks have been specially designed and tested for public use and are safe. Further, neither the National Fire Code (NFPA 1), the International Fire Code (ICC-IFC), or the Hydrogen Technologies Code (NFPA 2) have any restrictions or prohibitions that would prevent FCEVs from using below grade parking structures.

While hydrogen fueled passenger vehicles are typically identified by the OEM as a "Fuel Cell Vehicles" or a "Fuel Cell Electric Vehicle", there are no existing or planned national requirements for FCEVs to be identified by a placard and there are no existing or planned restrictions for FCEVs in below grade structures. Accordingly, any obsolete or inconsistent state regulations/statutes for FCEVs that restrict use and parking in below grade structures and require for placards should be amended to eliminate such requirements.

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[1] Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE); "Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan – 3.7 Hydrogen Safety, Codes, and Standards, 2015;" http://energy.gov/sites/prod/files/2015/06/f23/fcto_myrdd_safety_codes.pdf; June 2015

[2] National Fire Protection Association 1 (NFPA 1): Fire Code, web site: http://www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=1 January 2016

[3] National Fire Protection Association 2 (NFPA 2): Hydrogen Technologies Code, web site: http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=2; January 2016

[4] International Code Council; "International Fire Code (2015);" http://www.iccsafe.org/codes-tech-support/codes/2015-i-codes/ifc/; January 2016