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July 2015

Interview with ISO/TC 197 Chair: Introducing Hydrogen Fueling Family of Standards

by Karen Hall, FCHEA

In March, we launched FCHEA's "Interview with the ISO/TC 197 Chairman" series of articles. The first edition introduced the Chairman, Dr. Andrei Tchouvelev and the goals and challenges of the International Technical Committee (TC) on Hydrogen Technologies, ISO/TC 197. This second article focuses on the technical work - specifically the family of hydrogen fueling standards presently under development.

I asked ISO/TC 197 Chair Andrei Tchouvelev why the Technical Committee is developing a family of documents rather than more traditional stand-alone documents. "We decided to establish a suite of standards all relating to gaseous hydrogen fueling stations - Fueling Family - since this seemed like a sound approach to help ensure safety throughout the system", he explained. "When we get to 700 bar refueling and communication-assisted filling operations, there is a significantly more strict set of requirements involved than in a more traditional environment. A high pressure storage system requires components are tested to even higher pressures. Plus an added bonus - convenience for the user of having the most relevant standards under one generic number."

These documents are related, and share a numbering system as follows:

ISO 19880-1: *Gaseous hydrogen fueling stations - General requirements*, recommends the minimum design characteristics for safety, and where appropriate, for performance of public and non-public fuelling stations that dispense gaseous hydrogen to light duty land vehicles (e.g. Fuel Cell Electric Vehicles). The document will first be issued as a Technical Report, facilitating field experience and feedback for the development of the International Standard. The early efforts address fueling mainly for light duty hydrogen land vehicles, but the later revisions will also encompass buses and fork-lift truck applications. The Technical Report will summarize existing knowledge and experience accumulated globally with hydrogen fueling, and includes separation distance considerations and approaches as well as fueling protocol options. The Technical Report will lay the foundation for the future international standard (see below) that will replace ISO/TS 20100:2008. Working Group 24 is responsible for this work product.

ISO 19880-2: *Gaseous hydrogen - Fueling stations - Dispensers*, provides the requirements and test methods on the safety of complete hydrogen dispensers with the normal working pressure of 35 MPa and/or 70 MPa for gaseous hydrogen fueling stations. Working Group 19 is responsible for this work product.

ISO 19880-3: *Gaseous hydrogen - Fueling stations - Valves*, provides the requirements and test methods of the safety performance of high pressure gas valves (1 MPa and over) for gaseous hydrogen fueling stations. Working Group 20 is responsible for this work product.

ISO 19880-4: *Gaseous hydrogen - Fueling stations - Compressors*, contains safety requirements for material, design, manufacture and testing of gaseous hydrogen compressor packages used in fueling station service. Working Group 21 is responsible for this work product.

ISO 19880-5: *Gaseous hydrogen - Fueling stations - Hoses*, covers requirements for gaseous hydrogen hose and hose assemblies which are used for connecting the dispenser to the fueling nozzle; used as vent lines which carry gas to a safe location; and flexible hoses for use in other locations where flexibility is necessary. Working Group 22 is responsible for this work product.

ISO 19880-6: *Gaseous hydrogen - Fueling stations - Fittings*, specifies uniform methods for testing and evaluating the performance of fittings, including connectors and stud ends for ports, used with compressed hydrogen gas in hydrogen fueling station applications. Working Group 23 is responsible for this work product.

ISO 19880-7: Gaseous hydrogen - Fueling stations - Fueling protocols (Proposed TBD)

ISO 19880-8: Gaseous hydrogen - Fueling stations - Hydrogen quality control (Proposed TBD)

When asked what the most significant challenges are in creating a family of documents to support gaseous hydrogen refueling, Dr. Tchouvelev responded that "the documents in this family require close coordination. This includes clear handoffs between one document and the next. For example, use of consistent terminology and an understanding of set point pressures use for components and systems is necessary to ensure the documents present clear requirements and assumptions are understood."

"There is a time-critical need by governments and industry for these documents. The European Union Alternative Fuel Infrastructure (AFI) Directive that is coming into effect in November 2017 directly references ISO standards. Working Group (WG) 24, responsible for the development of ISO 19880-1: *Gaseous hydrogen -- Fueling stations - General requirements*, is working aggressively to ensure this document is available for adoption in the European Union via CEN process under the Vienna Agreement in time to meet the timeline of AFI Directive implementation. WG 24 is convened jointly by Guy Dang-Nhu of France and Jesse Schneider of the U.S. This document is on track to finish the draft Technical Report in July for vote by the Technical Committee from August to the end of September. December 2016 is the target date for publication of the International Standard."

It typically takes 3-5 years to produce an International Standard. I asked Dr. Tchouvelev how WG 24s aggressive schedule is being accommodated. "Five in-person meetings are being held in 2015 to complete the Technical Report and start the draft international standard (DIS), Dr. Tchouvelev noted. Even with the intense meeting plan, the schedule to meet the EU requirements for AFI Directive implementation in 2017 is very challenging, and three subteams (station acceptance criteria, hydrogen quality, and safety distances) have been formed to handle these subjects in parallel."

"There is already close coordination between ISO/TC 197 and CEN at program level who has the mandate over AFI Directive implementation, and CEN/TC 268/WG5 that acts as ISO/TC 197/WG24 mirror committee and will have a parallel vote on behalf of CEN for the WG24 DIS."

There is a clear, time-critical need for the ISO 19880-1 document in Europe. I asked Dr. Tchouvelev whether there is evidence of further international relevancy. He described the following examples:

"In the USA, H2FIRST (see <http://energy.gov/eere/fuelcells/h2first>) is tackling technical work in support of H2USA to fill the most critical gaps and needs for achieving a better-performing, less-expensive hydrogen fueling infrastructure in the USA. One current task in particular, Hydrogen Station Equipment Performance-HyStEP; provides a feedback mechanism with the developing standards to identify data needs for the research to address. The HyStEP work is currently engaged with WG 24 which is responsible for field testing of a complete station as part of General requirements."

"19880-8 (reserved for a future WG to develop Hydrogen quality control requirements as per recently submitted NWIP by Japan) will engage with H2FIRST on their Hydrogen Containment Detector task. Many of the component standards in the 19880 family address components, which feed back into the H2FIRST Reference Station Design work."

"There are similar activities in Japan. The Research Association of Hydrogen Supply /Utilization Technology - HySUT is an association founded in July 2009 aiming to establish hydrogen supply infrastructure and to improve hydrogen business environment. Research there is benefiting the development of requirements, and needs identified in the development of the standards feeds into research activities."

"The 19880 family of documents for hydrogen refueling stations have clear global relevance with significant urgency."