Bethesda January 28-29, 2014

IEA Hydrogen Roadmap North America Workshop

Topic: Hydrogen Safety and RCS SoA, Expectations and Requirements Andrei V. Tchouvelev **Evidence-based and Risk-informed RCS**

SoA: Evidence-based and risk-informed RCS for commercial deployment of HFC technologies!

□Since 2003 applied significant joint effort via IEA HIA Task 19/31, H₂CAN and HySafe to:

- ✓ Close most knowledge gaps on hydrogen behaviour:
 - Unintended releases, physical effects, materials compatibility, flammability, hazard analysis, QRA.

Developed first science-based and risk-informed H₂ national codes for pre-commercial deployment:

- ✓ USA NFPA 55 (2008) → NFPA 2
- ✓ Canada CHIC (2007) \rightarrow 2nd edition in 2014

□Laid solid foundation for world-wide development of evidence-based (science and best practices) and riskinformed RCS for commercial applications NOW!

H₂ Safety and RCS Web NA Viewpoint



Pathway to Harmonization (1) Old Paradigm: *Think globally, act locally*

Implications for <u>local / regional</u> jurisdictions:

 Referencing international standards (ISO and IEC) for installation / model codes:



- Example: Canadian Hydrogen Installation Code (CHIC) references ISO standards for electrolysis, reformers, storage, and other components, and IEC standard for classification of hazardous areas (ISO/TC 197, TC58, IEC/TC 31, TC 105)
- Affected standards: NFPA 2 and relevant NFPA and ICC fire and other codes & standards
- Developing certification programs for "listed components" to international component standards (ISO and IEC)
 - Wishful thinking: UL, CSA Group and BNQ establish a joint trans-NA certification program

Pathway to Harmonization (2)

<u>New Paradigm: Replace H₂-focused tunnel</u> <u>vision with broad area coverage (all-of-the-</u> <u>above approach)</u>

Implications for H_2 safety and RCS in general:

- Pay more attention to overlap / blending of hydrogen with other energy options, carriers, fuels:
 - Expand hydrogen C&S to include co-location with other fuels dispensing – green field H₂ fueling cannot be sustainable long term.
 - Develop proper requirements for HCNG blends there are still safety and knowledge gaps
 - Expand hydrogen C&S to adequately address promising niche market applications like materials handling, mining, power-to-gas, energy storage, smart grids