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IEA Hydrogen Roadmap
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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, H$_2$CAN 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 H$_2$ national codes for pre-commercial deployment:
  - USA – NFPA 55 (2008) $\rightarrow$ NFPA 2
  - Canada – CHIC (2007) $\rightarrow$ 2$^{nd}$ edition in 2014
- Laid solid foundation for world-wide development of evidence-based (science and best practices) and risk-informed RCS for commercial applications NOW!
H₂ Safety and RCS Web NA Viewpoint

Next 3-5 years is the most critical time for RCS development and closing remaining safety knowledge gaps!
Pathway to Harmonization (1)

Old Paradigm: *Think globally, act locally*

- **Implications for local / regional 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
New Paradigm: **Replace $H_2$-focused tunnel vision with broad area coverage (all-of-the-above approach)**

- **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 $H_2$ 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