# Key Learnings from Sandia Workshop

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# **Key Learnings from Sandia Workshops**

- Early Market Fuel Cell Technologies Codes and Standards Workshop
- DOE Vehicular Tank Workshop
- April 28-29 at Sandia National Laboratories in Livermore, CA



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## Sandia Workshop Learnings

Application of hydrogen fuel cells in powered industrial trucks is emerging quickly and is poised to become a large volume commercial product.

Some codes and standards are currently in place (i.e., UL 2267

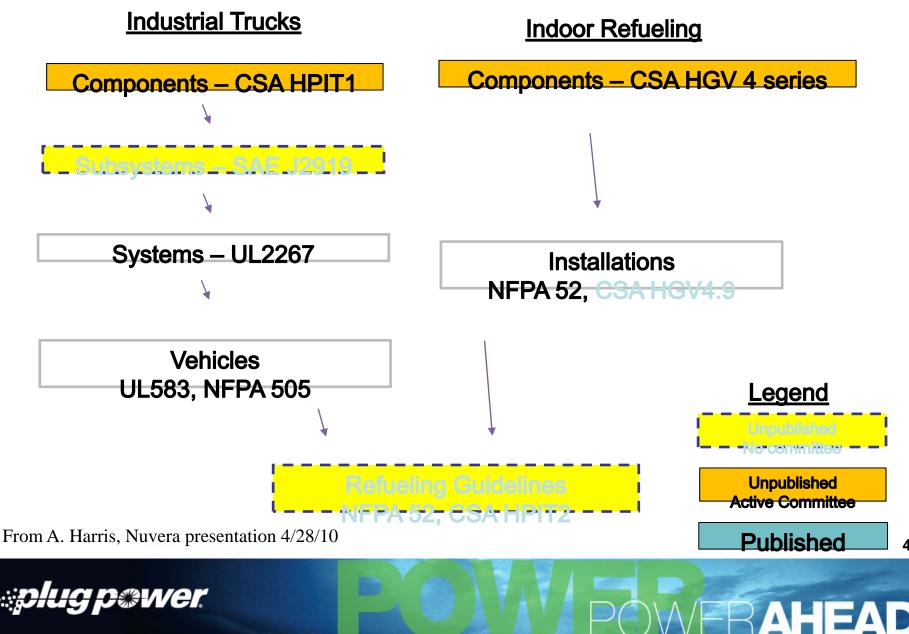
- Fuel cell in Powered Industrial Trucks).
  - Existing codes require updating for new learning in this emerging market.
- Currently drawing upon requirements for similar, but different applications (on-road vehicles, fueling stations for on-road vehicles, stationary and on-road vehicle storage).
  - Additional codes and standards are required to complete the regulatory framework to support the deployment of these products.
- Much productive work has occurred over the last year.
- DOE plays a valuable role in enabling the development of defensible and traceable of science/technical based requirements as a basis for codes standards.



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#### **Document Reference Paths**



# **Support for Ongoing Activities**

- Fuel tank requirements in product level standard (UL 2267)
- Address integration of fuel cell with truck (UL 2267 / UL 583)
- Develop detailed component requirements for fuel tanks in powered industrial trucks (HPIT1)
  - DOE providing scientific understanding of the affect of hydrogen on steel tanks at the fueling frequency in this new application
  - Issue component and dispenser TIRs
    - Review, revise and release as ANSI standards
      - Validation of test requirements funded by NREL
- Continued support needed for coordination effort
  - USFCC Forklift Task Group



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### **Follow on work**

- Follow-on work for steel tanks
  - Statistical understanding of of flaws in tanks
  - Refinement of NDE test methods (detect smaller flaws, increase speed / decrease cost)
  - · Characterization of materials
- Indoor hydrogen refueling
  - Dispenser designs sited today based conservative safety assessments
  - Codes and standards needed to create regulatory framework to expedite installation
    - Recommend a risk informed approach to requirements development Understand frequency, severity and likelihood of realistic releases
    - Need both scientists and codes and standards writers
    - Further develop requirement for indoor fueling in NFPA 52
    - Harmonization of NFPA 52 with IFC requirements
    - HPIT2 New standard under development
    - Need to understanding roles and scopes of different codes & standards to coordinate efforts / placement of requirements

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- Other
  - NFPA 505 2010 Beginning new revision cycle
  - End-of life / Aftermarket





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