Advancing the Hydrogen Safety Knowledge Base

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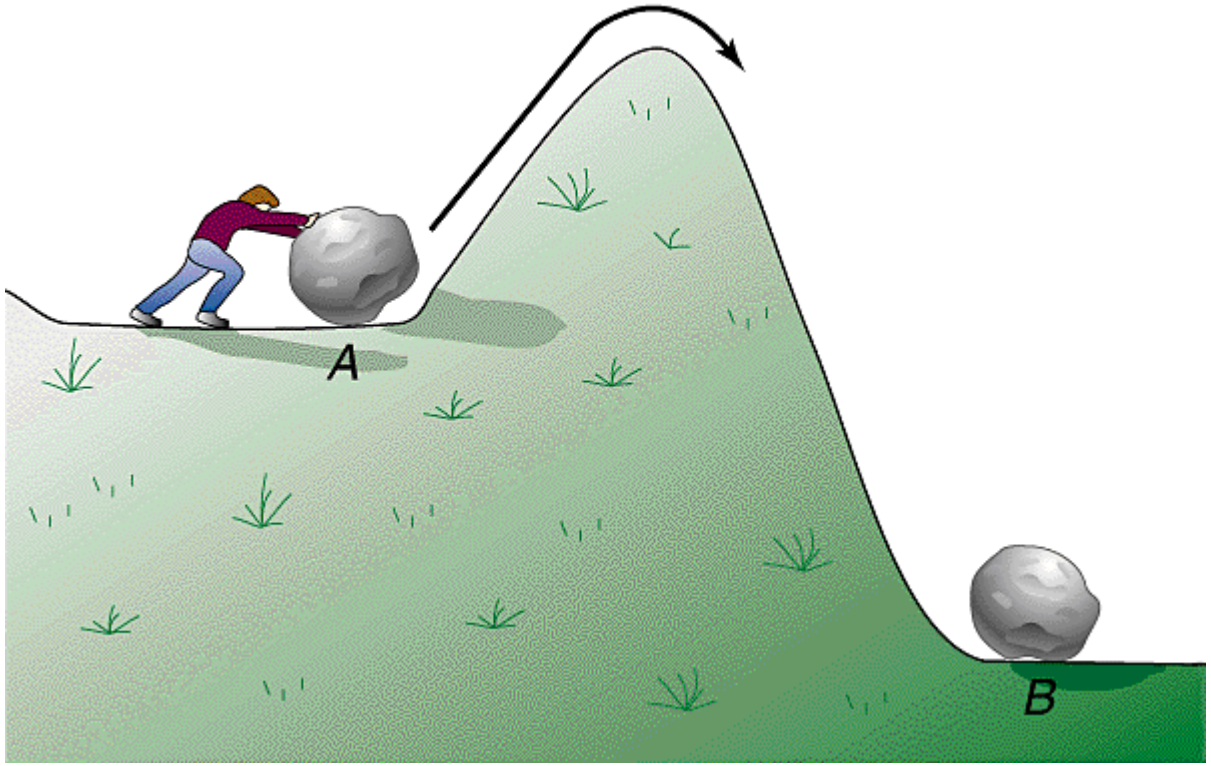
International Conference on Hydrogen Safety
Brussels, Belgium
September 9, 2013

PNNL-SA-97886

Hydrogen Safety, A Collaboration of Many….

The Activation Energy for International Collaboration



Safety Knowledge Tools Enhanced by International Collaboration[1]

- **Hydrogen Safety Best Practices (H2bestpractices.org)**
  - Subject matter experts played a significant role in design, review and resolution of technical content (2006-2007)
  - Collaborated with Task 22 to develop “Metal Hydride Storage and Handling” (2008)
- **Hydrogen Incident Reporting and Lessons Learned (H2incidents.org)**
  - Task 19 member countries submit safety event records to emphasize lessons learned (2009)
- **Hydrogen Safety Bibliographic Database**
  - Collaborated with HySafe and Task 19 Subtask B (Experimental and Testing Program) to ensure hydrogen safety information and references are current in each database (2008)
- **Permitting Hydrogen Facilities – Hazard and Risk Analysis**
  - Review and input on the FMEA demonstration tool
  - Ranking of each failure mode for its contribution to risk

[1]Weiner, S.C. and Blake, C.W., “Safety Knowledge Tools Enhanced by International Collaboration,” A White Paper of the International Energy Agency Hydrogen Implementing Agreement Task 19 – Hydrogen Safety,” October 18, 2010.

Focusing on Hydrogen Safety

Task 31 (2010 – 2013)
Subtask A – Physical Effects and Knowledge Gaps
Subtask B – Storage Systems and Materials Compatibility
Subtask C – Early Markets: Risk Characteristics and Hazard Analysis
Subtask D – Knowledge Analysis, Dissemination and Use

Task 19 (2004 – 2010)
Subtask A – Risk Management
Subtask B – Testing and Experimental Program
Subtask C – Targeted Information Packages for Stakeholder Groups

Advancing the Hydrogen Safety Knowledge Base

- **Developing uniform risk and harm criteria**
- **Expanding safety knowledge tools and resources**
- **Hydrogen sensor technologies – benefitting from collaboration**
- **Developing knowledge to improve guidelines on the indoor use of hydrogen**
- **What is the appropriate lean limit?**
- **A library of hazard assessment tools**

Developing Uniform Risk and Harm Criteria

- The development of evidence-based and risk-informed regulations, codes and standards has been an important focus area for both Tasks 19 and 31.
- A Task 19 report on knowledge gaps noted that establishment of harm and risk criteria are a key element required to utilize a risk-informed approach for developing hydrogen RC&S for hydrogen facility operation.
- Through journal publications and conference presentations, the results of this work have been disseminated as another resource for consideration and use by codes and standards groups and other decision makers.

Expanding Safety Knowledge Tools and Resources

- **Collaborated with Task members to add safety event records to "H2incidents.org"**

Canada	Switzerland	The Netherlands
Italy	France	Germany
U.K.	Norway	European Commission
Japan		

- **Utilized this network and partnered with IA HySafe's Hydrogen Incident and Accident Database (HIAD) through the EC's Joint Research Centre, e.g.,**
  - Share the podium at International Conference on Hydrogen Safety (ICHS4) during the topical session on safety event databases
  - Provide on-line demonstrations of the databases for ICHS attendees
  - Exchange safety event records for the respective databases

Hydrogen Sensor Technologies Benefitting from Collaboration

- **Sensors as key devices for detection and mitigative actions, e.g.,**
  - sounding audible alarms, activating ventilation systems, initiating shutdown of hydrogen systems.
- **Information exchange and knowledge dissemination facilitate the focused development, proper selection and correct deployment of hydrogen safety sensors.**

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Université du Québec à Trois-Rivières

H2Can

European Commission

NREL
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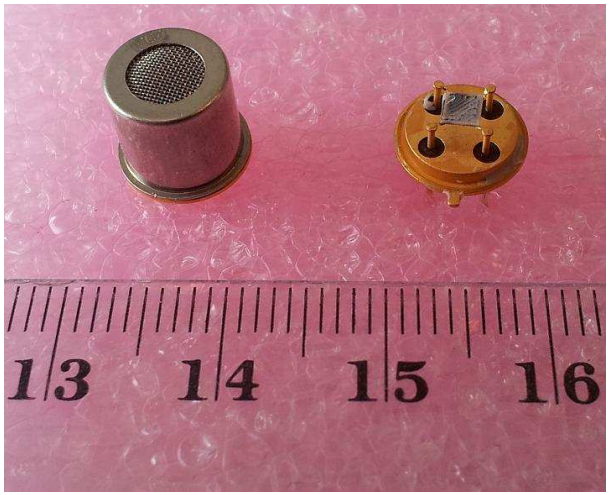
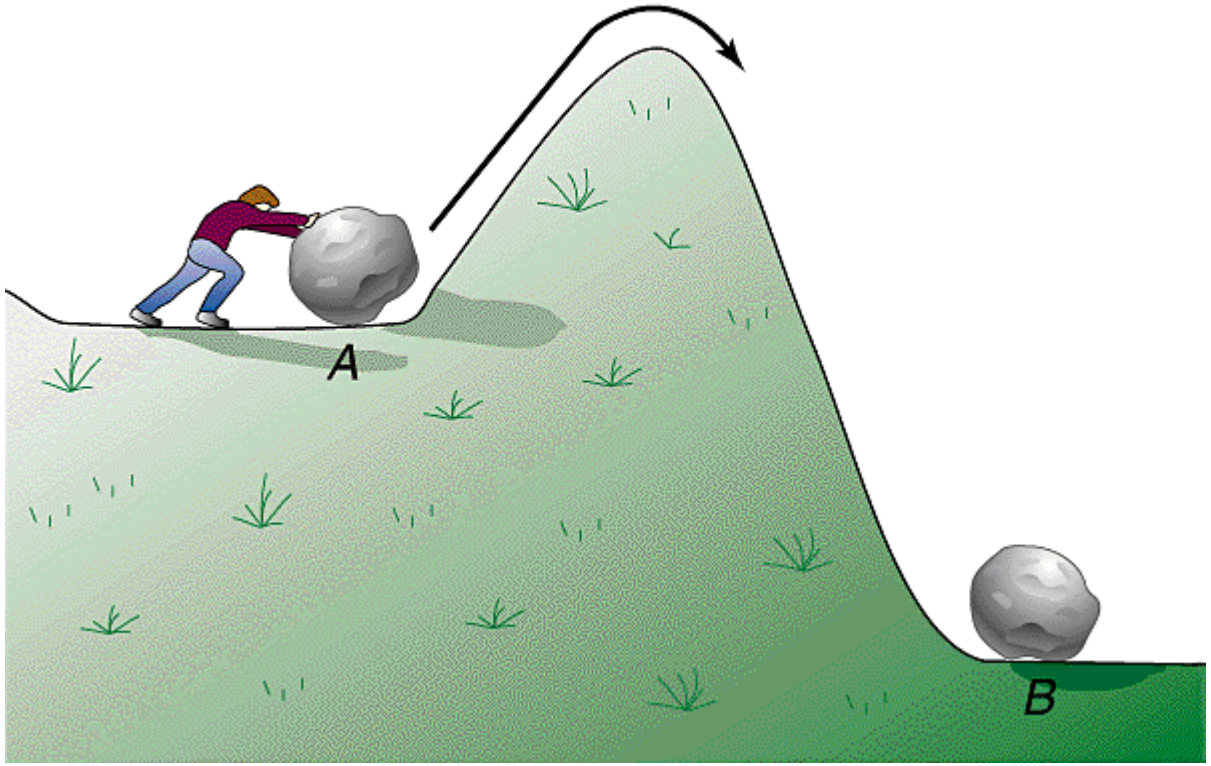


Concluding Thoughts



Acknowledging….

- **U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy**
  - Fuel Cell Technologies Office (Sunita Satyapal, Director)
- **Contributing authors**
  - Andrei Tchouvelev
  - Jeff LaChance
  - William Buttner
  - Lois Brett
  - Sidonie Ruban
  - Jay Keller
- **Task 19/31 member countries and their participating experts**
- **You, the audience and the ICHS**