

NHA Hydrogen Conference and Expo 2010

**Long Beach, California, USA
3-6 May 2010**

Volume 1 of 2

ISBN: 978-1-61738-828-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2010) by the National Hydrogen Association
All rights reserved.

Printed by Curran Associates, Inc. (2010)

For permission requests, please contact the National Hydrogen Association
at the address below.

National Hydrogen Association
1211 Connecticut Avenue NW, Suite 600
Washington, DC 20036-2701

Phone: (202) 223-5547
Fax: (202) 223-5537

info@HydrogenAssociation.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Volume 1

HYDROGEN BUSINESS SOLUTIONS FORUM

Hydrogen “101”: Hydrogen Fuel Cell Power for the Material Handling (Lift Truck) Industry	1
<i>Tom Dever</i>	
Fuel Cells for Portable Power in Military Applications	9
<i>Marnie E. De Jong</i>	
Hydrogen Business Solutions Forum	28
<i>Reuben Sendejas</i>	
Fuel Cell Solution for the FAA	36
<i>David Powers</i>	
Break-Out Session: Hydrogen Fuel Cell Power for the Material Handling (Lift Truck) Industry	49
<i>Tom Dever</i>	
U.S. Army ERDC-CERL Overview	73
<i>Nicholas M. Josefik</i>	

POSTER PRESENTATIONS

A Compact Hydrogen Production Module with Membrane on Catalyst.....	87
<i>T. Iseki, T. Nishii, Y. Shirasaki, Y. Nakagawa, I. Yasuda, M. Ito, Y. Takagi, H. Shigaki, H. Hikosaka, H. Tanaka, K. Mitsuya</i>	
Simulation of Releases from Hydrogen Fuel-Cell Vehicles in Tunnels	97
<i>W. Houf, Greg H. Evans, Erik Merilo, Mark Groethe, Scott C. James</i>	
Hydrogen and Fuel Cells Vehicles in the Post Kyoto Perspective.....	105
<i>Mario Valentino Romeri</i>	
Education and Outreach for Future Fuels – Tapping Into Cool and Addressing Resistance the Advanced Electric Drive Vehicle Education Program - A Program of West Virginia University.....	122
<i>A. Ebron, J. Ranta</i>	
Development and Demonstration of a High Efficiency 10kWe Stationary PEMFC System	127
<i>L. Wang, Z. Qi, C. Moorefield, R. Howell, D. Aagesen, M. Bignell, C. Jackson, K. Durai-Swamy</i>	
Hydrogen Technology Research at the Savannah River National Laboratory	133
<i>E. T. Danko</i>	

KEYNOTE SESSION 1

Welcome Address	148
<i>Michael McGowan</i>	
Report on State of Hydrogen Energy Industry	156
<i>Jeff Serfass</i>	
SunHydro: Solar Powered Hydrogen Fueling Stations	170
<i>Tom Sullivan</i>	
2010 Hydrogen Student Design Contest: Designing a Hydrogen Community.....	187
<i>Yaqin Lin, Amber Gomaz, Vijay Mohan, James Haworth, Aanchal Shah, Matthew Rankins, Mathew Thomas, Stephen Schrock, John Sheffield, Stuart Baur, Scott Grasman, Heath Pickerill</i>	
New Stations in Development	219
<i>Catherine Dunwoody</i>	

SAFETY CODES AND STANDARDS

Safety Considerations in Designing a Facility for Mechanical Property Measurements in High Pressure Gaseous Hydrogen Environments	229
<i>Y. S. Levy, N. E. Nanninga, A. J. Slifka, T. A. Siewert, J. D. McColskey, J. R. Fekete</i>	
A Numerical / Analytical Model of Hydrogen Release and Mixing in Partially Confined Spaces	253
<i>Kuldeep Prasad, William Pitts, Jiann Yang</i>	

How Fast Are Hydrogen Sensors and How Best to Measure This?	270
<i>L. Boon-Brett, G. Black, P. Moretto, N. Frischauft, J. Bousek</i>	
Risk Associated with the Use of Barriers in Hydrogen Refueling Stations	290
<i>J. Lachance, J. Phillips, W. Houf</i>	

EDUCATION & OUTREACH

Hydrogen Technology and Energy Curriculum (HyTEC) for High School Science	300
<i>Barbara Nagle</i>	
A New Perspective on Public Acceptance of Hydrogen: Which Hydrogen Future May Citizens Accept?	323
<i>Olga Di Ruggero, Alexander De Haan</i>	

INTERNATIONAL PROGRAMS

Towards Increased Integration of Leading Technical Solutions for Hydrogen Mobility: A New Concept & Case-Study in Berlin	342
<i>C. Retzke, H. Langas</i>	
IEA HIA Production and Other Activities: Current and Prospective	359
<i>Jan Jensen, Steven Pearce, Mary-Rose De Valladares</i>	
H₂ Infrastructure in Brazil	395
<i>Ana Carolina C. Murphy</i>	
HyNor - The Norwegian Hydrogen Highway	411
<i>Bjørn Simonsen</i>	

STORAGE: CHEMICAL & METAL HYDRIDES

N-Hydrogen₃ – Safe, Affordable, Efficient Hydrogen Now	427
<i>N. Olson, J. Holbrook</i>	

KEYNOTE SESSION 2

Hydrogen, Energy Storage & Leadership	478
<i>Daryl Wilson</i>	
Electric Energy Requirement for Hydrogen Fuel Production and/or Recharging Electric Battery Vehicle Fleets in New Zealand and the United States	499
<i>Paul Kruger, Jonathan Leaver</i>	
Canada's Hydrogen Highway and the 2010 Olympic Games	534
<i>Ron Harmer</i>	
National Innovation Programme & National Organization Hydrogen and Fuel Cell Technology: Transportation Infrastructure Initiatives	559
<i>Klaus Bonhoff</i>	
Sustainable Mobility through the Electrification of the Automobile	585
<i>Arwed Niestroj</i>	

FUEL CELL R&D RESULTS

Solid Oxide Fuel Cell Based on Proton-Conducting Ceramic Electrolyte	600
<i>U. (Balu) Balachandran, T. H. Lee, S. E. Dorris</i>	
Surface and Electrochemical Properties of Pt-Au/C Cathode Catalysts for Oxygen Reduction Reaction: The Promotion Effect of Ce Addition and Post Heat Treatment	616
<i>Chen-Wei Liu, Yu-Chen Wei, Kuan-Wen Wang</i>	
Development of Surface and Structure Controllable Cathode PdCo/C Catalysts for the Oxygen Reduction Reaction	640
<i>Yu-Chen Wei, Chen-Wei Liu, Kuan-Wen Wang</i>	
Fabrication of Dual Layer Ni/Ni-YSZ Hollow Fibers for Anode Support via Phase Inversion and Sintering Method	668
<i>Krzysztof Kanawka, Nicolas Droushiotis, Zhentao Wu, Geoff H. Kelsall, Kang Li</i>	

INFRASTRUCTURE ANALYSIS

Optimizing Hydrogen Pipeline Deployment in Real Geographic Regions	687
<i>Nils Johnson, Joan Ogden, Yueyue Fan</i>	
Optimal Regional Layout of Least-Cost Hydrogen Infrastructure	713
<i>B. Bush, O. Sozinova, M. Melaina</i>	
Technical and Economical Study About the Interest in Using PEMFC Systems to Feed Stand Alone Railway Equipments.....	749
<i>Eric Pinton, Laurent Antoni, Marc Antoni</i>	

MILITARY APPLICATIONS

High Differential Pressure PEM-Based Hydrogen Generation for Backup Power and Home Fueling	761
<i>E. Anderson, S. Szymanski, L. Dalton</i>	
Solar-Based Refueling Station for Unmanned Air Vehicles	784
<i>N. Lapeña-Rey, E. Troncoso, A. Criado</i>	
Powering Forward with Hydrogen Fuel Cells at the Defense Logistics Agency.....	800
<i>Leo Plonsky, Stuart Funk, Tom Joseph</i>	

Volume 2

PRODUCTION: ELECTROLYSIS R&D RESULTS

Results from the First Field Test of a Microbial Electrolysis Cell for Renewable Hydrogen Production.....	819
<i>Bruce E. Logan, Roland Cusick, Matthew D. Merrill, Bill Bryan, Denny Parker</i>	
The Potential of Using a-SiC:H as the Photoelectrode for Water Splitting	867
<i>Feng Zhu, Jian Hu, Ilvydas Matulionis, Todd Deutsch, Nicolas Gaillard, Eric Miller, Arun Madan, Josh Gallon</i>	
Research Advances Towards Low Cost, High Efficiency PEM Electrolysis.....	892
<i>Katherine Ayers</i>	
Comparative Performance of Electrolysis Cell Stacks at the Humboldt State University Hydrogen Fueling Station	918
<i>M. Harper, P. Lehman, G. Chapman, C. Capuano</i>	
High Temperature Electrolysis Dividends to the Pre-Consumer Hydrogen Economy.....	959
<i>J. Hartvigsen, S. Elangovan, L. Frost, C. Stoots, J. O'Brien, J. S. Herring, M. Sohal, G. Hawkes</i>	

STORAGE: GENERAL

Cryo-Compressed H₂-Storage – A Promising Candidate to Supplement the Vehicle Storage Portfolio	997
<i>Klaas Kunze</i>	
Improving Hydrogen Tank Refueling Performance Through the Use of an Advanced Fueling Algorithm – The MC Method	1026
<i>R. Harty, S. Mathison, N. Gupta</i>	

KEYNOTE SESSION 3

Hydrogen Infrastructure: NHA Keynote Session	1116
<i>Markus Bachmeier</i>	
HONDA	1128
<i>Stephen Ellis</i>	

DELIVERY AND REFUELING

Efficient Hydrogen Refueling Station Design	1137
<i>Alistair Wardrop</i>	
Feasibility Investigation of Hydrogen Vehicle Authorization System for Hydrogen Fueling	1159
<i>Jacquelyn Button</i>	

Combined Vehicle Fueling and Back-Up Power Applications	1169
<i>Martin A. Shimko</i>	
Integrating Hydrogen Fueling Station Into an Existing Fueling Station	1179
<i>Mathew Thomas</i>	

INFRASTRUCTURE DESIGN

Best Practice for Technology Qualification - From Business Idea to Commercial Product.....	1188
<i>Gerd Petra Haugom, Espen Cramer</i>	
East Tennessee Hydrogen Infrastructure	1205
<i>J. Ronald Bailey, S. Cliff Ricketts, Wayne T. Davis</i>	
Home Scale Solar-Powered Hydrogen Refueling System.....	1238
<i>I. Yamashita, S. Mathison, D. Cum, M. Okabe</i>	

INVESTING IN HYDROGEN AND FUEL CELL TECHNOLOGY

Are Plug-in/Battery Electric Vehicles More Market Ready Than Hydrogen Fuel Cell Vehicles?.....	1249
<i>Sigmund Gronich</i>	
Hydrogen Fuel Cell Vehicle and Station Deployment Plan: A Strategy for Meeting the Challenge	
Ahead: Progress and Next Steps.....	1280
<i>Jordan McRobie</i>	
Alternative Transportation Technologies: Hydrogen, Biofuels, Advanced Efficiency and Plug-in	
Hybrid Electric Vehicles	1310
<i>Alan T. Crane, Joan Ogden</i>	
Investing in Hydrogen and Fuel Cell Technology: Financing the Hydrogen Economy and Fuel Cell	
Industry	1328
<i>Irvin Barash</i>	
Hydrogen Refueling Cost Reduction to Enable Commercialisation.....	1357
<i>N. Gupta, Jurgen Louis, Brad Smith</i>	

PRODUCTION: BIOMASS

On-Site Hydrogen Production From High-Pressure Liquids	1375
<i>Ben Oster</i>	
Low Temperature Hydrogen Production from Biomass Reformation	1407
<i>William Mays</i>	
Hydrogen from Steam/CO₂ Reforming of Waste --- Renewable Biogas for Fuel Cells and Making	
Green Hydrogen	1434
<i>Richard M. Noling, David March, Terry R. Galloway, Joe Waidl</i>	
Photobiological H₂ Production by Korean N₂-Fixing Unicellular Cyanobacterial Strains.....	1469
<i>Jong-Woo Park, Wonho Yih</i>	

TRANSPORTATION

Demonstration of a Hydrogen Fuel-Cell Locomotive	1496
<i>A. R. Miller, K. S. Hess, T. L. Erickson, J. L. Dippo</i>	
Exceeding Expectations: Learnings from the FCV Learning Demo	1523
<i>Keith Wipke, Sam Sprik, Jennifer Kurtz, Todd Ramsden</i>	
AQMD's Five Cities Program: Demonstrating Hydrogen Vehicles and Infrastructure	1545
<i>Patricia Kwon</i>	
National Alternative Fuels Training Consortium	1564
<i>A. Ebron</i>	

CODES & STANDARDS WORKSHOP: INTERNATIONAL STANDARDS PROGRESS AND OPPORTUNITIES

The Hydrogen Fuel Quality Issue: The Vision of a Fuel Supplier	1594
<i>Françoise Barbier, Martine Carré</i>	

Pressure Relief Devices: Calculation of Flammable Envelope and Flame Length	1620
<i>Vladimir Molkov</i>	
Round Robin Testing of Commercial Hydrogen Sensor Performance—Observations and Results	1644
<i>W. Buttner, R. Burgess, C. Rivkin, M. Post, L. Boon-Brett, G. Black, F. Harskamp, P. Moretto</i>	
Author Index	