

National Hydrogen Association

20th NHA Annual Hydrogen
Conference
2008

March 30 – April 2, 2008
Sacramento, California, USA

Volume 1 of 5

Printed from e-media with permission by:

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

ISBN: 978-1-60560-384-1

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

Copyright (2008) by the National Hydrogen Association.

All rights reserved.

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

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

Phone: 1-202-223-5547

Fax: 1-202-223-5537

info@HydrogenAssociation.org

National Hydrogen Association
20th NHA Annual Hydrogen Conference 2008

TABLE OF CONTENTS

VOLUME 1

Codes and Standards for Hydrogen Fueled Vehicles	1
<i>C. Sloane</i>	
Recent Research and Development on Barrier Walls for Mitigation of Unintended Releases of Hydrogen	7
<i>W. Houf, R. Schefer, G. Evans, J. Keller, C. Moen</i>	
Comparison of Four Fuel Cell Battery Hybrid Powertrains in Bus Applications	44
<i>K. Harris</i>	
DOE Hydrogen from Coal Program Activities	62
<i>M. Ackiewicz</i>	
Performance Claims Define the Product Commercialization of a Pd Alloy Membrane for H₂ Production	77
<i>J. Acquaviva</i>	
70 MPa GH₂-Refuelling Station in Release A	94
<i>Robert Adler</i>	
Developing a Safety Sensor for Fuel Cell Vehicles	119
<i>T. Aiken</i>	
Hydrogen Fuel Cell Opportunities in California Airport Operations	151
<i>A. McKinley</i>	
Advances in Wireless Hydrogen Sensor Networks	169
<i>T. Anderson, H. Wang, B. Kang, F. Ren, C. Li, Z. Low, J. Lin, S. Pearton, A. Osinsky, A. Dabiran, P. Chow, C. Balaban, J. Painter</i>	
Air Force Energy Initiatives	188
<i>B. Anderson</i>	
Status of Hydrogen Separation Membrane Development	200
<i>U. Balachandran, T. H. Lee, L. Chen, S. E. Dorris</i>	
Vehicles and Infrastructure Keynote Panel	224
<i>N. Barber</i>	
Gaining Political Support and Advocacy Through Coordination and Collaboration	227
<i>S. Baxter-Clemmons</i>	
International Energy Agency Hydrogen Implementing Agreement	246
<i>N. Beck, Y. Sato, A. Garcia-Conde, M. De Valladares</i>	
Introduction of Fuel Cell Technology Into Developing Countries	268
<i>M. Binder</i>	
Hydrogen Quality NHA Conference 2008	307
<i>J. Birdsall</i>	

A Second-Generation, Magnesium Hydride Fueling System for Hydrogen Fuel Cell-Powered Cars and SUVs	323
<i>J. G. Blencoe, M. T. Naney</i>	
Making Hydrogen with Nuclear Energy for Liquid Fuels	349
<i>C. Bolthrunis</i>	
Fueling with Hydrogen: Moving from Research to Retail	375
<i>N. Bouwkamp</i>	
Meeting Challenges and Reaching Milestones: Producing Hydrogen ICEs for the Market Place	387
<i>H. Braess</i>	
GM's Perspective on Hydrogen	408
<i>L. D. Burns</i>	
Finalizing Hydrogen and Fuel Cell Standards through Data Projects: Hydrogen Vehicle Fueling	451
<i>J. Schneider</i>	
Federal Hydrogen Initiatives State and Regional Opportunities	470
<i>K. H. Carnes</i>	
Hydrogen & Syngas Program Overview	489
<i>D. Cicero</i>	
NHA Hydrogen from Coal Working Group Meeting	510
<i>C. Zygarlicke</i>	
Progress in the Commercialization of Hydrogen Storage Vessels	522
<i>Marie Duhart</i>	
Standards for Hydrogen Fueled Vehicles : Hydrogen Storage	531
<i>C. Sloane</i>	
Bring Honda Fuel Cell Vehicles from the Lab to Market	544
<i>T. Cunningham</i>	
Education in New York State: The New Hope Pilot tm Case Study in Teacher Training	558
<i>Mary-Rose De Valladares</i>	
Emergency Preparedness: The Hydrogen and Fuel Cell Advantage	584
<i>N/A</i>	
Market Transformation U.S. Department of Energy Hydrogen Program	599
<i>P. Devlin</i>	

VOLUME 2

Ramping up for Commercialization	621
<i>N/A</i>	
Technical and Economical Analysis of Hydrogen Refueling Stations	639
<i>A. Elgowainy, M. Mintz, J. Gillette, M. Paster, M. Hooks, B. Kelly</i>	
The Hydrogen Marathon	657
<i>S. Gelsi</i>	
Propelled by Microcel	678
<i>R. Eshraghi</i>	

Fuel Cell Bus Evaluation Results	696
<i>L. Eudy, K. Chandler</i>	
A Conceptual Process Design and H2A Cost Analysis for the Hybrid Cu-Cl	720
<i>M. Ferrandon, M. Lewis, D. Tatterson, R. V. Nankani, M. Kumar, L. E. Wedgewood, L. C. Nitsche</i>	
On the Road to Commercial	752
<i>Catherine Dunwoody</i>	
PEM Fuel Cell Optimal Humidification Relating to Operating Conditions	780
<i>F. Breque, J. Ramousse, K. Agbossou, Y. Dube, P. Adzakpa</i>	
Improved Plant Safety Through Low Hydrogen Inventory	799
<i>R. Friedland</i>	
Hydrogen from Steam/CO2 Reforming of Waste	817
<i>T. R. Galloway, F. H. Schwartz, J. Waidl</i>	
The Status of Vehicular Hydrogen Storage	873
<i>M. Gardiner, G. Ordaz, C. Read, G. Sandrock, N. Stetson, S. Satyapal</i>	
Hydrogen, Renewables and a Smartgrid-The HARP Project in British Columbia	903
<i>A. Grant, J. Wong</i>	
National Hydrogen Association	923
<i>B. K. Gross</i>	
The H2Seed Project: Early Commercialization of H2 Technologies for Remote Communities	943
<i>R. D. Maclver, D. Aklil, M. Monter, R. Goodhand</i>	
Renewable Electrolysis: Integration, Validation and Demonstration	972
<i>K. W. Harrison</i>	
Increasing the Range of a FCV Through an Advanced Fueling Algorithm	991
<i>J. Cohen, O. Brown, K. Takaku, S. Mathison, R. Harty</i>	
Health Effect of Air Pollution Hydrogen as a Solution	1009
<i>C. Verdugo-Peralta</i>	
High Temperature Electrolysis for the Production of Hydrogen and Liquid Fuels	1016
<i>S. Herring, J. O'Brien, C. Stoots, L. Moore-McAteer, G. Hawkes, K. Condie, M. McKellar, M. Sohal, E. Harvego, K. Dewall, D. Hall, J. J. Hartvigsen, D. Larson</i>	
Hydrogen Energy Market Engagement	1039
<i>D. Taylor</i>	
The Operation Result of the Demonstration of Fuel Cells and Energy Networks of Electricity, Heat, and Hydrogen at an Apartment Building	1058
<i>H. Aki, Y. Taniguchi, I. Tamura, A. Kegaga, Y. Ishikawa, S. Yamamoto</i>	
Hydrogen Infrastructure and Fuel Cell Vehicles, Are they Ready for the Future?	1080
<i>K. Hirose</i>	
Novel Carriers and Approaches for Hydrogen Delivery	1109
<i>M. Hooks</i>	
H2S Interactions with Palladium Alloy Membrane Surfaces	1130
<i>B. Howard, B. Morreale, J. Miller, C. O'Brien, D. Alfonso, M. Ciocco</i>	
H2 Airport Project	1154
<i>P. Gauthier</i>	
Hydrogen at Airports	1169
<i>R. Marmaro, J. Nadeau</i>	

Why Hydrogen and Fuel Cells are Needed for California Climate Policy	1188
<i>J. Cunningham, S. Gronich, M. Nicholas</i>	
A Blueprint for the Long-Term Deployment of Hydrogen Infrastructure in California	1201
<i>N. Johnson, C. Yang, J. Ogden</i>	
Progress and Challenges for TOYOTA'S Fuel Cell Vehicle Development	1221
<i>T. Kawai</i>	

VOLUME 3

Progress in the Commercialization of Virent's BioForming Process for the Production of Renewable Hydrogen	1245
<i>G. Keenan</i>	
The Greater Columbia Fuel Cell Challenge	1264
<i>R. Keller</i>	
The Hydrogen Airport-A National Initiative	1280
<i>R. Kenard</i>	
New York State's Hydrogen and Renewable Resource Initiatives	1293
<i>R. Kenard</i>	
Cost Efficient Off-Board Tank Storage for Compressed Hydrogen Gas	1314
<i>K. L. Klug</i>	
Renewable and Nuclear Energy as Appropriate Technology for Large-Scale Production of Hydrogen Fuel	1329
<i>P. Kruger</i>	
U.S. Department of Transportation Changes to Accommodate H2 as an Alternative Fuel in Commercial Vehicles	1355
<i>Q. Kwan, W. Chernicoff</i>	
Data for the Use in Quantitative Risk Analysis of Hydrogen Refueling Stations	1388
<i>J. Lachance, J. Brown, B. Middleton, D. Robinson</i>	
Process Heat Initiatives and a Focus on Hydrogen	1420
<i>R. Greyvenstein, E. Lahoda</i>	
Helping Teachers Introduce Hydrogen Education into Their Classrooms	1439
<i>K. Q. Larson</i>	
I-95 Hydrogen Corridor Hydrogen Delivery Tradeoff Study	1452
<i>P. L. Lemar, E. M. Schmura</i>	
Hydrogen Quality Sampling Apparatus, (HQSA) at 70MPa	1482
<i>T. Lindsay</i>	
Interactions Between Hydrogen Pathways and Electricity Supply	1507
<i>R. McCarthy, C. Yang, J. Ogden</i>	
Communication and Pre-Cooling Requirements for 70MPa Fueling of Hydrogen Vehicles	1541
<i>M. McDougall, L. Gambone</i>	
Utilizing Data Analysis to Facilitate Fuel Cell Vehicle Technology towards Commercialization	1566
<i>Tim McGuire</i>	

"Action-Alignment-Adaptability" Meeting Our Goals for Hydrogen	1581
<i>D. Macleod</i>	
Consumer Preferences for Refueling Availability: Results of a Household Survey	1597
<i>M. W. Melaina, C. Welch, E. Rambo, B. Baumgartner</i>	
Catalytic WGS Multi-Function Membrane Reactor	1615
<i>P. Bossard, J. Mettes</i>	
HDSAM 2.0: Expanded Capabilities, Enhanced Results in Hydrogen Delivery Modeling	1640
<i>M. Mintz, A. Elgowainy, J. Gillette, M. Paster, M. Ringer, D. Brown, M. Hooks, B. Kelly</i>	
HCNG Engine Powered Transit Buses Operating on Waste Hydrogen	1668
<i>N/A</i>	
Progress of Home Energy Station System	1689
<i>N/A</i>	
Hydrogen Technology and Energy Curriculum (HyTEC) for High School Science	1710
<i>B. Nagle, J. Zoellick, P. Lehman</i>	
Towards a Test Method for Hydrogen Sensor Performance	1734
<i>N. D. Marsh, T. G. Cleary</i>	
Vision for the Columbia Fuel Cell District	1749
<i>N. McLean</i>	
Jump Starting Hydrogen in the Transportation Industry	1761
<i>J. Boesel</i>	
Challenges in Generating Hydrogen by High Temperature Electrolysis using Solid Oxide Cells	1784
<i>M. S. Sohal, J. E. O'Brien, C. M. Stoots, M. G. McKellar, E. A. Harvego, J. S. Herring</i>	
Codes and Standards/Permitting Update for Hydrogen Fuel Stations	1821
<i>D. Farese</i>	

VOLUME 4

Collaboration, Government Initiatives and Market Traction in the Fuel Cell Industry	1861
<i>G. Conway</i>	
Hydrogen Infrastructure Modeling	1888
<i>K. Martin</i>	
4 Steps Towards Commercialization	1911
<i>P. Gauthier</i>	
Renewable Hydrogen Co-Production from a High Temperature Fuel Cell	1931
<i>F. Jahnke</i>	
NHA Treasurer's Report	1957
<i>Jay Laskin</i>	
Biographies and Platform Statements of NHA Directors and Candidates	1963
<i>N/A</i>	
World Energy Overview	2011
<i>N/A</i>	

The Importance of Interregional Refueling Availability to the Purchase Decision	2018
<i>M. Nicholas, J. Ogden</i>	
The "Hydrogen Story" Initiative	2043
<i>F. Novachek</i>	
National Hydrogen Association : Keynote Session 2: Early Markets	2052
<i>M. Oros</i>	
Hydrogen Production from the Next Generation Nuclear Plant	2068
<i>M. W. Patterson</i>	
The BMW Hydrogen 7 Clean Energy Program-Lessons Learned and Progress Toward Commercialization	2084
<i>W. Lehner, P. Klaus, F. Amaseder, T. Baloga</i>	
NHA Annual Hydrogen Conference 2008 with Hydrogen Expo US	2129
<i>P. Baxley</i>	
A Technology Roadmap for Australia's Hydrogen Delivery Infrastructure	2145
<i>A. Pigneri</i>	
DLA's Hydrogen and Fuel Cell Program	2194
<i>L. Plonsky</i>	
Annual Report 2008	2209
<i>N/A</i>	
Hydrogen and Renewable Energy-Need for Linked Strategies	2223
<i>V. Raman</i>	
Opportunities for Hydrogen-Based Energy Storage for Electric Utilities	2240
<i>T. Ramsden B. Kroposki, J. Levene</i>	
Progress in Development and Commercialization of Base-Facilitated Reforming Technology	2261
<i>B. Reichman, W. Mays, J. Strebe, M. Fetcenko</i>	
A Strategic Plan to Address Functional Energy Values and Economic Development for Hydrogen and Fuel Cell Technology	2300
<i>J. M. Rinebold</i>	
NFPA 2 NFPA's Comprehensive Hydrogen Technologies Code	2338
<i>C. H. Rivkin</i>	
Small Scale Renewable Energy Power System with Hydrogen Combustion	2357
<i>C. Robbins, R. Purcell, L. Sheetz, R. Jacobson, A. Gertler</i>	
Direct Hydrogen Production from Biomass Gasifier Using H2 Selective Membrane	2379
<i>M. Roberts, R. Souleimanova, D. Fosnacht, D. Hendrickson</i>	
The Effects of the U.S. Energy Policy Act 2005 (EPACT05) Over the Risk- Financing Spectrum in the Fuel The Effects of the U.S. Energy Policy Act 2005 (EPACT05) Over the Risk-Financing Spectrum in the Fuel Cell Vehicle (FCV) Sector	2422
<i>M. V. Romeri</i>	
The Need for Hydrogen Specific Support	2440
<i>M. Ros, I. Bunzeck, H. Jeeninga</i>	
Demonstrating Production of Hydrogen using the Sulfur-Iodine Hydrogen Cycle	2471
<i>B. Buckingham</i>	

VOLUME 5

Hawaii Hydrogen Power Park Kahua Ranch	2489
<i>S. Busquet, M. Ewan, R. Rocheleau</i>	
Pennsylvania Indigenous Energy Hydrogen Delivery Tradeoff Study	2513
<i>Ellen M. Schmura, Sarah Largent, Paul L. Lemar</i>	
Transition to Hydrogen Supply	2538
<i>P. Gauthier, J. Birdsall, M. Mintz, K. Martin</i>	
High-Pressure Electrolysis Optimized for Supplying Premium Power from Wind and Photovoltaic Power Sources	2539
<i>S. Nagy</i>	
Designing for Safe Operations: Understanding the Hazards Posed By High-Pressure Leaks from Hydrogen Refueling Systems Part 2	2561
<i>L. Shirvill, M. Royle</i>	
Analytical Technique for Composite Storage Tank Design Factor Specification	2587
<i>V. M. Shkolnikov, K. L. Klug</i>	
Developing High-Performance Hydrogen Purification Membranes for High Temperature Operation Using Ternary Metal Films	2624
<i>L. Semidey-Flecha, C. Ling, S. Hao, K. Coulter, A. Gade, D. Way</i>	
Key Infrastructure Requirements in Early Hydrogen Markets	2644
<i>Greg Solomon</i>	
Large-Scale Co-Generation of Hydrogen and Electricity from Wind and Nuclear Sources	2664
<i>S. Suppiah, A. Miller, R. Duffey</i>	
High Efficiency Solar Production of Hydrogen from Water	2684
<i>R. Taylor, R. Davenport, A. T-Raissi</i>	
Session: Design Considerations for Real World Conditions	2703
<i>A. V. Tchouvelev, J. L. Lachance, A. Engebo</i>	
Comparison of Transportation Options in a Carbon-Constrained World: Hydrogen, Plug-in Hybrids and Biofuels	2727
<i>C. E. Thomas</i>	
Challenges in Fuel Efficiency and Emissions Measurements for Hydrogen Vehicles	2799
<i>T. Wallner, S. Gurski, H. Lohse-Busch, M. Duoba, W. Thiel</i>	
Impacts of Hydrogen Pathways Vs. Gasoline/Diesel Pathways on Urban Air Quality: A Sacramento Case Study	2822
<i>G. Wang, J. M. Ogden</i>	
GTI Advanced Energy Systems GTI's H2 Fueling Infrastructure Demonstrations	2848
<i>B. Weeks</i>	
Hydrogen Direct Injection Technology-Challenges and Opportunities	2873
<i>A. Welch, D. Mumford, S. Munshi, J. Holbery, B. Boyer</i>	
Numerical Study on Spontaneous Ignition of Direct Release of Pressurized Hydrogen into Air	2910
<i>J. X. Wen, B. P. Xu, S. Dembel, V. H. Y. Tam, S. J. Hawksworth</i>	
Californians and the Media	2934
<i>C. White</i>	

Finding the Value of Water in a Hydrogen Economy	2953
<i>R. G. White, N. Goldstein, S. Yeh</i>	
Comparison of Energy Consumption and Green-House-Gas Emissions of Different Mobility Scenarios with Optiresource.....	2968
<i>J. Wind, P. Froeschle</i>	
Fuel Cell Vehicle Learning Demonstration: Spring 2008 Results	2981
<i>K. Wipke, S. Sprik, J. Kurtz, J. Garbak</i>	
Hydrogen in the Economy-Near Term Markets.....	3007
<i>L. Wnuk</i>	
Zero-Emission Enabling-Technology Transit Users Group	3041
<i>L. Wnuk</i>	
Composite Pd and Pd/Alloy Porous Stainless Steel Membranes for Hydrogen Production, Process Intensification and CO2 Sequestration.....	3061
<i>Y. H. Ma, N. K. Kazantzis, M. E. Ayturk, N. Pomerantz, C. Huang-Chen</i>	
H2 Fuel 4U--Education the Future on the Promise of Hydrogen in South Carolina.....	3085
<i>C. R. York, E. M. Dickey</i>	
Author Index	