

N H A NEWS

Mapping the Path to a Hydrogen Future

2-6 March 1998 — A summary of a week of hydrogen events

Implementing a Global Energy Solution: 9th Annual U.S. Hydrogen Meeting

By Paula Eidson, National Hydrogen Association

Energy issues have received top billing in the international news and rank on the U.S. national agenda, especially during the deliberations of the Conference of Parties in Kyoto. Is it because the U.S. dependence on imported oil is projected to grow to 60% of U.S. demand by 2005 and remain vulnerable to oil shocks for at least the next 20 years? Is it because megacities in developing countries suffer from pollution levels well above World Health Organization guidelines, which will worsen if fossil fuels are used to meet their exploding energy demand? Or is it because of the international pressure to combat carbon dioxide emissions in industrial and developing countries? It is for *all* of these reasons that nations and their media are looking ahead to the transportation and power generation technologies of the future. These drivers were also the backdrop of the National Hydrogen Association's 9th Annual U.S. Hydrogen Meeting, *Implementing a Global Energy Solution*, held 3-5 March 1998, in Virginia (U.S.A.).

The conference revealed that hydrogen technology has been exhumed from basic laboratory research to enter near-term commercial markets, although longer-term technologies still require validation and research. With the presence of actual hardware and industry and government enthusiasm, the hydrogen community silently overcame its quixotic disposition of earlier meetings. Emergence of subsidiaries and merged companies, the universal desire for a healthy planet, and the growth in demand for energy in all nations, reveal that the season for clean, hydrogen energy technologies is upon us.



A Ford Ranger with an internal combustion engine was modified by Clean Air Now! to run on hydrogen. CAN is headquartered in Southern California (U.S.A.), where strict emissions regulations are being enforced, encouraging the further development of hydrogen-

fueled vehicles and infrastructure. Pictured (from left) are: James Provenzano (CAN), United States Senator Harry Reid (Nevada), Paul Hirsch (Madison Government Affairs), and Gregory Daines (U.S. Senate Appropriations Committee).

A strong industrial interest in hydrogen was evident at the meeting. Large investments and corporate partnerships attest to industry's commitment. Companies such as Ballard, Daimler-Benz, Ford Motor Company, General Motors, and other big businesses have invested millions of dollars to develop fuel cell vehicles. If these companies stand by their corporate projections, the U.S. alone may see hundreds of thousands of hydrogen-fueled cars on the roads by the middle of the next decade. And, in the power sector, large utilities in the U.S. are forming partnerships with manufacturers to develop small stationary fuel cell units for commercial and residential uses. Companies such as these instill confidence in a future of clean energy alternatives for transportation and power that, until now, few seriously considered.

A Consensus Emerges

Because of growing industry leadership and investment, the U.S. Department of Energy acknowledges we may quite possibly see in the next five years that:

- hydrogen filling stations will coproduce electricity;
- fuel cells will be powered by wind, solar, and hydropower;
- PEM fuel cells will be deployed in a growing number of applications;
- universal codes and standards will exist to ensure safe utilization of hydrogen.

These projections agree with the NHA's near-term objectives to deploy at least:

- 2,000 hydrogen vehicles by the year 2002;
- 50 MW of distributed, grid-connected hydrogen fuel cells and two remote renewable-power demonstrations by 2002; and
- 100 hydrogen-fueled buses by 2005.

The panelists of the "Implementing Hydrogen Solutions" discussion supported these goals with enthusiasm and frankness. Overall, the panelists—representing industry, government, and research—championed hydrogen's market attractiveness and were optimistic about its commercialization prospects, but encouraged the hydrogen industry to be even more aggressive in deploying technologies.

Addison Bain addresses students at the 9th Annual U.S. Hydrogen Meeting.

But this is not a purely American perspective, as was made clear in the International Roundtable discussion. This gathering of distinguished international delegates signified a common interest in promoting hydrogen and represented a bond among nations to eradicate climate change, decrease the economic dependence on oil, establish energy security, and utilize local energy resources. An event such as the International Roundtable sends a critical message to our governments to continue support of clean, hydrogen energy technologies for transportation and stationary power.

Structural, Institutional Hurdles

The hydrogen community responsively recognizes the structural and institutional barriers that need to be overcome before thousands of hydrogen-fueled vehicles hit the road and hydrogen generators occupy residential and commercial lots.

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As echoed by the conference speakers, the major stoplight remains the lack of a convenient fuel delivery and hydrogen supply infrastructure. “Bridge technologies” — modifying existing technologies to accommodate the use of hydrogen — will ease the introduction of hydrogen. For instance, existing refueling stations may be equipped with a partial oxidation reactor that can convert gasoline to a hydrogen-rich gas to power a fuel cell car. This concept will allow industry to take advantage of current refueling infrastructure as an approach to phase in a unique hydrogen infrastructure.

Also, the U.S. is spotted with the elements of a hydrogen infrastructure that could be expanded by linking areas of regional hydrogen production and use into clusters. For instance, by strategically placing refueling stations, “hydrogen clusters” may be connected by operating centrally fueled fleets, thereby creating a corridor of hydrogen activity. A combination of these approaches will ease into a more defined hydrogen infrastructure.

Test models of hydrogen-fueled vehicles occupy the roads today, and two examples were present at the meeting to display the exciting, approaching reality of hydrogen use and representing two market applications — personal transportation and fleets. A hydrogen-fueled bus that will be implemented in the Augusta



(Georgia, U.S.A.) Public Transit fleet this spring offered rides to attendees and local school children, the inheritors of the benefits of the technology. The bus drives and looks like a normal public transit bus, only it's quieter and emits only water vapor as the by-product. Pictured (from left) are: Jim Morrison (STC Augusta), Bill Summers (Westinghouse Savannah River Company), Dan Reicher (DOE), and Terry Montgomery (DOE).

Mass production and use of hydrogen energy technologies requires the need for uniform guidelines. The industry is working through the NHA with national and international standardization organizations to create codes and standards to ensure that hydrogen is handled safely. In addition to handling guidelines, hazards assessments and risk management must be in place to gain the confidence of the general public, investors, and insurers. The industry proposes adopting the HAZOP (hazards and operability) assessments used by the petroleum industry, which is also a primary consumer of hydrogen.

With these props in place, the U.S. can proceed to enter its role in a clean energy future.

A Technology Revolution

In his opening address at the conference, Dan Reicher, Assistant Secretary for Energy Efficiency and Renewable Energy at the U.S. Department of Energy (DOE), acknowledged that in today's highly competitive global market, the U.S. cannot afford to wait 30 to 50 years to develop and deploy hydrogen technologies.

And as Matthew Fairlie, Vice President of Canadian-based Stuart Energy Systems, reminded the audience, the concept of a gasoline-powered car was once controversial and troubling to grasp. From the archives of the U.S. legislature is a comment on its discovery:

Stores of gasoline in the hands of people interested primarily in profit would constitute a fire and explosive hazard of the first rank. The menace to our people [on] our streets and along our roads and poisoning the atmosphere would call for prompt legislative action even if the military and economic implications were not so overwhelming.... The cost of producing is far beyond the financial capacity of private industry.... In addition, the development of this new power may displace the use of horses, which would wreck our agriculture. (*Congressional Record*, 1875)

An era of horse-drawn carriages as the main form of transportation seems both ancient and alien in our time of technological sophistication. The hydrogen energy industry is confronted by skeptics because it can radically change the production and use of energy in much the same way Americans nervously witnessed the beginning of the transportation revolution in 1875. But, with the prognosis of altering climates, growing worldwide energy demand, economic dependence on a vulnerable supply of fossil fuels resting on our shoulders, our generation may embrace hydrogen energy sooner than we think. And at that time, too, the primary use of fossil fuels will seem primitive.

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[Home Page](#) • Return to [NHA News Index](#)