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16th Annual National Hydrogen Association Conference Hears New DoE Secretary Samuel Bodman, New CalEPA Secretary Alan Lloyd

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Flanked by fuel cell vehicles from GM, Ford and DaimlerChrysler, Energy Secretary Bodman addresses participants in the NHA's annual conference during a lunchtime ceremony outside the conference venue, the Marriott Wardman Park Hotel.

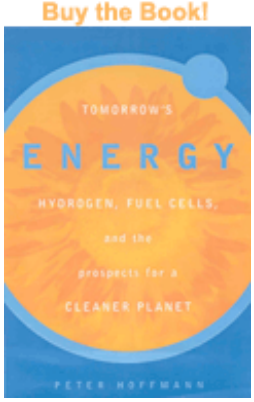
WASHINGTON, DC - The Capital's celebrated cherry blossoms weren't out yet, but despite large worries over ballooning oil prices there was an unmistakable sense of spring in the air at the National Hydrogen Association's 16th annual conference here March 29-April 1.

The atmosphere was festive outside the Marriott Wardman Park Hotel when a big crowd gathered outside at noon during the ceremonial signing of a "recognition of participation" document by new Energy Secretary Samuel Bodman and senior representatives from DaimlerChrysler, General Motors, Ford and ChevronTexaco, partners in the federal government's multi-year, multi-million dollar fuel cell and hydrogen demonstration program (*H&FCL May 04*).

"One year ago the Department of Energy announced winning proposals for the National Hydrogen Learning Demonstration," Bodman said in what appeared to be one of his first public speeches in his new role and first encounter with the hydrogen community. "Since then we have negotiated with each of the four teams of partners to work on projects that would assess the status of hydrogen infrastructure and fuel cell technology against time-phased, performance-based targets."

The four teams will eventually field 134 fuel cell vehicles and up to 28 hydrogen fueling stations, Bodman added. "If our research program is successful, it is not unreasonable to think we could see the beginning of mass market penetration by 2020."

The four-day event was noteworthy for what seemed like an unprecedented number of hydrogen-fueled vehicles both inside the 15,000 sq. ft. exhibition hall but also outside in the traditional "Ride & Drive" event. Some 20 vehicles were on hand, ranging from a tiny 1-cylinder



The Indian Bajaj three-wheeler single-cylinder i.c. engine taxi converted by Energy Conversion Devices from compressed natural gas fuel to hydrogen under a partnership program between the U.S. government (USAID) and industry.

Indian cargo Bajaj three-wheeler adapted by Energy Conversion Devices to hydrogen that took participants for rides around the parking lot of the Marriott Wardman Park Hotel to a sleek, long 12-cylinder BMW record-breaking race car (*H&FCL Nov. 04*) on display in the exhibition area.

Also available for testing and rides were an array of fuel cell cars and SUVs from DaimlerChrysler, Ford, Toyota and others, as well as hydrogen-powered buses from Ford and ISE Corp. of San Diego, CA that ferried visitors to the new Shell Hydrogen fueling stations on Benning Road on the outskirts of the District of Columbia (*H&FCL Dec. 04*).

A total of 65 exhibitors - five more than last year - displayed their products and services, the Hydrogen Expo USA organizers said, ranging from hydrogen production and storage equipment, testing devices, makers of specialty materials to fuel cell power systems and engineering services.

Among the noteworthy new concepts at Hydrogen Expo: a high-power density pivotal two-stroke engine developed by a New Zealand company, Pivotal Engineering Ltd., Christchurch. Optimized to run on hydrogen fuel, the water-cooled engine is tiny: A design rendering in a company brochure shows a 2-liter version the size of perhaps a large conventional car battery, nestled between the rear axle and rear seats of a typical medium passenger car.

Total attendance was just about 1,000, somewhat below last year's attendance of 1,100 in Los Angeles but for those with long memories it was still impressive: "It almost looks as if there are more speakers this year than there were participants when I first came to the NHA conference in 1993," joked Rick Smith, of the Hydrogen Energy Center, Portland, ME.

Alan Lloyd: The Public Health-Hydrogen Link

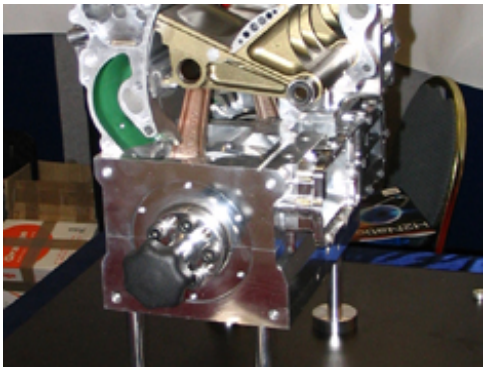
Alan Lloyd, in his first public talk since his confirmation as new secretary of California's Environmental Protection Agency earlier this year, paid tribute to the late Dr. Robert Zweig for stressing early on the link between clean air, public health and hydrogen. It was Bob Zweig who "first turned me on to hydrogen," said Lloyd (Zweig died three years ago - *H&FCL March 02*).

Lloyd took issue with those critics who charge "we're spending too much time on long term" issues, "but we have to recognize that getting to a hydrogen economy will take a long time." He approvingly quoted Gov. Schwarzenegger who once told a reporter, who asked that question, that if you want to compete in the Olympic Games in ten years, "you have to start training now." He said there is a confluence of people, especially in Japan and in Europe "who can make things happen, and we are working very hard on this.

"We can't afford to let this chance go," Lloyd added. "Everything is in place, to some extent, with all stakeholders. Keep the eyes on the prize. We can make a difference."

Significant news at the conference came from the California Environmental Protection Agency which unveiled a draft version of the state's two-volume Hydrogen

Blueprint Plan, and by Ballard Power Systems which said that last year it achieved PEM fuel cell stack costs of US $100/kW based on production volumes of 500,000 units and that it expects to achieve costs of $30/kW by 2010 - DoE's target.



A cutaway model of the compact two-stroke engine designed by New Zealand's Pivotal Engineering Ltd. The triangular shape is the "piston" moving up and down in an arc, attached to the shaft on the right.

California Hydrogen Highway

Presented by Shannon Baxter-Clemmons, special CalEPA advisor on hydrogen and renewable energy programs in a lunch keynote address, the document's executive summary calls for a three-phase development of the California Hydrogen Highway Network. Phase I to be completed by about 2010, calls for the construction of 50-100 public hydrogen fueling stations that could serve an estimated 2000 hydrogen vehicles that might be cruising the state's highways by 2010, en route to 20,000 vehicles that would "poise California for full-scale commercialization of hydrogen technologies." The stations should be located in major urban areas, near fleets that are expected to first use hydrogen vehicles.

Funding for the first 100 stations should be provided by the state on a 50/50 match basis with the private sector. The cost to the state for infrastructure incentives is estimated at $6.5 million annually for five years, plus another $4.2 million in incentives for both fuel cell and hydrogen i.c. engine vehicles also for five years.

By 2010 the network should achieve a 30% reduction in greenhouse gas emissions, "relative to a comparable number of today's fuels and vehicles," and the network should utilize at least 20% renewable resources for hydrogen production.

Gov. Schwarzenegger is expected to issue the final document some time near the end of this month, according to the document.

Ballard: $100/kW Achieved for Fuel Cell Stacks

Ballard's claims about current stack cost assessments, within shouting distance of what's needed to compete with i.c. engines, came in form of a trendline graf that was part of the company's release on its "Technology Road Map" to commercially viable fuel cell stack technology by 2010, released during the conference.

The graf's curve showed that Ballard last year had already achieved costs of about $100/kW for fuel cell stacks, predicated on a production volume of 500,000 units. Obviously these are computer-calculated numbers since neither Ballard nor any other stack manufacturers has produced large numbers of stacks.

The release of these figures came as somewhat of a surprise since in the past Ballard usually had been fairly reluctant to divulge data such as these. A spokesman told H&FCL that the recent management changes at the company "produced a change in attitude." The company recognizes that it has to answer questions asked by a skeptical public, he added, hence the rollout of these figures "which have been extensively worked."

Nevertheless, these are apparently numbers based on solid data, and they are pretty much in line with recent DoE estimates of $200/kW for fuel cell system costs, as presented by Assistant Energy Secretary David Garman during the recent rollout of the fy 2006 budget request (*H&FCL March 05* -

Garman's numbers were based on figures calculated by DoE consultants such as TIAX, a DoE source told H&FCL at this conference, something that wasn't clear at the time). DoE's 2010 target cost for commercial introduction of a fuel cell system is $45/kWnet ($30/kWnet for the stack, $15/kWnet for the balance of plant).

Other 2010 Ballard targets are 5,000 hours of durability (the company says it achieved 2,200 hours last year); freeze start at minus 30 deg. C in 30 seconds to 50% rated power (it has demonstrated 50 consecutive starts from minus 20 deg, C); reduction in power density volume to 2,500 Watts net/liter, more aggressive than DoE's target of 2,000 Watts/liter.

Ideas Forum: Renewables Can Do the Job

Of more than passing interest was an Idea Forum - a novel concept at this conference series - on hydrogen from renewables. Moderator Peter Lehman, head of the Schatz Energy Research Center at Humboldt State University, Arcata, CA, said a recently commissioned DoE report, "Peaking of World Oil Production," warned "the problem of the peaking of world conventional oil production is unlike any yet faced by modern industrial society" and that this problem "will not be temporary and past 'energy crisis' experience will provide relatively little guidance."

Krishna Sapru, the driving force behind the Bajaj/ECD hydrogen three-wheeler project, in her presentation quoted India's prime minister Manmohan Singh, as saying in January that "energy security is to India today what food security had been to the country in earlier times."

Noted Lehman: "There is a mythology that renewable technologies are not up to the job of supplying a significant portion of our primary energy. That's not just true." Frano Barbir, of the Connecticut Global Fuel Cell Center, Storrs, said there is enough renewable energy (solar energy on 1/10th of world deserts: equals 2,500 EJ, plus world wind potential of 30 EJ plus world hydro potential of 30 EJ (1 EJ equals 1 Quad). By comparison, the total U.S. primary energy demand in 2000 was 400 EJ.

"Yes, we do have technologies to harvest it, but it's expensive, and it will always be expensive," Barbir said. "Individual hydrogen energy technologies, including fuel cells, don't make much sense if considered outside the context of the entire energy system." A transition will take many years, we need to start somewhere, and we must concentrate on technologies and applications that do make sense now."

Scott Sklar, president of the Washington DC-based strategic planning and marketing firm, The Stella Group, said he agreed "pretty much with everything:" Barbir had said. The market opportunities are already there: "business is buying this stuff because of energy security for digital components, for example." The other selling point is power reliability: "There are massive parts of the market where expensive technologies" already do the job and sell well, Sklar said. One of his major customers, a New Jersey utility, is happily buying into renewables because each hour of outage costs the utility $10,000, Sklar said.

Financing Forum: Hydrogenics' Advice

The conference was preceded by the day-long Second Annual Hydrogen Financing Forum, organized by the Center for Economic & Environmental Partnership, Inc., a New York-based organization. The session brought together venture capitalists, small entrepreneurs, technologists, and DoE experts to discuss financing, advice for entrepreneurs and other issues of the hydrogen/fuel cell business.

Pierre Rivard, CEO of, by now, ten-year old Hydrogenics Corp., Toronto, dispensed hands-on advice in his luncheon keynote talk, "Lessons Learned." Among his words of wisdom for budding entrepreneurs: "Build

up emotional capital with loved ones (Remember that it's your dream, not theirs);" "Do not consider funding as a commodity (Accept money only from 'deep pocket' 'intelligent' investors);" "Do not accept more funding than you need (Bloated cash dulls economic edge and reduces 'tension of purpose');" "Select a venture for its higher social utility, not for purely cash outcome (Gives you stamina when runway turns out longer than anticipated);" and "Do not treat vision and leadership as a commodity (Maintain founders on payroll as long as tolerable)."

A number of Association awards were announced at the awards luncheon on the last full day. Dr. Alan Lloyd was named a Lifetime Honorary Member "in recognition of his continuing efforts in hydrogen policy and outreach activities and his tireless advocacy which has helped pave the way for state initiatives in California;"

- Sen. Byron Dorgan (D-ND) was given the Senator Spark Matsunaga Memorial Hydrogen Award "for the perseverance of raising awareness in the United States Senate to the need for acceleration" of research and development;

- Harold "Bud" Bebee of the Sacramento Municipal Utility District (SMUD) received the Meritorious Service Award for "long and exemplary membership in the NHA;"

- Don Paul, ChevronTexaco's vice president and chief technology officer, was honored with the Special Member Award for "significant support of the National Hydrogen Association;"

- This editor was honored with the Dr. Robert M. Zweig Public Education Award for "his long dedication to hydrogen education and outreach through the publication of 'The Hydrogen & Fuel Cell Letter', the oldest continuously published news source of its kind."

Finally, the Grand Prize winner of the Second Annual H2U Hydrogen Design Contest Award for designing a hydrogen-based power park was the team from Humboldt State University. Honorable Mentions went to, in alphabetical order, Cornell University, University of Toronto, University of Washington, and University of Waterloo. *Contact: NHA, Patrick Serfass, phone 202/302-7894, e-mail* ***serfassp@hydrogenassociation.org***