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HYDROGEN OUTREACH, EDUCATION AND AWARENESS

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Abstract

The US Department of Energy (DOE) Hydrogen Program funds a varied portfolio of activities, from conceptual research and analysis to pilot testing and outreach, education and awareness. The long-term research projects support the Hydrogen Program's goal of a sustainable, domestic energy system, while development activities focus on near-term, commercially viable hydrogen energy system options. Hydrogen outreach, education and awareness activities play a critical role in the dissemination of information leading to the development of positive public opinion for the introduction of new hydrogen technologies and the fostering of early demand for hydrogen energy systems.

The proposed activities have the overall objective of disseminating technical information that communicates the advances in research and development and environmental benefits to community leaders and the general public. The dissemination of information to the general public and stakeholders is crucial to the development of positive public opinion to the introduction of new technologies and the fostering of early demand for hydrogen infrastructure systems as one solution to Clean Air Act compliance. Furthermore, our outreach activity approach is consistent with requirements mandated by the Matsunaga Act and reauthorized in the Hydrogen Future Act, as well as technology transfer and outreach activities authorized under the Energy Policy Act of 1992 (EPACT).

Objective

Successful outreach efforts are critical to overall hydrogen energy goals and the DOE Hydrogen Program if it is to emerge as a significant contributor to US energy needs. Non technical barriers such as safety, infrastructure investment, and public policy changes will only be overcome with outreach, education and awareness, and mobilizing communities and individuals to action. To achieve this, our outreach effort includes providing leadership, generating ideas, and coordinating activities with other organizations.

Our FY '99 activities have the overall objective of disseminating technical and non technical information that communicates the advances in research and development and environmental benefits to stakeholders, community leaders, and the general public. Informing community leaders and the general public is crucial to the development of positive public opinion to the introduction of new technologies and will foster early demand for hydrogen infrastructure systems as one solution to global climate change.

Past Results

FY '99 represents the third year of a three-year cooperative agreement with DOE to conduct analysis and outreach activities. In general, our outreach program focuses on three distinct audiences or stakeholder groups. The first is US industry and those companies with whom the federal government must establish partnerships if we are to realize a hydrogen energy future. The second group is educators and students via which we hope to educate future leaders and their parents on the benefits of hydrogen. Finally, we have a public outreach effort to educate civic groups, lay audiences, and organizations unfamiliar with hydrogen and its benefits.

In FY '97, our effort was more analytical in nature as we assisted DOE in both analysis and technology transfer activities. Analytical tasks were executed in two broad areas – systems analysis and technical/economic assessments. The systems analysis activities helped define the strategic goals of hydrogen R&D by collecting and analyzing data regarding energy efficiency, environmental externalities, and economic competitiveness factors of hydrogen energy. The technical/economic analysis activities looked at component technologies and their relative merits in different hydrogen energy system configurations. Finally, we assisted in supporting the International Energy Agency (IEA) Annex 11 task to identify, compile, and integrate models of hydrogen technology components into system models that describe overall pathways.

In FY '98, we developed and reviewed plans with DOE and private industry that outlined a five-year approach to both technology validation and outreach/ communication activities. Major deliverables included fact sheets that highlighted technology validation and commercialization efforts that DOE was undertaking with industry, and we produced both a Technology Validation and Communications/Outreach Plan in response to calls to outline the directions for these activities. We did curtail our analytical efforts in FY '98, however we did complete a cursory analysis of fuel cell markets and the potential effects of several policy options including carbon taxes, renewable portfolio standards, and green power subsidies.

Also in FY '98, we continued an education program introducing hydrogen into secondary school classrooms. Primary activities included further development of our *Mission H_2* CD-ROM, coordination and participation of three Hydrogen Education seminars, and development of the Hydrogen Clean Corridor Curriculum (led by MRS Enterprises). The Hydrogen Education seminars took place in March as part of the National Hydrogen Association's Annual Meeting and in May at the Warrenton Middle School in Virginia.

Current Year Results

Industry Outreach

This task is designed to help determine the near-term direction, pathways, and requirements for a hydrogen transportation infrastructure which may, in turn, assist the DOE Hydrogen Program in their R&D choices. Efforts include targeted industry and stakeholder meetings leading to an industry-led consensus-building workshop in the late 1999. In addition, Sentech will produce a workshop report and a general brochure from this consensus, leading to greater public understanding of the industry-driven approach for the near-term direction(s) of hydrogen.

We have identified similar public and private organization undertakings and have taken part in a variety of meetings to date – in particular, HTAP (Hydrogen Technical Advisory Panel), the H_2CC (Hydrogen Corridor Council), and most recently, a California-led hydrogen bus project coordination group – and are looking into different options of working together to achieve a strong industry-led consensus.

Education

This task looks to increase general knowledge of hydrogen's benefits, as well as aiding in the creation of a skilled and informed workforce that will be required for a hydrogen future. This year, the *Mission H_2* interactive Hydrogen CD-ROM – along with a teacher's guide – will be completed (Figure 1).

The project team was assembled in late March, consisting of educational and technical consultants, and people skilled in computer graphics, programming, and narration. The beta version of the CD-ROM has been given a 'facelift' – both cosmetically and in advanced programming capability.

We are currently in the final stages of completing the script, and identifying a variety of graphics, photographs, and video clips to include in the CD. The script, once completed, will go through both a technical and educational review. We are also adding additional bells and whistles, increasing the interactive learning capabilities throughout, and beginning the development of Challenge Rounds. The final version will be dual platform so as to be easily utilized on either Macs or PCs.

***Mission H_2* CD-ROM**

In addition, since this project is a joint DOE/ industry funded venture, industry sponsorship continues to be sought out. SunLine Transit Agency is the first to sign on as a Gold Level ($10,000) sponsor. Discussions are currently being held with International Fuel Cells to finalize a previous verbal agreement of their sponsorship, and additional sponsors are being identified. The industry monies will go toward pressing and packaging, and promotion and distribution of the CDs, and will allow for expanded distribution at a nominal cost (e.g., shipping and handling).

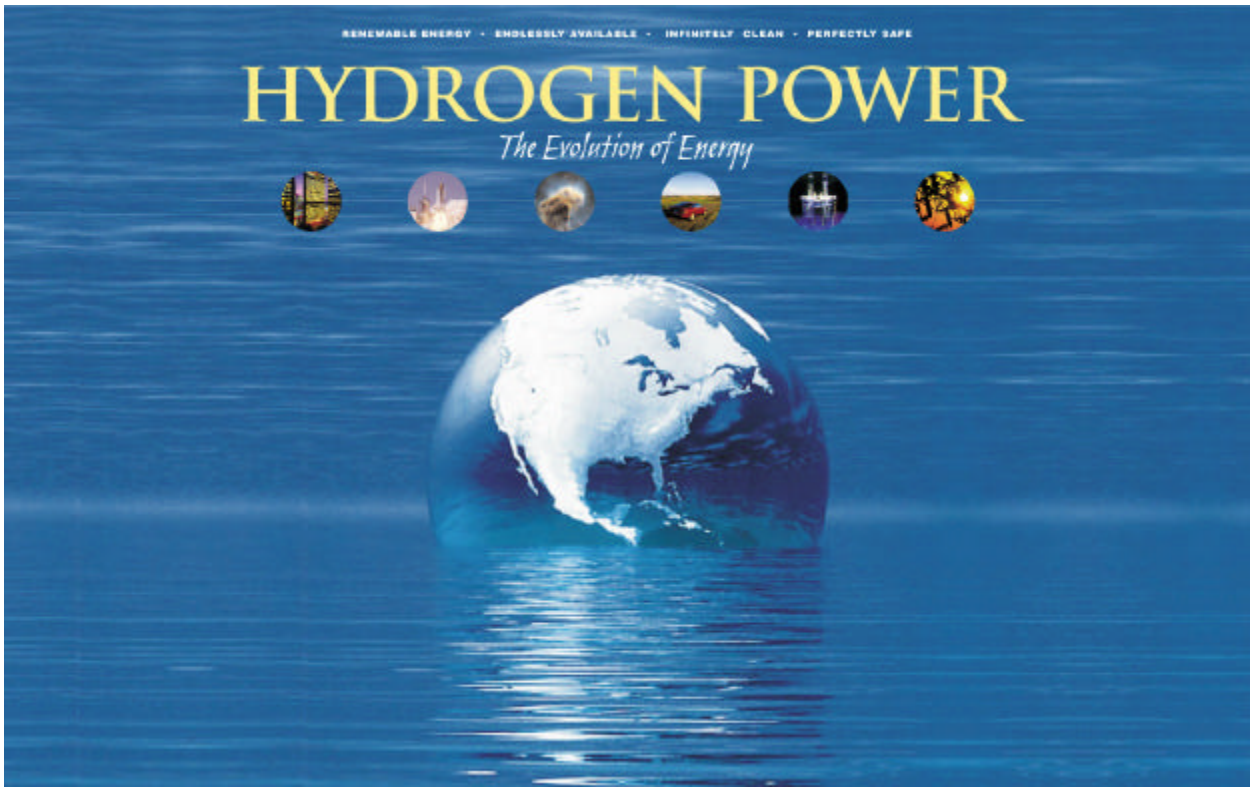
Awareness

This task focuses on enhancing awareness – to the general public and key stakeholders and decisionmakers – to emphasize the many positive aspects of hydrogen, and how investing in science and technology in the development of hydrogen energy technologies can bring many potential positive returns to our Nation.

While we had hoped to exhibit at the Canadian Hydrogen Conference in early February, the cooperative agreement had not been signed in time for the required preparation. In lieu of this, a paper entitled, "Enabling Hydrogen in the 21st Century, The U.S. Department of Energy

Hydrogen R&D Program," was prepared jointly with the DOE Hydrogen Program. Cathy Gregoire Padro, the NREL Hydrogen Program Manager, presented this paper at the conference.

The new hydrogen display, "Hydrogen Power – The Evolution of Energy," was created for exhibition by a variety of organizations promoting hydrogen (Figure 2). The display was unveiled at the Annual National Hydrogen Association meeting in April.



The general 10' x 8' display allows for easy adaptation of items, depending on the targeted audience. For example, materials that can be used interchangeably – and some interactively – include a variety of videos, the *Mission H_2* CD-ROM (when complete), the remote control fuel cell vehicle *Red Thunder II*, or a small fuel cell or electrolyzer system. Published documents have also been added, including the DOE Hydrogen Program Plans, Technology Validation Summary and Fact Sheets, and a variety of materials promoting hydrogen from other organizations, including the NHA, SEIA and Fuel Cells 2000.

The display was brought to the 4th Annual Renewable Energy and Energy Efficiency Expo: Clean Energy Works '99 on Capitol Hill April 21st. The exhibition was coordinated with the NHA, and included a variety of published hydrogen materials and a DCH Technology fuel cell demonstration with hydrogen provided by a metal hydride canister from ECD, Inc. Over 300 individuals passed through the exhibit hall within the 6-hour time frame. Overall, this proved to

be a rewarding opportunity increasing awareness of hydrogen energy and technologies to Congress, their staff, media sources and the general public.

The exhibit was also brought to the 5th Annual Clean Cities Conference in Louisville, Kentucky in mid-May, along with a variety of hydrogen materials focused on transportation – including information sheets on those Clean Cities that are actively pursuing hydrogen transportation projects. This was the first real hydrogen presence in the Clean City arena with nearly 600 conference attendees. However, while the interest in hydrogen – and fuel cells – was extremely high, the overall level of awareness of hydrogen as a transportation option was low. Creating a stronger relationship with DOE Clean Cities can be an important opportunity for hydrogen as it gets further into the mainstream.

The exhibit will next be brought to the 7th Annual Electric Vehicle and Alternative Fuel Conference near Detroit, Michigan and will be displayed later in the summer within DOE's Forrestal building.

In addition to the exhibit, a general, non technical hydrogen awareness brochure is currently in production, and a series of one-page technology "success story" fact sheets are in the development stage. These items will not only promote the public benefits of a hydrogen future, but will also describe the Federal government hydrogen investments geared toward achieving these benefits.

Plans for Future Work

Technology Roadmapping

Technology roadmapping is a process to guide technology investment decisions by identifying critical technologies and technology gaps, and finding ways to leverage R&D investments to fill those gaps. While originally invented more than a decade ago at Motorola, the process was applied to government industry programs at Sematech to develop semiconductor technology in advance of other countries. DOE applied the process to several R&D programs in the mid-1990s, most recently to develop "Industries of the Future" for the Office of Industrial (Efficiency) Technologies.

Sentech has initiated a process to utilize technology roadmapping in the hydrogen R&D effort. The focus in 1999 is to define the requirements for hydrogen infrastructure by holding a workshop in late 1999. Future technology roadmapping activities include building consensus action plans between government and industry and to further refine and integrate the transition between research and technology validation activities.

Education

Our education effort will culminate in the development of a teacher's information package for secondary school and high school educators. The package will include the most up-to-date version of the *Hydrogen Clean Corridor Curriculum*, *Mission H_2 CD-ROM* with teacher's guide,

Hydrogen 2000 Renewable Power Video, and instructions for hydrogen experiments including fuel cell model cars.

Awareness

We plan to continue exhibiting the hydrogen "roadshow" to regional civic and non technical groups, expand the printed material and other interactive exhibit content that promote hydrogen as a safe, clean, and not-too-distant energy option, and coordinate with DOE's Clean Cities and other government outreach efforts to include hydrogen as an alternative fuel option. Sentech will consider a mass media campaign in conjunction with a mainstream environmental foundation or organization that could include public service announcements or other communication opportunities.

Feedback

Our outreach effort will need to determine its effectiveness, and that will be accomplished via several feedback mechanisms, including conducting market research and survey opinion polls to determine the level of awareness of hydrogen in a variety of constituency groups. After analyzing the data received from in-person and on-line surveys, we will evaluate the effectiveness of our communication materials to determine how well we are delivering the hydrogen message.

Goals and Basis for Goals

The goals established in our hydrogen outreach effort address HTAP concerns and take a lead in meeting the requirements of the Matsunaga Act, the Hydrogen Future Act, and the 1992 EPAct, the driving legislation for the DOE Hydrogen Program.

Sentech seeks to build consensus among industry and other constituent groups about hydrogen's role in the current and future economy, to foster innovative partnerships, communicate research results, and develop a positive public perception of hydrogen and hydrogen energy technologies through outreach, education and awareness activities. We will seek to establish specific quantifiable metrics with which to evaluate outreach in the future.

These metrics are likely to include:

- Awareness of hydrogen (number of exhibit viewers, mass media exposure, print media articles, etc.)
- Regional cluster of activity (number of clusters, number of participating organizations)
- Policy change effectiveness (local, regional, or national legislation proposed)
- Industry involvement in technology investment and infrastructure (number of companies involved)