A GLOBAL hydrogen EFFORT

A number of countries consider hydrogen to be a central tool to address long-term energy security, environmental and economic concerns. However, to achieve this hydrogen future, international collaborations in all areas of hydrogen energy development, from research to technology validation to implementation, are essential. This brief sample of ongoing efforts represents the current global commitment to hydrogen as a potential long-term solution to the world's energy needs.

International Energy Agency (IEA)

During the first oil crisis in the 1970s, the IEA was established as an intergovernmental body committed to securing energy supply, economic growth and environmental sustainability through the facilitation of collaborative efforts. For more than 20 years the IEA has supported collaborative research activities focused on the development of advanced energy technologies. To accelerate implementation of these research activities, several IEA Implementing Agreements have focused on innovative hydrogen research and development in all sectors of the economy. The Implementing Agreements target seven areas: technology, energy security, the environment, economics, the market, deployment and outreach.

International Partnership for a Hydrogen Economy (IPHE)

In November 2003, energy ministers from16 countries representing 85% of the world gross domestic product joined to create the IPHE, an important global effort to maximize collaborative partnerships among countries and to promote sharing of experiential and research results.

U.S. Secretary of Energy Spencer Abraham speaking at the IPHE Meeting: "Through this Partnership, we have established a comprehensive framework on which to structure global hydrogen research and development. We can begin to take steps ... toward our ultimate goal - a secure, environmentally friendly energy future."

International Organization for Standardization (ISO) Technical Committee on Hydrogen Technologies

The ISO's Technical Committee on Hydrogen Technologies focuses on standardization of systems and devices for the production, storage, transportation, measurement and use of hydrogen. The 15 participating countries work toward developing consensus codes and standards for hydrogen. The ISO also produces technical reports on the hazards associated with the use of hydrogen with the objective of improving safety measures and contributing to hydrogen's successful use in energy applications for home and office heating, generation of electricity and transportation.

Europe

"The safe use of hydrogen as a fuel is a primary goal of our technical committee as it seeks to facilitate the rapid emergence of hydrogen technologies in the new energy applications."

~ Randy Dey, Chair of the ISO Technical Committee on Hydrogen Technologies (ISO TC-197)

Governments and industries throughout Europe have been actively involved in hydrogen and fuel cell development since 1988 when €8 million was made available for such research over a four-year period. Recently, European Commission President Romano Prodi unveiled a €2 billion hydrogen vision designed to bring hydrogen technologies, including fuel cells, closer to large-scale commercial viability as well as pledging that by 2050, Europe's hydrogen supply would be based on renewable resources. In November 2003, the European Commission launched the European Initiative for Growth, a €2.8 billion initiative, which anticipates a ten-year program for hydrogen-related research, production and use. It also includes the European Hydrogen and Fuel Cell Technology Platform.

Currently, the EU has more than 70 on-going research and development projects conducted by governments, universities and industry. In particular, the EU has committed to supporting the Clean Urban Transport for Europe (CUTE) demonstration project. As one of the world's largest hydrogen fuel cell technology projects, CUTE will rollout a fleet of 27 hydrogen-powered buses serving nine cities in Europe. This project has also required the development and maintenance of an accompanying hydrogen distribution infrastructure to support the fleet. Madrid, Spain hosts the first operational CUTE bus, which began service in June 2003. In its first year of service, it has traveled more than 6000 miles and transported more than 30,000 passengers.

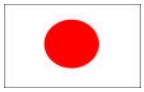
Iceland has set a goal to be the world's first hydrogen economy. By 2005, Iceland plans to begin operation of a small fleet of hydrogen fuel cell buses that run on renewably produced hydrogen. With an abundant supply of renewable geothermal and hydroelectric power, the buses will be fueled by hydrogen electrolyzed from water. A refueling station is already operational in Reykjavik. The first three hydrogen-fuelled buses will replace four percent of Iceland's mass transit fleet.

Asia - Pacific

In anticipation of the 2008 Olympic Games in Beijing, China, the U.S. Secretary of Energy, China's Science and Technology Minister and Beijing's Vice Mayor created the Green Olympic Protocol, an agreement focusing on the utilization of clean energy technologies, including hydrogen buses, in Beijing during the 2008 Olympic Games. A vision workshop was held in May 2004, with participants from industry, universities and government, on the role of hydrogen in the Chinese economy.

Australia recognizes the potential of hydrogen to contribute to a more environmentally friendly and sustainable energy mix and will focus on areas where it has resource, scientific and technical advantages. Currently, Australia's hydrogen R&D includes the Australian Institute of Energy's (AIE) Hydrogen Division, a National Hydrogen Study and a potential hydrogen cooperative research centre.

India also supports a hydrogen R&D program. The Hydrogen Energy Program, administered by India's Ministry of Non-conventional Energy Sources (MNES), focuses on the production, storage and use of hydrogen. The Ministry has already demonstrated the use of gasifiers for converting woody biomass into hydrogen to fuel electric generators for village power in remote areas and the use of hydrogen and natural gas blends for operating vehicles.



As a leader in hydrogen and fuel cell research and development, Japan has researched hydrogen fuel cell technologies since the early 1980s. In 1992, Japan created the International Clean Energy Network Using Hydrogen Conversion (WE-NET in Japanese), a ten-year program designed to focus R&D efforts on core hydrogen technologies. Today, the WE-NET program has been replaced by the Ministry of Economy, Trade and Industry's (METI) New Hydrogen Project (NHP). Their goal is to facilitate the commercialization of hydrogen fuel cells.

QUICK FACTS

Asia-Pacific Economic Cooperation (APEC), which has 21 members including Australia, U.S., Philippines, Malaysia and Japan, now considers hydrogen to be a potential long-term solution to its growing collective energy demand. APEC members represent more than a third of the world's population (2.6 billion people), approximately 60% of world GDP (US$19, 254 billion) and about 47% of world trade. The recently developed Interim Framework Document on hydrogen and fuel cells identifies opportunities for APEC to work with the IEA and the IPHE to advance hydrogen energy; to develop a program for assistance on policy and regulatory issues; and to work toward harmonized codes, standards and regulations.

North America

The United States has been involved in hydrogen research, development and demonstration (RD&D) since the late 1950s when liquid hydrogen was first used to power the National Aeronautic and Space Administration's (NASA) spacecrafts. During the oil crisis of the 1970s, the U.S. Department of Energy (DOE) was created to focus attention on alternative energy resources, including hydrogen technologies, and in turn the DOE Hydrogen Program was formed to oversee hydrogen RD&D. In 1990, the U.S. Congress passed the Spark M. Matsunaga Hydrogen, Research, Development and Demonstration Act (PL 101-566), which prescribed the formulation of a plan for hydrogen research and development in the United States. The Hydrogen Technical Advisory Panel (HTAP) was later mandated by the Matsunaga Act to ensure consultation on and coordination of hydrogen research. These efforts have intensified in recent years. In 2002, DOE launched the FreedomCAR (Cooperative Automotive Research) Program, a partnership with the U.S. Council for Automotive Research. The program seeks to alleviate the nation's growing dependence on imported oil by advancing the high-technology research needed to produce hydrogen fuel cell vehicles (FCVs). To ensure that the necessary infrastructure exists to allow FCVs to successfully enter the market, the U.S. government announced a parallel development effort known as the President's Hydrogen Fuel Initiative in 2003. Over the next five years these programs will contribute $1.7 billion toward the advancement of hydrogen, fuel cell and hybrid-electric vehicle technologies.

Canada's hydrogen R&D program is based on establishing an export capability and response to environmental pressure. The Canadian government administers the Canadian National Hydrogen R&D Program (CNHP) through the CANMET Energy Technology Centre (CETC). Its objective is to develop and evaluate hydrogen systems for stationary, transport applications and especially off-grid applications for remote areas of Canada. In April 2004, the Canadian government announced funding for the Canadian Hydrogen Highway™ to be built between Vancouver and Whistler, British Columbia. An additional $5 million will fund three other projects, including the Vancouver Fuel Cell Vehicle Project, the Hydrogen High-Pressure Valve Development Project and the Hydrogen-Powered Delivery Van Project.

Brazil

The Ministry of Mines and Energy is leading an effort with industry and universities to develop a national roadmap for the transition to a hydrogen economy in Brazil. In the greater São Paulo Metropolitan Area, the Brazilian government is stimulating the development and utilization of fuel cell buses with its support for an operational test fleet of fuel cell buses. The project, in collaboration with industry partners, assists the Brazilian government and the Empresa Metropolitana de Transportes Urbanos de São Paulo S/A in acquiring eight fuel cell buses. The Brazilian government hopes that this fuel cell bus project will provide valuable experience and increase demand for fuel cell buses as well as pave the way to making hydrogen technology commercially viable throughout Brazil. Currently, Brazil also utilizes natural gas and ethanol technologies for public transportation needs in other major cities like Rio de Janeiro.

For more information on hydrogen and to view the electronic version of this fact sheet, please visit www.HydrogenAssociation.org or www.eere.energy.gov/hydrogenandfuelcells/

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