“I am going to encourage the building of a hydrogen highway to take us to the environmental future.”

– Governor Arnold Schwarzenegger, State of the State, January 2004
The California Fuel Cell Partnership members will demonstrate in California the potential for fuel cell-powered vehicles as a safe, practical, clean and efficient alternative to vehicles powered by internal combustion engines through:

1) Conducting fleet demonstrations by operating and testing vehicles in the hands of real-world users.
2) Conducting fuel demonstrations to support fuel cell vehicles, including hydrogen and other fuels as needed by the demonstration vehicles.
3) Facilitating the path to commercialization by preparing local communities for fuel cell vehicles and fueling, promoting practical codes and standards, and defining needed support and incentives.
4) Enhancing public awareness and education about the benefits and challenges of fuel cell vehicles and fuels, targeting communications in fleet demonstration communities, and coordinating with stakeholders and other fuel cell vehicle programs worldwide.

Since 1999, the California Fuel Cell Partnership (CaFCP) has made extraordinary progress. Public and private sector members – government and industry – are working shoulder to shoulder in common pursuit of ambitious goals to create the conditions for the successful introduction of fuel cell vehicles and hydrogen as a transportation fuel. Collaboration and “coopetition” are the forums leading the fundamental changes required in the environmental and economic dynamics of transportation.

This progress report on the CaFCP’s activities from 1999 through 2003 is designed to accomplish two goals:
1) To familiarize followers of fuel cell developments with the real-world demonstrations that have taken place in California to date; and
2) To highlight the key issues we believe must be addressed to successfully transition to the widespread use of fuel cells and hydrogen fuel.

The CaFCP recently announced plans for continuing the successful collaborative work through 2007. Over the next four years, our members will work to facilitate the placement of fuel cell vehicles in independent, fleet demonstration projects in California. Hydrogen stations will demonstrate early applications of hydrogen fueling technology while supporting the fleet projects. More fuel cell-powered buses will operate in revenue service as well, raising awareness not only with transit customers, but also with regulators and the public.

Members of the CaFCP will also continue to promote the development of practical codes and standards for fuel cell vehicles and hydrogen fueling stations, help prepare local communities for the vehicles and fueling, and expand public awareness through education and outreach activities.

As fuel cell-powered cars and buses move into the hands of users, CaFCP members will gather valuable operating data and lessons. The application of this experience is an integral step in preparing these fuel cell vehicles and the fuel infrastructure for commercialization. Our members are committed to supporting these efforts so that everyone gains knowledge and moves forward from this learning.

As the 2004 Chairman of the CaFCP, I have the privilege and honor to follow in the steps of my predecessors who have contributed substantially to the growth of the CaFCP. The members of the Steering Team, supported by the dedicated executive team, provide innovative approaches, cooperative tone and a commitment to success of the CaFCP through consensus. We expect more accomplishments throughout this year and the balance of our next operational phase. We look forward to sharing those results in 2005, as we advance fuel cell vehicle commercialization and move towards a sustainable energy future.

Sincerely,
Firoz Rasul
Chairman, Ballard Power Systems 2004 CaFCP Chairman


**CaFCP Accomplishments**

1999-2003 Highlights

The path to realizing fuel cells for transportation may be long and challenging, but the California Fuel Cell Partnership (CaFCP) has made a significant start in the nation's most populous state. When the members set out to work together in April 1999, they established the following goals:

- **Demonstrate alternative fuel vehicle technology**
- **Demonstrate alternative fuel infrastructure**
- **Explore the path to commercialization**
- **Increase public awareness**

To date, the CaFCP has made great strides toward each of these goals. Specific accomplishments include:

- **Armistice members placed 55 fuel cell vehicles on California roads and highways.**
- **Transit agency members have tested two hydrogen stations on city streets, and have placed orders for seven fuel cell buses in begin routine transit service in 2004.**
- **Energy members installed and operated two hydrogen refueling stations and one methanol fueling station in California, with nine other hydrogen stations installed and operated independently by individual members. A key objective is to promote fuel station interoperability among all of these stations.**
- **CaFCP members constructed a state-of-the-art demonstration and testing facility in West Sacramento, California.**
- **CaFCP members jointly developed an emergency response guides for fuel cell vehicles. This guide is used to train local first responders. Over 200 emergency response agencies have been trained.**
- **As part of its outreach program, the CaFCP distributed 2,000 fuel cell vehicle safety kits to California teachers and brought over 3,800 visitors to the headquarters facility.**
- **CaFCP surveys show that awareness of fuel cell technology has increased from less than 20% of Californians knowing about fuel cells in 2000 to about six in ten Californians having heard about the technology in 2003.**

Along with these accomplishments, the CaFCP has proven its value as a forum where the challenges of hydrogen and fuel cell technology are shared and representatives with one common goal – to maximize the potential for fuel cell vehicles and fueling technology – to help California and the world achieve a cleaner, more sustainable future.

**Vision for the Future**

Building on its past successes, the CaFCP will continue its collaborative work through 2007. In the next four years, the 30 CaFCP members will work to facilitate placement of up to 300 fuel cell vehicles in the independent, fleet demonstration projects within the state – primarily focused on the greater Los Angeles area and the Sacramento-San Francisco region – and develop a hydrogen fueling infrastructure to support the vehicles.

Through daily use by real-world drivers, fixed programs provide valuable operating data for both vehicles and fueling. They also raise awareness in communities likely to serve as first commercial markets. As fuel cell cars and buses increase in number, educating stakeholders – those who can make a difference in reaching commercial success – will take on renewed emphasis so that challenges are understood and addressed together.

It will also be an important time to exchange experiences with other fuel cell demonstration projects worldwide, so that timely advances are made in technical knowledge, as well as public awareness. The CaFCP’s Steering Team between the following key points will help to keep the momentum moving forward:

1. **New technologies like fuel cells and hydrogen production must be nurtured.** Participating companies are “paving the way” with new fuel into the future. Success success upon gaining real-world experience with practical demonstration and cooperative learnings.
2. **Government has an important role in providing dedicated, coordinated long-term funding to support research and demonstration projects, and in building public interest and support.**
3. **The CaFCP strongly supports a sustained level of R&D to maximize the availability of low- and renewable hydrogen sources.** In the near term, the use of conventional fuels to produce hydrogen will provide a transition to a renewable hydrogen future. By developing both vehicles and their associated infrastructures, the necessary elements can be realized to use hydrogen produced from renewable and clean sources when it becomes widely available.
4. **It is important to keep a realistic “expectations perspective”** to the timeline to the broad commercial market introduction in 2015 to 2020. Earlier introductions will take place in fleet and transit applications.
5. **Using hydrogen as a transportation fuel introduces new challenges, safety, liability, and insurance concerns must be addressed and accepted before true expansion can begin to take hold.**
6. **More public awareness must be cultivated now in order to gain marketplace acceptance in the future.**
7. **Customer understanding is vital to market success, and must be emphasized – the public and private sectors should highlight and advance the favorable attributes of fuel cell vehicles and hydrogen fueling infrastructure.**

From gaining acceptance to promoting infrastructure and understanding, the CaFCP will continue to set the standard for real-world demonstration through its unique collaboration. The overarching goal remains the same: to build momentum for fuel cell vehicle and hydrogen fueling technology – and help California and the world achieve a cleaner, more sustainable future.
Fuel Cell Vehicles

The power of the CaFCP’s collaboration is illustrated through the work of the automotive companies based in the headquarters facility in West Sacramento, California. This group of automotive company representatives is the driving force behind the success of a primary CaFCP goal – to demonstrate fuel cell vehicles on California roads. With assistance from other members, in particular the hydrogen producers, the automotive companies have accomplished much in the pre-competitive arena, from identifying and advancing highly technical fueling issues, to conducting joint vehicle testing and demonstration.

Accomplishments

Vehicle on the Road - Since 2000, members have placed 55 light-duty FCVs in California, and traveled over 145,000 miles on California’s roads and highways. Vehicles – one of the most visible faces of the CaFCP – have been used to support more than 120 public outreach events, carrying nearly 12,000 test-riders.

Providing Data and Learnings – Despite their competitive positions, the CaFCP’s automotive members have worked cooperatively to overcome the challenges inherent to implementing a new vehicle and fueling technology. As a distribution point of technical information, they have communicated valuable data and experience addressing codes and standards, safety, and fuels issues. Important feedback regarding pressure relief devices (PRDs), a safety-related value used on many FCVs, was provided for the CaFCP-commissioned Hydrogen Vehicle Facilities Study. Vehicle diagrams, evaporation pathways, and emergency shut-down procedures were provided for the CaFCP Emergency Response Guide, a resource to supplement training materials for professionals who may respond to FCV’s accidents. Automotive company representatives have also conducted briefings to outside organizations such as environmental advocates and standards development organizations.

Vehicle Fueling Interface – Today there is no question that any car can drive into any gasoline fuel station and receive fuel safely, quickly, and conveniently. To ensure that the same is true for hydrogen fuel cell vehicles, members have devoted significant time and energy to the development of guidelines to establish interoperability, or “common fit” protocols. Since 1999, the CaFCP has advanced through six revisions of a Fueling Interface Guideline. In 2003, the CaFCP expanded its work to cover the performance and safety validation of hydrogen stations being utilized by its members. Additionally, discussions began on hydrogen purity standards in order to address fuel cell vehicle performance and durability issues.

Program Learnings

CaFCP members have placed more FCVs on the road in California than have been placed in any other region of the world. Along the way, many members have learned many lessons.

Safety First – Safety must always be the first consideration when establishing new protocols or programs. The experience and knowledge that manufacturers have gained through their own operations will be extended as common guidelines for the public fuel demonstrations.

Program Learnings

Fuel cell bus demonstrations allow for high visibility, real-world testing on controlled, in-service routes, supported by centralized fuel refueling and maintenance. CaFCP’s bus demonstration program includes government representatives, fuel cell technology experts, and three California transit agencies who operate the demonstration sites: Santa Clara Transit Agency (Santa Clara Valley), Santa Clara Valley Transportation Authority (Silicon Valley), and AC Transit (San Francisco Bay East). The CaFCP has gathered many learnings that will help address future challenges.

Accomplishments

The CaFCP’s bus demonstration program has realized many noteworthy accomplishments over the past four years.

Demonstration Sites – Two prototype fuel cell buses were operated in California to test demonstrations at the transit companies, providing finished experience for drivers, maintenance staff, and passengers.

Public Outreach – Numerous visitors to the transit facilities, as well as special events, provided opportunities for thousands to see fuel cell transportation technology at work. Ballard’s ZBus partners in this bus demonstration, Challenge Blonder, Falkwexy traversing the 275-mile, cross-desert drive from Las Vegas to Los Angeles.

Funding for Next-Generation Buses – Contracts have been secured for seven fuel cell buses: four using Ballard fuel cells (for AC Transit and Santa Clara VTA), and three using UTC fuel cells (for Santa Clara VTA), and three using UTC fuel cells (for Santa Clara VTA). In 2003, AC Transit and the testing phase at Ballard’s Vancouver, Canada facility, Santa Clara VTA and AC Transit have begun construction of hydrogen fueling stations.

Common Interest – In the pre-commercial development phase of a new technology, independent stakeholders and experts must be willing to share certain proprietary experience in areas that serve the common interest (particularly safety and reliability) so that all participants can advance.

Quality not Quantity – Demonstration of fuel cell vehicles and fueling infrastructure must work in step. Successful partnering in focused, coordinated programs is more important than hiring for numerical targets, and decreases the risk of premature deployment.


Worldwide Coordination – To increase cooperative learnings with other bus demonstration sites, members developed a common fueling performance data. This data collection protocol has been shared worldwide.

Fiscal Targets – In anticipation of future needs, the CaFCP staffed technical specifications for second generation fuel cell buses, setting challenging targets for better performance, increased reliability, and reduced costs.

Full program learnings include:

- Demonstrations should be tied to an overall strategy for hydrogen fueling infrastructure.
- Companies, government, and public agencies need a champion to promote the technology along its long road to commercial viability, and to be an advocate throughout the process, from locating sources of funding to building facilities and training staff.
- Data Collection – To ensure the delivery of comprehensive and relevant demonstration data, programs must adhere to a sound data collection plan. The plan should provide objective in-use performance and reliability results, evaluate hydrogen infrastructure development and operation, and describe transit facility modifications required for safe operation.

Taking It to the Streets

Fuel Cell Buses

Program Learnings

Through early experiences with two buses and the interaction among active members, the CaFCP has gathered many learnings that will help address future challenges.

Program Learnings

- From a public relation standpoint, the demonstration projects can be very effective. The CaFCP’s publicity program includes high visibility with both the public and the media.
- With the CaFCP’s Emergency Response Guide for fuel cell buses, CaFCP members have been able to conduct joint vehicle testing, foster a common understanding of the hydrogen fueling process, and develop the ability to deal with safety-related situations.
- Public Outreach – Throughout the four-year demonstration project, the CaFCP has worked closely with agency staff and stakeholders to provide training, enable productive conversations, and foster a spirit of partnership.
- To ensure the success of the demonstration project, a transit agency needs a champion to promote the technology along its long road to commercial viability, and to be an advocate throughout the process in the form of an advocate who can bring resources with them.
- To ensure the delivery of comprehensive and relevant demonstration data, programs must adhere to a sound data collection plan. The plan should provide objective in-use performance and reliability results, evaluate hydrogen infrastructure development and operation, and describe transit facility modifications required for safe operation.

- The CaFCP’s Emergency Response Guide for fuel cell buses is excellent. It provides valuable information, and is quick and easy to access.
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Hydrogen Fueling Infrastructure

Implementing a new fueling infrastructure is an enormous undertaking. But CaFCP members have taken important steps to lay the foundation for this eventual transition, such as ensuring the vehicles and stations are developed in a collaborative manner, engaging national and international organizations that write standards relating to fueling infrastructure, educating local permit officials and training first responders to respond to fuel cell vehicle incidents.

Accomplishments

Fueling Stations – CaFCP members have constructed two hydrogen-fueling stations and one methanol-fueling station.

• The West Sacramento hydrogen-fueling station was jointly designed and installed in 2000 by the local leaders in energy and industrial gas suppliers (BP, ESSO Mobil, Shell Hydrogen, ChevronTexaco, Air Products and Chemicals, and Praxair). To meet the fueling needs of the auto members, it provides three hydrogen-fueling modes: cryogenic liquid, 3600 psi gaseous and 5000 psi gaseous. To date, over 2,700 fueling events have been completed.

• The Richmond hydrogen-fueling station was designed and installed in 2010 by Stewart Energy at AC Transit’s Richmond bus yard. It provides two hydrogen-fueling modes: 3600 psi gaseous and 5000 psi gaseous. This station provides auto members extended driving range outside of the Sacramento area and proximity to hydrogen for AC Transit’s fleet bus project.

• The Redwood hydrogen-fueling station was jointly designed and installed in 2001 by the Methanol Fuel Cell Alliance of DaimlerChrysler, Ballard, BP, Statoil Chemicals, and Praxair. To meet the fueling needs of the auto members, it provides three hydrogen-fueling modes: 3600 psi gaseous, 5000 psi gaseous and 5000 psi gaseous. This station further developed a comprehensive hydrogen-fueling process.

Mobile hydrogen-fueling supports CaFCP events where hydrogen stations are not available. This service has been very useful during Road Rallies I and II and during hot weather testing in Death Valley.

Ensuring Interoperability – At the CaFCP’s inception, there was no widely accepted fueling process for hydrogen vehicles. Vehicle manufacturers have different engineering strategies for such variables as fueling pressure, temperature, and design. To ensure safe and consistent fueling for all vehicles, CaFCP members worked together to create procedures that would allow all types of hydrogen-powered vehicles to fuel at the same station. The energy members continue to work closely with vehicle manufacturers to further develop safe and comfortable hydrogen-fueling protocols.

Engaging Standards Development Organizations (SDOs) – SDOs are organizations that develop codes and standards for industries or sectors where there is need to have community-accepted requirements. Standards promote interoperability within industries and help move new industries, like hydrogen and fuel cells, forward.

Through its demonstration projects, the CaFCP provides SDOs a valuable real-world experience and data to better define those codes and standards. Additionally, the CaFCP has an open line of communication with several national and international SDOs including: Society of Automotive Engineers, International Code Council, International Organization for Standardization and National Fire Protection Association.

Educating Local Permit Officials – Permit officials help communities ensure that development projects meet established codes and standards, such as protecting human and environmental health and safety. Permitting authorities include planning departments, public works, fire/HazMat departments and building departments. Most of these organizations are unfamiliar with hydrogen as a transportation fuel. Therefore, ensuring a hydrogen-fueling station can require extended periods of time and effort to proceed through the permitting appraisal process.

For each of its fueling station projects, CaFCP members helped identify permitting issues and educate local officials on hydrogen safety, codes and standards. By addressing concerns in a proactive manner, station developers can reduce the amount of time and effort required to obtain permits.

Training First Responders – The CaFCP is actively educating first responders about hydrogen and fuel cell vehicles. First responders include local police, fire, and emergency medical personnel. They are the most current information regarding the new vehicle technologies operating on California roads and highways. CaFCP members have worked closely with local fire departments, the Office of the California State Fire Marshal and other stakeholders to develop a comprehensive emergency response guide and corresponding training materials to familiarize first responders with hydrogen and fuel cell vehicles so they are prepared when those new technologies are introduced to their communities.

To date, CaFCP members and staff have trained over 250 first responders in 10 communities including El Centro, El Segundo, Hermosa Beach, Long Beach, Redwood City, Richmond, Sacramento, Simi Valley, UC Davis and West Sacramento. The program will expand as more vehicles are introduced into California communities. Training is based on the information in the emergency response guide and includes the properties of hydrogen, fuel cell vehicle safety and design, specific emergency response procedures for HFCVs, and a hands-on presentation of fuel cell vehicles.

CaFCP staff and member organizations perform the training with assistance from experienced first responders as needed.

Program Learnings

Application of existing codes to new uses – Historically, hydrogen has been used as an industrial gas. Until now codes were developed for hydrogen as a transportation fuel, existing industrial codes must be used to establish commercial fueling stations. Greater coordination and utilization of the code writing bodies is needed to make a successful transition. CaFCP members have active participants on hydrogen-fueling station code development boards to help develop commercial hydrogen codes.

Consensus between industries on standards, exceptions, timing – Each industry sector and each individual company tends to have its own “culture”. Different cultures interact in different ways, have diverse priorities and varying comfort levels when it comes to sharing meaningful information. The CaFCP has found it most effective to proceed on a case-bycase basis to ensure that hydrogen and fuel cell vehicle safety and design, specific emergency response procedures for HFCVs, and a hands-on presentation of fuel cell vehicles.
Stakeholder Outreach

The CaFCP has conducted targeted stakeholder outreach initiatives to raise awareness of fuel cell vehicles and hydrogen among key opinion leaders and decision makers. This outreach effort takes on heightened importance as major announcements supporting this new technology make headlines, such as President Bush’s hydrogen car initiative and Governor Schwarzenegger’s plans for hydrogen infrastructure in California.

By focusing education and outreach efforts towards policy makers and other key audience groups, CaFCP is building bridges to those who will play an especially critical role on the path to successful commercial introduction.

Accomplishments

National Policy Makers – Through annual briefings in Washington, D.C., CaFCP strives to keep policy makers informed of current developments at the world’s largest fuel cell vehicle demonstration site. In the past two years, CaFCP briefings have addressed more than fifty congressional and administration staff – publicly but not exclusively – at the California delegation. Lawmakers were also briefed last year on the CaFCP’s articles by 2003 Steering Team Chairman Alain Lloyd, in testimony before the Committee on Science of the U.S. House of Representatives.

State Policy Makers – CaFCP was launched on the steps of the State Capitol; since then, vehicles and member representatives have returned several times for outreach events, including a legislative reception and vehicle exhibit. More than 20 state legislators, their representatives, and executive branch officials have visited the CaFCP headquarters, gaining a first-hand view of potential challenges for bringing this technology forward.

Community Officials – Before placing fuel cell vehicles into communities for fleet building and demonstration programs, local officials must thoroughly understand the technology so that their communities are primed for success. CaFCP is increasing its focus on developing resource materials for local officials, and conducting training and other outreach programs for greater understanding and acceptance in the community.

Educators – Students today will likely be part of the first, large-scale wave of fuel cell vehicle customers. Working with the California Science Teachers Association and other education organizations, CaFCP has conducted introductory workshops for more than 1,000 teachers and has distributed 2,000 Fuel Cell Learning Kits to middle school and high school teachers. The Learning Kits include a resource CD with links to educational sites, short videos describing the technology, and its implications for society; sources for complete classroom curriculum, and other useful information.

Environmental Community – To assure that the CaFCP’s projects take into account environmental perspectives, and to help keep the environmental community informed, CaFCP provides an Environmental Team comprised of representatives from California’s top environmental organizations. The E-Team serves as a sounding board for policy issues and project decisions. To date, six briefings have been held with CaFCP executives and environmental leaders.

Technology Supplier Industry – To reach the growing base of companies and organizations providing goods and services supporting fuel cell and hydrogen development, CaFCP conducted two Technology Forums. These Forums provide two-way communications between CaFCP members and those interested in the opportunity for formal exchanges with the members, including one-on-one meetings.

Environmental Program Learnings

Accross the Board Outreach – Stakeholder outreach must remain a top priority of demonstration organizations; it is equally important to build bridges with the local period officials as it is with the top rungs of the political ladder.

Cultivate Creative Stories and Champions – General awareness of fuel cell vehicles and hydrogen is increasing, but it is increasingly important to establish a strong network of knowledgeable experts able to address and respond to technical and policy issues as they arise.

Program Learnings

J oint Studies on Commercialization Challenges – CaFCP is the multi-sector government/industry structure provides a unique forum for joint discussion of the challenges facing the development of fuel cell vehicles. CaFCP has funded two studies to date:

1) "Fuel Scenarios Study: Bringing Fuel Cell Vehicles to Market" – a summary of economic and environmental benefits and challenges for utilizing hydrogen, gasoline, ethanol, and methanol as potential fuels for fuel cells. The study was not intended to identify the best option, but to provide a snapshot in time of the issues and opportunities associated with each fuel. The process of carrying out this study was instrumental in reassuring the members around hydrogen as the priority fuel for the early fuel demonstration vehicles.

2) "Support Facilities for Hydrogen-Fueled Vehicles" – a ground breaking study to better understand the safety issues associated with housing fuel cell vehicles in home garages, public garages and maintenance facilities. The study is due to be published in 2004.
Public Outreach

Nothing opens the eyes of the public to the promise of this new technology quite like seeing, touching or driving a fuel cell car. CaFCP is reaching out to as many people as possible to do just that. The CaFCP outreach programs have brought more than 100,000 people face-to-face with fuel cell vehicles over the past four years.

Accomplishments

Three Fleets – CaFCP’s several road-rally vehicles have brought fuel cell vehicles, and public excitement, to dozens of small towns and big cities. In the California Coast 2002 Road Rally, seven fuel cell cars drove the state’s Central Coast, from Monterey to Santa Barbara through Big Sur and Santa Barbara. During the three-day road rally, thousands turned out for ride-and-drive opportunities and fuel cell displays in communities along the route. In 2003, CaFCP’s Rally Thru the Valley took the fuel cell cars from Sacramento to Los Angeles, through California’s Broadbasket, the Central Valley. Ride-and-drive, fueling, and events were held in Stockton, Ripon, Merced, Fresno, and Bakersfield. Before ending with public rides in Los Angeles, the fuel cell cars traversed the grazing Griswold mountain pass on their way south.

Earth Week Events – Each April, thousands turn out at community environmental citizenship events in commemoration of Earth Day. CaFCP – which formally announced Earth Week in 1999 – helps its members identify events where displays of fuel cell cars, fueling and environmental exhibits are a welcome addition. Sacramento, San Francisco Bay Area, Davis, Los Angeles, Orange County and San Diego are some of the areas where the CaFCP has joined in Earth Day events.

County Fairs and Other Public Events – Numerous occasions, CaFCP has exhibited vehicles and learning displays at events that have a single concentration of California. Highlights include the Orange County Fair and the San Diego County Fair; the Anaheim Auto Show; Safeco an environmental-themed festival; and two marathons (the L.A. Marathon and the California International Marathon in Sacramento) where a fuel cell vehicle has served as the zero-emission pace car.

Public Tours – One day each month, the doors are opened at the CaFCP headquarters in West Sacramento and the public is invited for public tour day. During the past four years, more than 1,200 people have attended these “Fourth Friday” public tours. They learn about hydrogen and fuel cells, see CaFCP’s hydrogen fuel station in operation, and can take a short spin in a fuel cell car.

Conferences – Large-scale conferences provide direct access to key audiences. CaFCP has participated in the following conferences with speakers, workshops, exhibits, and poster: California Society of Engineers; Electric Drive Transportation Association; California Science Teachers Association; Fuel Cell Seminar; U.S. Clean Cities; Future Car Congress; Society of Automotive Engineers World Congress; and Congressional Fuel Cell Expo.
On a typical spring day in April 2000, about 250 CaFCP representatives, dignitaries, and interested Californians of all ages ventured to a busy freeway in West Sacramento to break ground on a project that would become a global center for transportation fuel cell technology.

CaFCP members chose to locate a demonstration center in the state’s capital region to take advantage of the state’s leading automotive and technology companies. Using a national firm’s design specification, construction was managed by a development company. A hydrogen fueling station was installed to provide a ready source of fuel for the on-site vehicles.

Throughout 2003, Stuart Energy worked alongside CaFCP members to advance the station towards full interoperability with all fuel cell vehicles, similar to that of the CaFCP’s headquarters demonstration center in the state’s capital. This dialogue continues to identify better practices in fueling infrastructure, station performance validation practices, and other steps necessary to expanding hydrogen technology infrastructure.

The station employs Stuart Energy’s patented Hydrogen Energy Station (HES) system, which consists of a high-pressure, high-purity hydrogen electrolyzer, a storage unit, and a gaseous hydrogen dispenser that provides hydrogen to vehicles. The dispenser operates at pressures up to 2,070 bar to fuel a vehicle, the driver simply experes a “smart” card to activate the dispenser, and attaches the hose to the vehicle. Meeting challenges is part of the continuous development of the CaFCP’s member companies to pursue interoperability. Scenic Richmond has generated many lessons in this first extensive multi-user/multi-station fuel cell vehicle infrastructure expansion – lessons that will benefit future station implementation.

In 2002, two buses manufactured串联 placing fuel cell vehicles in customer fleets. Other members have announced they will start demonstration fleet programs beginning in 2004.

Honda FCX

As part of its efforts to bring fuel cell technology to the market, Honda is well along in the placement of about 30 fuel cell cars in the U.S. and Japan by the end of 2004. This includes two Honda FCXs in their fleet. The University of California, Davis-Toyota FCV infrastructure evaluations. To support these vehicles, Air Products built a 1,500 kilogram hydrogen station at the university.

Richmond Fueling Station

California Environmental Quality Act (CEQA) and other technical guidelines. Outreach to community groups, including educational tours of the CaFCP headquarters facility, was a key element in the site selection process. A CaFCP representative expressed passion for familiarizing the community with the benefits of on-site hydrogen fueling.

Post-commissioning

CaFCP member Stuart Energy initiated and commissioned its “intelligent” hydrogen fueling station technology in the city of Richmond, California, at the AC Transit bus yard on October 30, 2002. This is the first satellite station to supply hydrogen fuel for CaFCP’s fuel cell vehicles. Stuart Energy provides electrolyzer technology, using grid and city power and city hydrogen infrastructure.

Business Program

Honda FCX

The Honda FCX is the world’s first fuel cell passenger car, certified for regular commercial use by the U.S. EPA and California Air Resources Board (CARB). Testing began at the EPA fuel economy ratings (51 city / 48 highway) for 2003 models.

To help the city of Los Angeles, Honda offered to fund the development and implementation of a hydrogen fueling program in the city. Later in 2003, Honda announced its intention to expand the fuel cell applications in California, and today the City of Los Angeles is operating two FCVs in their fleet.

The station consists of a high-pressure, high-purity hydrogen electrolyzer, a storage unit, and a gaseous hydrogen dispenser that provides hydrogen to vehicles. The dispenser operates at pressures up to 2,070 bar to fuel a vehicle, the driver simply experes a “smart” card to activate the dispenser, and attaches the hose to the vehicle. Meeting challenges is part of the continuous development of the CaFCP’s member companies to pursue interoperability. Scenic Richmond has generated many lessons in this first extensive multi-user/multi-station fuel cell vehicle infrastructure expansion – lessons that will benefit future station implementation.

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In 2002, two buses manufactured placed fuel cell vehicles in customer fleets. Other members have announced they will start demonstration fleet programs beginning in 2004.

Honda FCX

As part of its efforts to bring fuel cell technology to the market, Honda is well along in the placement of about 30 fuel cell cars in the U.S. and Japan by the end of 2004. This includes two Honda FCXs in their fleet. The University of California, Davis-Toyota FCV infrastructure evaluations. To support these vehicles, Air Products built a 1,500 kilogram hydrogen station at the university.

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Organization Summary

The CaFCP is a unique, voluntary, non-legal entity whose success to date has been directly related to the energy and enthusiasm of the participating companies, agencies and individuals. Members choose to participate in the aspects of the program that are most important and interesting to them, often making extraordinary contributions of time, resources and commitment to achieve progress for not only their own organization, but also for the benefit of all members. The CaFCP has matured over the past 4 years, but has always remained responsive to the needs of its members, who have shaped and made the CaFCP the successful organization that it is today.

An executive Steering Team meets quarterly to direct the work of the CaFCP. The Chair of the Steering Team is rotated annually among the four sectors represented in the CaFCP – vehicle manufacturers, fuel providers, technology providers and government agencies. This shared leadership reflects the diversity of representatives in the organization and results in an increased appreciation among the members of their various interests and perspectives.

The Steering Team directs the activities of the Working Group, which is managed by the Executive Director. The activities of the Working Group and staff are organized into three general areas:

1. Technical Programs – led by CaFCP members through the project groups
2. Communications – led by CaFCP staff
3. Program Implementation – led by CaFCP staff

The CaFCP has been described by organizational experts as a post-modern organization. In a post-modern organization, the form of the organization follows its function. This type of organization is characterized by highly interactive communications among its members, and a strong base of knowledge and expertise that is brought into the joint collaborative effort toward a common purpose. The post-modern organization promotes shared leadership that leads to innovation and change in a complex environment.

Members

Automotive
DaimlerChrysler
www.daimlerchrysler.com
Ford
www.ford.com
GM
www.gm.com
Honda
www.honda.com
Hyundai
www.hyundai-motor.com
Nissan
www.nissan-global.com
Toyota
www.toyota.co.jp
Volkswagen
www.vw.com

Energy
BP
www.bp.com
Chevron
www.chevron.com
ExxonMobil
www.exxonmobil.com
Shell
www.shell.com

Fuel Cell Technology
Ballard Power Systems
www.ballard.com
UTC Fuel Cells
www.utcfuelcells.com

Government Agencies
California Air Resources Board
www.arb.ca.gov
California Energy Commission
www.energy.ca.gov
South Coast AQMD
www.aqmd.gov
U.S. Department of Energy
www.energy.gov
U.S. Department of Transportation
www.dot.gov
U.S. Environmental Protection Agency
www.epa.gov

Transit Agencies
AC Transit
www.actransit.org
Santa Clara-VTA
www.vta.org
Sunline Transit Agency
www.sunline.org

Fuel Technology
Air Products and Chemicals
www.airproducts.com
BP
www.bp.com
Chevron
www.chevron.com
ExxonMobil
www.exxonmobil.com
Shell
www.shell.com

Power
BP
www.bp.com
Chevron
www.chevron.com
ExxonMobil
www.exxonmobil.com
Shell
www.shell.com

Technology
Ballard Power Systems
www.ballard.com
UTC Fuel Cells
www.utcfuelcells.com

A-Team
Audit
Executive Director
Planning
Membership

E-Team
Steering Team

C-Team
Program Implementation (CaFCP Staff)
Technical Programs (CaFCP Member Staff)

Technical

Safety
Interoperability
Study

Administrative

Media
Public Outreach
Stakeholder Outreach
progress