SANDIA NATIONAL LABORATORIES
FCTP MARKET TRANSFORMATION PROGRAM

QUARTERLY PROGRESS REPORT FOR JANUARY 1–MARCH 31, 2012

SUBMITTED BY: DANIEL DEDRICK, (925) 294-1552, DEDEDRI@SANDIA.GOV

RECIPIENT: SANDIA NATIONAL LABORATORIES

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Sandia National Laboratories

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

FCTP MARKET TRANSFORMATION PROGRAM

COVERING PERIOD: JANUARY 1, 2012 THROUGH MARCH 31, 2012

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PRINCIPLE INVESTIGATOR: LENNIE KLEBANOFF (925-294-3471, LEKLEBA@SANDIA.GOV)

OTHER KEY NATIONAL LAB RESEARCHERS: JOE PRATT, KARINA MUNOZ-RAMOS, ABBAS AKHIL, DITA CURGUS, BENJAMIN SCHENKMAN

FY 2012 MILESTONES/DELIVERABLES

Task	Planned	Status
Task 1—Assessment of the Use of Stationary Fuel Cell Power at the Sandia Kauai Test Facility on the Pacific Missile Range Facility, Kauai, HI		
Subtask 1.1—Engage stakeholders at the KTF, PMRF, and the local utility to pave the way for project initiation		Complete
Subtask 1.2—Write and submit proposal to the Navy for fuel cell support of the Navy Aegis Assure Program		Not executed; decision by PMRF commander
Subtask 1.3—Write and submit final feasibility report	9/30/2012	In progress
Task 2—Fuel Cell Mobile Lighting		
Subtask 2.1—Program management		
Final project report	9/30/2011	9/30/2012
Subtask 2.2—Modification of original "alpha" prototype		
Complete modifications to alpha unit	8/1/2010	Complete
Begin field test of upgraded alpha unit	9/1/2010	Complete
Complete alpha unit field test	9/30/2010	9/30/2012
Subtask 2.3—Design, Construction, testing and field testing of a "show unit"		
Complete design of show unit	6/1/2010	Complete
Complete construction of show unit	8/1/2010	Complete
Complete final testing of show unit	9/1/2010	Complete
Show unit at trade shows in 2011, then transfer to Saunders Elect.	9/1/2010	Complete

Task	Planned	Status
Subtask 2.4—Design, construction, testing and field test of a "hybrid" fuel cell mobile light for field testing at SFO		
Complete design of hybrid fuel cell mobile light	7/1/2010	Complete
Complete construction of a hybrid fuel cell mobile light system	10/1/2010	Cancelled
Complete final testing of the hybrid system	11/1/2010	Cancelled
Begin deployment of Beta fuel cell mobile light at SFO	12/1/2010	6/1/2012
Complete field testing of Beta mobile light at SFO	9/30/2011	9/30/2012
Subtask 2.5—Design, construction, testing and field test of a fuel cell mobile light for the kennedy space center		
Complete design of the KSC unit	7/1/2010	Complete
Complete construction of the KSC unit	9/1/2010	Complete
Complete final testing of the KSC unit	10/1/2010	Complete
Begin deployment of KSC unit	11/1/2010	Complete
Complete field testing of KSC unit	9/30/2011	9/30/2012
Subtask 2.6—Design, construction, testing and field test of a fuel cell mobile light for the Boeing manufacturing plant and Paine field		
Complete design of the Boeing unit	8/1/2010	Complete
Complete construction of the Boeing unit	9/1/2010	Complete
Complete final testing of the Boeing unit	10/1/2010	Complete
Begin deployment of Boeing unit	11/1/2010	Complete
Complete field testing of Boeing unit	9/30/2011	Cancelled
Subtask 2.7—Construction and testing of a fuel cell mobile light for Disneyland		
Complete design of the Disneyland Unit	9/1/2010	Not executed
Complete construction of the Disneyland unit	10/1/2010	Not executed
Complete final testing of the Disneyland unit	11/1/2010	Not executed
Begin deployment of Disneyland Unit	12/1/2010	Not executed
Complete field testing of Disneyland unit	9/30/2011	Not executed
Task 3—Hydrogen ICE Bus Demonstration and Community Outreach	03/2011	Complete
Final project report on bus use, GHG savings, energy savings, community response, employee response, possible employee survey, Joint with LLNL.	In progress	9/30/2012

TASK 1—ASSESSMENT OF THE USE OF STATIONARY FUEL CELL POWER AT THE SANDIA KAUAI TEST FACILITY ON THE PACIFIC MISSILE RANGE FACILITY, KAUAI, HI

BACKGROUND

This task describes the activities to be conducted at Sandia National Laboratories in FY 2012 in support of DOE's program for stationary fuel cell market transformation. Sandia operates the Kauai Test Facility (KTF), a missile test installation located on the greater Pacific Missile Range Facility (PMRF), Kauai, HI. There are two potential opportunities for placing a stationary fuel cell at this military facility. The first is at the KTF facility itself. The second opportunity is to place a fuel cell to provide power support for the upcoming Aegis missile test program, in which a shipboard defensive missile system will be tested at the PMRF by the Navy. The testing of this nominally shipboard-based system will require the establishment of significant new infrastructure at the PMRF. The KTF currently suffers from low-quality grid power at the site, which must often be supplemented by diesel generators. In addition to this installation at the military facility, there is the broader question of bringing fuel cell technology to the island of Kauai.

ENGAGE STAKEHOLDERS AT THE KTF, PMRF, AND THE LOCAL UTILITY TO PAVE THE WAY FOR PROJECT INITIATION

As part of the project, we engaged stakeholders and third parties capable of providing or seeking funding for the project. We established a connection with the Sandia staff member in charge of the KTF (Steve Yesner). We also enlisted the support of Golden State Energy/Steam Power Partners (Tom Damberger, Steve Petty), who have the world's deepest experience in installing stationary fuel cell systems from Fuel Cell Energy. Through our KTF Sandia contact, we communicated with the PMRF site commander. In addition, we established connections with the Ken Oscar and Bill Martin from Fluor Company, who have extensive experience with large alternative-energy installations. As time passed, we also brought into our team Joe Boivin from Hawaii Gas.

WRITE AND SUBMIT PROPOSAL TO THE NAVY FOR FUEL CELL SUPPORT OF THE NAVY AEGIS ASSURE PROGRAM

The original idea was that once the fuel cell analysis indicated feasibility and local stakeholders were engaged, we would write and submit a proposal to the Navy for the installation of stationary fuel cell power at the KTF/PMRF. This proposal would have been led by Fluor. After much discussion with the local PMRF commander, it became clear that they would not entertain a proposal using fuel cells, due in part to an unsuccessful stationary fuel cell project ongoing on the PMRF site. Instead, interest turned to the non-military areas of Kauai.

The group investigated the feasibility of bringing liquid natural gas (LNG) to the island. The large stationary fuel cells require NG, and no land-based NG is available on Kauai. Research by Steam Power Partners (Damberger, Petty) and Hawaii Gas (Boivin) indicated that LNG could be

brought to the island in cryogenic shipping containers, and that this method of LNG delivery was being conducted in Europe. Analysis indicated that the total cost for power (including LNG costs) derived from the fuel cell would be of order $0.30 /kW-hr, which is less than the current residential rate of ~ $0.40/kW-hr.

Previously, Steam Power Partners has been exploring the interest of certain parties on Kauai for such a fuel cell system. However, in this past quarter, effort has turned to understanding a change in the tax laws associated with such projects. The change requires that a third-party investor such as Steam Power Partners bundle together with other projects. This considerably raises the threshold for initiating a project, as bundling adds an administrative complication. This past quarter, we have had several discussions with Steam Power Partners to identify other possible projects that can be considered bundling partners. That discussion is ongoing.

Over the past three months, The Gas Company has been working with the necessary regulators/Hawaiian PUC to address the issue of importing LNG to the Hawaiian Islands. Importing LNG would be necessary to fuel any stationary fuel cell deployed in Hawaii. The environmental alliances in Hawaii are very concerned about the importation of any fossil fuels. Steam Power Partners and Golden State Energy have been in contact with The Gas Company regarding several specific host sites on Oahu as the initial cornerstone for the fuel cell technology. Initial investigations of the availability of biomethane at the largest wastewater treatment plant on Sand Island in Oahu revealed sufficient fuel to drive a 1.4 MW fuel cell power plant. This proposition does, however, have issues because biomethane is not currently classified as a renewable fuel in Hawaii. There is legislation working its way through the legislative process that would add it to the renewable mix.

Until such time as the path is clear to import sufficient quantities of LNG into Hawaii, the ability to site fuel cells in the state will continue to be limited. Although Steam Power Partners has a number of significant opportunities, the fuel situation is the unique milestone to activate placement of fuel cells.

Milestone Status for Task 1

9/30/2012: Final feasibility report for placing stationary fuel cell at the KTF/PMRF.

We will submit a final report on the economic and technical feasibility of placing a stationary fuel cell in the Hawaiian Islands, with a description of progress for actually placing a unit there. In addition, we will examine the net greenhouse and pollutant gases avoided by installation of the stationary fuel cell power.

TASK 2—FUEL CELL MOBILE LIGHTING

This report summarizes the activities conducted at Sandia National Laboratories, in collaboration with its project partners, with status update for Q2 of FY 2012 in support of DOE's program for fuel cell market transformation. In this project we originally targeted the construction of 5 fuel cell mobile lighting systems for field testing: one at San Francisco International Airport (SFO);

one for Paramount Pictures and for use of Saunders Electric, Inc.; a third unit was targeted for use at the Kennedy Space Center, Cape Canaveral, Florida; a fourth unit was planned for use at the Boeing Manufacturing Facility (and Paine Airfield) in Everett, Washington; a fifth unit was originally planned for use at Disneyland, but discussions with Disneyland did not lead to an agreement to deploy there.

Milestone Status for Subtask 2.1

9/30/2011: Final project report: Writing of the final report has been delayed as the units are only now being introduced into the field for testing.

MODIFICATION OF ORIGINAL "ALPHA" PROTOTYPE FOR DEPLOYMENT WITH CALTRANS

Objective: Modify the existing alpha system prototype to allow its use in road construction work with Caltrans.

Discussion: This modification of the alpha took place in Q3 FY2010. However, we decided to use the modified alpha system in the entertainment realm. The upgrades included a better cabinetry and weatherproofing of the lights in standard Multiquip lamp housings. The unit now resides with Saunders Electric for use in entertainment industry events. The auxiliary power for the unit remains unchanged, as we decided to use the "beta" systems to evaluate the integrated electronic packages for the technology. Instead, a beta unit was deployed with Caltrans in Q2 FY2012.

In the past quarter, a "cold-weather package" was developed for the fuel cell mobile light by Altergy Systems. This proprietary technology allows the unit to be started in very cold weather. A beta unit with cold-weather package was delivered to Caltrans on February 18, 2012 at the District 3 Kingvale facility near Lake Tahoe and the road crew was instructed in its use. The unit was run at the facility to provide lighting and also taken out for various night tasks including rock removal from hills near roads (to remove hazards), for shoulder repair work, and also for lighting a "chain checkpoint" during nights with heavy snow. The unit has performed well, but one of the lights on the unit has gone out.

We have seen on a number of occasions that the plasma lights will go out, even if the fuel cell is performing normally. We are currently investigating this issue.

Milestones for Subtask 2.2

8/1/2010: Complete modifications to alpha unit. Status: Complete.

9/1/2010: Field test upgraded alpha unit with Saunders Electric. Status: Unit deployed in entertainment industry events such as the Academy Awards and the Golden Globe Awards.

9/30/2011: Complete alpha unit field test. Status: Unit just beginning field testing in Los Angeles.

DESIGN, CONSTRUCTION, TESTING AND FIELD TEST OF A FUEL CELL MOBILE LIGHT OPTIMIZED FOR THE ENTERTAINMENT INDUSTRY

Objective: Design a fuel cell mobile light system that is optimally useful to the entertainment industry.

Discussion: Based on our early learning with the alpha system, we originally planned to design a near-commercial "alpha prime" version of fuel cell mobile light that still employs high-pressure hydrogen storage but is modified in other ways for optimal performance for the film industry. The original plan was for Paramount and Saunders to provide the performance specifications regarding lighting level and control, auxiliary power requirements, weight, volume, and allowable noise for the system. We decided not to construct such an entertainment industry "alpha prime" system. Rather a "show unit" was constructed for Multiquip to demonstration at construction equipment shows to promote customer interest. This unit was showed extensively in 2011.

In October of 2011, we made the decision not to show the unit at shows, and focus on the field-testing needed for commercialization. The show unit was then sent to Saunders Electric in November of 2011 in anticipation of the upcoming awards-show season in Hollywood. The "show" beta unit, along with the modified alpha unit, was used at the following Hollywood award shows from January through March 2012: 2012 Screen Actors Guild Awards, 2012 Golden Globe Awards, and the 2012 Academy Awards. At each of these venues, we solicited feedback from those using them on ways to improve the units and engaged with technical administrators on site to spread the new more broadly about fuel cells.

Milestones for Subtask 2.3

6/1/2010: Complete design of show unit mobile light. Status: Constructed a "show" beta unit instead, which can eventually be used for field testing. Show unit design finished 6/1/2010.

8/1/2010: Complete construction of the show unit. Status: Show industry unit completed 9/1/2010.

12/1/2010: Show unit at trade shows. Status: "show unit" shown at the World of Concrete 2011, PowerGen 2010, and the National Association of Broadcasters Meeting 2011. Show unit then sent to Hollywood CA for use by Saunders Electric.

DESIGN, CONSTRUCTION, TESTING, AND FIELD TEST OF A "HYBRID" FUEL CELL MOBILE LIGHT FOR FIELD TESTING AT SFO

Objective: Assess the use of metal hydride technology in the fuel-cell mobile light product.

Discussion: An alternative method to high-pressure storage of hydrogen is to employ a metal hydride "bed" as the storage medium. One advantage of using a metal hydride system is a greater volumetric storage density, thereby allowing more hydrogen to be stored in a given space, which

increases mobile light duration. Another advantage is that a metal hydride allows a lower overall system pressure, thereby increasing safety. These advantages are offset by the higher cost of metal hydride tanks (at least currently), and managing the thermal issues that arise because the metal hydride bed material must be heated to release its hydrogen and heat must be removed from the tanks when they are refueled. We felt it important for Multiquip to gain some experience with the metal hydride technology so that when the metal hydride storage becomes more affordable in the years ahead and can be used in production units, personnel are familiar with the technology.

Sandia designed the hybrid fuel cell mobile light in the summer of 2011, in collaboration with Multiquip and Altergy Systems. The parts for the unit were ordered in the fall of 2011, and all components were delivered to Multiquip in Boise, Idaho. Construction of the unit was to commence in April 2012; however, an unanticipated event changed this plan: our manufacturing partner, Ovonic Hydrogen Systems, was purchased by another company (BASF), without an interest in hydrogen storage. Therefore, our Ovonic project personnel were no longer involved with hydrogen storage technology and we no longer had a commercial source for a metal hydride tank. We decided to cancel plans to construct the hybrid system, due to lack of manufacturing support. Instead, the beta unit destined for Boeing will be re-directed to SFO for field testing in June 2012.

Milestones for Subtask 2.4

7/1/2010: Complete design of hybrid fuel cell mobile light. Status: Completed 8/31/2011.

10/1/2010: Complete construction of a hybrid system. Status: Activity cancelled.

11/1/2010: Complete final testing of the hybrid mobile light. Status: Activity cancelled.

12/1/2010: Begin field test of the hybrid unit at SFO. Status: Activity cancelled. Instead, we will field-test a beta unit at SFO beginning 6/1/2012.

9/30/2010: Complete field test of SFO beta unit. Status: Planned for 9/30/2012.

DESIGN, CONSTRUCTION, TESTING, AND FIELD TESTING OF A FUEL CELL MOBILE LIGHT FOR THE KENNEDY SPACE CENTER

Objective: Build and field test one fuel cell mobile light for use at the Kennedy Space Center.

Discussion: One of the beta fuel cell mobile lights has been in use at the Kennedy Space Center (KSC), in collaboration with NASA. The purpose of the deployment is to gather system duration information in a hot, humid, and salty air environment. This information will allow Multiquip to gather much-needed endurance information prior to fuel cell mobile light commercialization.

The unit was designed, constructed, and deployed at the Kennedy Space Center in August 2011. It is noteworthy that for the final Space Shuttle launch in July 2011, the upgraded alpha unit was

deployed in the International Press area. As of April 16, 2012, the unit has been refueled 4 times at the Kennedy Space Center (KSC), and has performed flawlessly. The unit is showing some normal rusting of exterior elements, involving the external winching used to raise and lower the lights. The unit is currently undergoing inspection for any interior degradation. The unit is being used to provide security lighting for a new building at the KSC site.

Milestones for Subtask 2.5

7/1/2010: Complete design of the KSC unit. Status: Completed 5/1/2011.

9/1/2010: Complete construction of KSC unit. Status: Completed 7/1/2011.

10/1/2010: Complete final testing of the KSC unit. Status: Completed 7/15/2011.

11/1/2010: Begin deployment of KSC unit. Status: Deployment commenced 8/1/2011.

9/30/2011: Complete field testing of the KSC unit. Status: To be completed 9/30/2012.

DESIGN, CONSTRUCTION, TESTING AND FIELD TESTING OF A FUEL CELL MOBILE LIGHT FOR BOEING MANUFACTURING AND PAINE FIELD USE

Objective: Build one fuel cell mobile light for use in the Boeing Manufacturing Plant and for their Paine Field Operations in Everett, Washington.

Discussion: The purpose of the deployment is to gather duration information in a cold and rainy environment, in manufacturing and Air Field operations. This information will allow Multiquip to gather much-needed endurance information prior to commercialization.

The unit was designed by 6/1/2011, constructed by 7/15/2011, tested, and shipped to Boeing by 8/15/2011. The unit was introduced to Boeing staff on 8/30/2011. The unit has not yet been deployed because Boeing was conducting a thorough safety review of the system. The Boeing unit was sent to the Aberdeen Proving Ground on November 16, 2011 to support a DOE-related fuel cell event, at DOE request.

At this Aberdeen event, some problems occurred with the unit operation. Specifically, the lights would come on and then shut down. Evaluation of the unit after the event indicated that an intermittent contact problem in the fuel cell's interior caused the problem. The problem was repaired, and the issue was noted for future construction of fuel cells by Altergy Systems.

A new generation of plasma lights with greater thermal efficiency is now available. We are evaluating these to determine if they should be put on the Boeing unit for evaluation. With the departure of our project personnel from Ovonic Hydrogen Systems, we will be diverting this "Boeing unit" to SFO for deployment in their runway repair operations. Because the SFO hydrogen station will not be available until 2013, we plan to convert the refueling manifold on

the Boeing beta system to allow facile fueling from compressed tanks of H_2 which are commercially available.

Milestones for Subtask 2.6

8/1/2010: Complete design of the Boeing unit. Status: Completed 6/1/2011.

9/1/2010: Complete construction of the Boeing unit. Status: Completed 7/15/2011.

10/1/2010: Complete final testing of the Boeing unit. Status: Completed 8/1/2011.

11/1/2010: Begin deployment of Boeing unit. Status: Delayed originally, deployment switched to SFO, commencing 6/1/2012.

9/30/2011: Complete field testing of the Boeing unit. Status: Cancelled; unit will be sent to SFO instead for deployment from 6/1/2012 – 9/30/2012.

DESIGN, CONSTRUCTION, TESTING AND FIELD TESTING OF A FUEL CELL MOBILE LIGHT OPTIMIZED FOR DISNEYLAND

Objective: Build and field test one fuel cell mobile light, for use at Disneyland in Anaheim, CA.

Discussion: The original plan was to build a fuel cell mobile light for deployment at Disneyland. The purpose is to use the technology and demonstrate in collaboration with Disney in both park maintenance and park theatrical operations. However, after multiple discussions with Disneyland, they decided they were not interested in hydrogen fuel cell technology. The Disney unit was therefore not built. Instead a "show unit" was constructed (see above).

TASK 3—HYDROGEN ICE BUS DEMONSTRATION AND COMMUNITY OUTREACH

OBJECTIVE

Partner with LLNL to maintain a hydrogen bus (taxi service) program servicing the SNL CA and LLNL sites, and continue outreach programs to engage, support, and educate the local community of the Tri-Valley, San Joaquin County, and other East Bay areas on emerging hydrogen technologies.

DISCUSSION

Our approach to this project was as follows: Prior to receiving the buses, extensive discussions were carried out with LLNL and SNL facilities management, and with the LLNL site manager for the Nuclear National Security Administration to secure "buy-in" for the project. With the project receiving strong acceptance and support, we leased the H_2 buses from the Ford Motor Company, followed by an initial certification of them in collaboration with Ford maintenance

staff. During this certification phase, we designed appealing "wraps" for the buses to bring attention to their H_2 technology. There are no hydrogen stations currently operating in the Tri-Valley area, so we had to establish a mobile refueling station at the LLNL site using an Air Products mobile refueler. With reliable fueling established, the buses were integrated into the LLNL/Sandia taxi service, replacing two buses that were operated on diesel fuel. Thus, use of the H_2 buses led to a decrease in diesel fuel use at the two laboratories. Furthermore, the H_2 buses were used for educating the local public on the benefits of hydrogen and fuel cell technology. We managed frequent maintenance problems that arose with the buses, these problems being unrelated to the hydrogen technology (except for the need to replace a sensor, with the failure being detected with on-board diagnostics), and many involved traditional bus mechanical systems.

RESULTS

In November of 2010, the two H_2 buses were integrated into the LLNL/SNL fleet. The buses traveled all over the LLNL and SNL sites, as well as to the local commuter train station, picking up LLNL and SNL employees and transporting them to our campuses. The typical ridership per shuttle bus is approximately 80–100 passengers/day with each H_2 bus traveling approximately 80–100 miles each day. The H_2 buses are "topped off" with approximately 13 kg of hydrogen each day. We put 8,757 miles on the buses in the first six months of operation (as of June 30, 2011). The average number of miles driven by each bus is 730 miles per month. With regard to a fuel comparison, the average number of gallons of diesel used on our previous buses is 168 gallons per month (per bus), so substantial fuel savings was realized. It is our understanding that this level of use is among the highest for DOE facilities using such buses. Both buses found extensive use in a number of community outreach activities. Two of these are described in more detail below.

The first community event was a joint SNL/LLNL Celebration of Hydrogen Technology in downtown Livermore on February 22, 2011. This event was organized by the project and LLNL and SNL protocol and public relations personnel. Approximately 70 members of the public, media, local dignitaries, and LLNL and SNL management and staff were on hand to see the two H_2 buses, along with the H_2 Fuel Cell Mobile Light, the cryocompressed hydrogen vehicle from LLNL, and a number of posters on hydrogen research and development being conducted at the labs. Speakers included:

1. Ron Cochrane, Executive Officer from LLNL and Bob Carling, Director of the Transportation Energy Center from SNL.
2. John Garbak, DOE Technology Development Manager
3. John Marchand, Vice Mayor, City of Livermore
4. Alice Williams, Nuclear National Security Administration Site Manager

KPIX television (San Francisco) broadcast video from the celebration on their evening news including an interview with the Sandia PI Klebanoff, and press from two local newspapers attended as well. Representatives from Congressmen Garamendi's and McNerney's offices and

California State Assembly member Joan Buchanan were also in attendance. Members of the public were given rides on the buses and had a chance to talk with LLNL and SNL staff scientists about the hydrogen technology depicted in the posters. In another community outreach event one of the H_2 buses was on display at the Expanding Your Horizons conference on Saturday February 26, 2011, at the Diablo Valley Community College, San Ramon campus, with rides given to attendees. The Expanding Your Horizons conference serves to:

- Increase the interest of young women in math and science through positive hands-on experience (over 300 present).
- Foster awareness in math- and science-related careers.
- Provide young women with opportunities to meet and interact with positive role models who are active in math- and science-related careers.

Other outreach events included the John Muir Birthday-Earth Day Celebration in Martinez, California, on April 16, 2011. This event provided a shuttle service from the parking area to the event main gate. Over 1,000 people attended this event. In addition, lectures were given on hydrogen technology (fuel cells, hydrogen storage, H_2 bus, H_2 mobile light) to an environmental science class at Las Positas Community College in Livermore on April 12, 2011. One of the buses was also used at the SNL "Take Your Daughters and Sons to Work Day" on April 28, 2011. The buses were on display at the Bay Area American Chemical Society meeting in Oakland, California on April 30, 2011. The buses were also highlighted at the LLNL internal safety fair on June 22, 2011. Finally, the buses were on display at the opening of the Innovation for the Green Advanced Transportation Center in Livermore, which is located near the laboratories, on June 30, 2011. The opening was attended by 300 people including Congressman John Garamendi. At all of these events we handed out brochures that explain the DOE Hydrogen Market Transformation sub-program and information about the buses. We were on hand to answer questions about the buses.

CONCLUSIONS

Two Ford H_2 buses were successfully integrated in the LLNL/SNL taxi fleet. They have been extensively used for transporting laboratory staff both within the LLNL/SNL campuses and also to a local commuter rail stop. To our knowledge, the LLNL/SNL buses have received the most use (highest number of miles driven, greatest number of refuelings) of any H_2 bus effort in the DOE program.

In fall of 2011, the project concluded when buses were returned to Ford due to ongoing maintenance problems not associated with the hydrogen technology. It was deemed that local Ford maintenance support for the buses was not sufficient to continue the project.

MILESTONES

9/30/2012: Final project report on bus use, GHG savings, energy savings, community response, employee response, possible employee survey. Joint with LLNL.