9. Technology Validation

Introduction

In addition to the technical challenges being addressed through research, design, and development, there are obstacles to successful implementation of fuel cells and the corresponding hydrogen infrastructure that can be addressed only by integrating the components into complete systems. After a technology achieves its technical targets in the laboratory, the next step is to show that it can work as designed within complete systems (i.e., fuel cell vehicles and hydrogen refueling infrastructure).

Technology validation confirms that component technologies can be incorporated into a complete system solution and that system performance and operation are met under anticipated operating scenarios. DOE is developing and testing complete system solutions that address all elements of infrastructure and vehicle technology, validating integrated hydrogen and fuel cell technologies for transportation, infrastructure, and electric generation in a systems context under real-world operating conditions. Data will be collected to determine whether targets have been met under realistic operating conditions, to provide feedback on progress, and to efficiently manage the research elements of the program while providing redirection as needed.

In this merit review activity, each reviewer was asked to respond to a series of questions, involving multiple-choice responses, expository responses where text comments were requested, and numeric score responses. In the pages that follow, the reviewer responses to each question for each project will be summarized: the multiple choice and numeric score questions will be presented in graph form for each project, and the expository text responses will be summarized in paragraph form for each question. A table presenting the average numeric score for each question for each project is presented below.

Presentation Title	Principal Investigator and Organization	Page Number	Relevance	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Controlled Hydrogen Fleet & Infrastructure Analysis	Keith Wipke, National Renewable Energy Laboratory (NREL)	9-6	4.00	3.75	3.75	3.75	3.50	3.78
Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project	Dan Casey, Chevron	9-8	4.00	3.80	3.60	3.60	3.20	3.68
Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project	Mike Veenstra, Ford Motor Company	9-10	3.67	3.67	3.33	3.17	3.17	3.43
Hydrogen to the Highways	Ronald Grasman, Daimler	9-12	4.00	3.60	3.60	3.40	3.20	3.62
Hydrogen Vehicle and Infrastructure Demonstration and Validation	Rosalind Sell, General Motors Corporation	9-14	3.83	3.83	3.67	3.33	3.00	3.63
Validation of an Integrated Hydrogen Energy Station	Edward Heydorn, Air Products	9-16	3.80	3.80	3.40	3.40	3.60	3.58
California Hydrogen Infrastructure Project	Edward Heydorn, Air Products	9-18	3.60	3.40	3.20	3.60	3.40	3.38
Technology Validation: Fuel Cell Bus Evaluations	Leslie Eudy, National Renewable Energy Laboratory (NREL)	9-20	3.40	3.60	3.40	3.60	3.20	3.44
Hawaii Hydrogen Energy Park	Richard Rocheleau, Hawaii Natural Energy Institute	9-22	3.75	3.75	3.00	4.00	3.75	3.48

Presentation Title	Principal Investigator and Organization	Page Number	Relevance	Approach	Technical Accomplishments	Collaborations	Future Research	Weighted Average
Detroit Commuter Hydrogen Project	*Jody Egelton, Southeast Michigan Council of Governments (SEMCOG)*	*9-24*	*2.80*	*3.00*	*2.40*	*3.20*	*2.40*	*2.68*
Tanadgusix (TDX) Foundation Hydrogen Project	*Katherine Keith, Tanadgusix Foundation*	*9-26*	*2.20*	*2.20*	*2.25*	*2.20*	*2.20*	*2.22*
Texas Hydrogen Highway - Fuel Cell Hybrid Bus and Fueling Infrastructure Technology Showcase	*David Hitchcock, Texas Hydrogen Highway*	*9-28*	*2.60*	*2.40*	*1.75*	*2.40*	*2.40*	*2.18*
Florida Hydrogen Initiative	*Pam Portwood, Florida Hydrogen Initiative*	*9-30*	*1.83*	*1.83*	*2.17*	*2.50*	*1.83*	*2.03*
OVERALL AVERAGE FOR TECHNOLOGY VALIDATION			**3.31**	**3.26**	**3.06**	**3.21**	**2.96**	**3.16**

NOTE: Italics denote poster presentations.

Overview of Technology Validation: John Garbak, U.S. Department of Energy

1. Was the Sub-program area adequately covered? Were important issues and challenges identified? Was progress clearly presented in comparison to the previous year?

A reviewer stated the challenges and focus of work were clearly identified. Total progress was well-outlined (total miles traveled, fuel dispensed), and over a million miles of travel is a significant accomplishment. Progress on durability also appears good (60,000 miles). Comparison to 2008 was not presented in the overview, but may not be as relevant to this program of vehicle demonstration as the total accomplishments will be. Progress in the data collection aspect since 2008 is very good. Another reviewer commented that a detailed overview of Technology Validation efforts was provided. Goals, objectives and key targets were addressed. The current number of fuel cell vehicles and stations were provided. Future projects, including the project at the Volcano National Park were discussed. One reviewer noted they wanted to hear more about the DOE's plans for the future and progress from the previous year. For example, what about the distance of H_2 vehicles, start up time, performance and life cycle of the PEM in vehicles? What about the stationary power generation? Is DOE testing different sizes and getting results? Comments from another reviewer mentioned the sub program overview was adequately presented. The program has been in existence for four years and has made a lot of progress. Several demonstrations and large data base development is underway which provide good information on vehicles, infrastructure, safety, etc. This is invaluable for making the case for fuel cell vehicles and hydrogen refueling infrastructure. Program is on target to meet 2009 goals, including 2000 hr durability by 2010. Recent results include 1.9 million miles traveled using 140 vehicles, 85,000 vehicle miles, 6 stations, refueling at 700 bar, and climate effects analysis. Good data on Gen 1 vehicles has been collected; Gen 2 vehicles are now on the road and being evaluated. The challenge continues to be fuel cell durability.

Another reviewer stated they didn't attend the previous year, but from what they saw this year, it appeared to be adequately covered. Challenges of hydrogen infrastructure were discussed in detail. The change in strategy of the new Administration was covered briefly during the plenary session. It was a difficult topic because this area receives zero funding in the 2010 President's Budget Request. One reviewer commented the Sub-program area was adequately covered as it fully explained the scope of the program and requirements. Important issues and challenges were fully identified as one would hope for in a program important for the long-term energy security of the nation. Comments from one reviewer said they believe the presentations and the progress are excellent while another reviewer noted this sub-program is based largely on vehicle learning demos and was adequately covered and justified. Another reviewer mentioned the presentation covered the tech validation program well and the 2009 progress was clearly shown, but there was not an obvious comparison with 2008. This was a very brief presentation. Three reviewers answered yes to this question, with one adding the targets are being met with impressive numbers of vehicles/stations; the cost is dropping substantially on fuel cell stack and hydrogen cost.

2. Are plans identified for addressing issues and challenges? Are there gaps in the project portfolio?

A reviewer stated a budget request of zero for 2010 will be a problem for this program. Is there a plan for addressing this issue should this be part of the final 2010 appropriation? Are there other DOE partners (vehicle systems, Clean Cities, other) that could help? Other challenges (data on refueling events, real-world operation of vehicles in variety of climates, etc.) are well-outlined and addressed by the program. There do not appear to be any significant gaps in the program. Another reviewer noted that challenges, including a $0 budget for next year, were addressed including plans to work closely with industry partners. One reviewer mentioned there do not appear to be gaps in the project portfolio. There are many challenges in deploying hydrogen fuel cell vehicles and the accompanying infrastructure, but it appears that funding from DOE in this area will be scarce in the near-term to address them. Comments from another reviewer said the zero request for FY2010 is the major issue. If this holds, the sub-program will cease to exist. If not, continuing to get data on the Gen 2 vehicles to address durability will be the major objective and challenge. Another reviewer stated that apart from new funding, there are no gaps in the project portfolio and all issues and

challenges appear to be soberly presented. As for the funding shortfall, not much can be done unless national leadership changes its will. One reviewer commented they are fortunate to have been part of Ford's effort to unveil a fuel cell vehicle prototype publicly five years ago and also to have been a hands-on witness to the latest design levels of fuel cell vehicles in the past year. The progress by the auto companies in their fuel cell vehicle programs over the five years has been outstanding, if not awe inspiring. The DOE deserves a lot of credit for its contribution to this progress. Comments from one reviewer noted the performance of FC vehicles under real life conditions, and the documentation and analysis of same are very important activities while another reviewer mentioned they would like to see more on infrastructure of production and storage. Another reviewer stated the presentation was too brief to cover all the topic areas. One other reviewer noted that the future plans were identified but will they be able to be met without funding? Two reviewers agreed that the plans were identified and there were no apparent gaps.

3. Does the Sub-program area appear to be focused, well-managed, and effective in addressing the DOE Vehicle Technologies Program R&D needs?

A reviewer stated this sub-program appears to be well-organized, and is effectively providing the vehicle, infrastructure, and fuel cell partners with useful real-world information on performance, reliability, and operation. It is addressing the needs that the Hydrogen Program has for data and experience. Data collection and analysis portion of the program is very carefully planned (special Matlab tools developed), and provides adequate safeguards against distribution of proprietary data while giving more than adequate information for the public to be used in the Hydrogen Program activity. Another reviewer mentioned this is a well-managed program that is working diligently to validate hydrogen and fuel cell technologies in real-world applications. The program also works to determine the current state of the technologies to assist the direction of future research. Comments from another reviewer said the Sub-program is well managed. Data collection and dissemination is an effective and transparent process. A well-designed data matrix was developed. The Sub-program is focused on transportation and FCVs. If the 2010 budget holds and hydrogen FCVs are eliminated it will not be effective in meeting program goals. Another reviewer noted the Sub-program is well-focused, well-managed, and effective in meeting Hydrogen Program R&D objectives. One reviewer stated it was hard to tell from this presentation and there is a need to explain the relationship with all DOE labs especially NREL. Comments from one reviewer said the subprogram is well focused, well managed and appears to be effective in supporting the DOE program and its goals. Six of the reviewers answered yes to all of the questions with one adding it seems all the targets are being met and providing crucial data to overcome technical issues. This reviewer went on to say they are not sure what will happen if the budget is not restored or at least supplemented by Congressional appropriations. One other reviewer who answered yes also said the DOE deserves a lot of credit for its contribution to the great amount of progress in the product development of fuel cell vehicles. The comments by the auto industry representatives gave this observer a confident belief that the key players can see the finish line in terms of being able to commercialize these products.

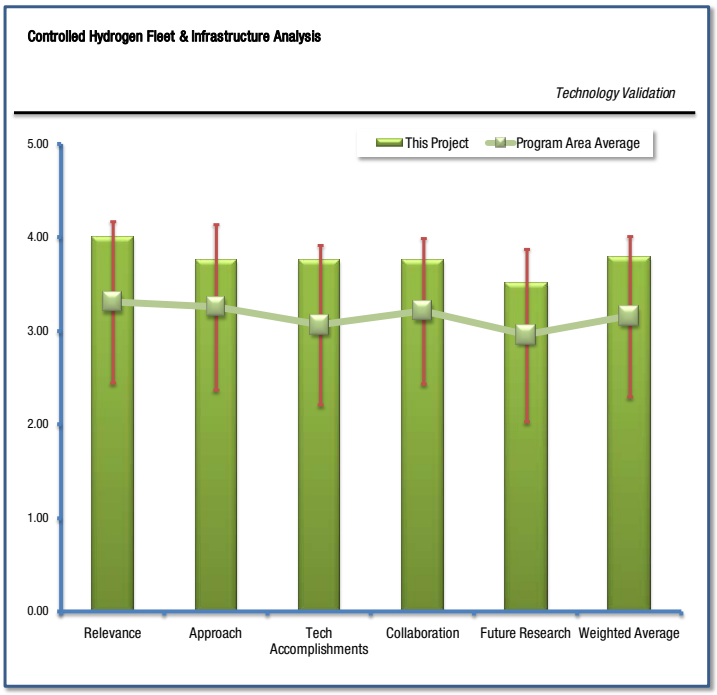
4. Other comments:

A reviewer stated it would be interesting to hear about the findings from the retired vehicles (overall condition of vehicles, did teardowns occur), but some of this may be proprietary. The public outreach products are very informative and extensive, giving diverse ways to examine the data produced by the project. Details of the operation of the vehicles should be very useful to manufacturers in improving the next generation of fuel cell vehicles. Analysis of the greenhouse gas emissions (W-T-W) is a very important addition to address objections, especially regarding hydrogen production via electrolysis (the electricity emissions issue). Another reviewer queried why is the cost target $2-3 per gge for 2015? That seems a bit vague, what is the reason? How will the reduction in funding levels affect the existing and continuing technology validation projects? Will there have to be drastic cuts or elimination in some projects?

A reviewer asked how the program can justify the cost of continuing data collection in the fleet vehicles and new construction at the Hawaiian power park at this time. One reviewer asked why there was a 50% decrease in funding from FY2008 to 2009. With the likely zero vehicular H2 budget for FY2010, there does not seem much hope for H2 in

the foreseeable future which is a shame! Comments from another reviewer said the Sub-program is commendably well-run and advances clean and green reasonable alternatives to meet advanced transportation alternatives. Another reviewer asked if, given the decision by the DOE to discontinue vehicular hydrogen, this activity will continue in FY-2010. One reviewer noted it was also good to see progress in terms of hydrogen fueling infrastructure while another reviewer said this was a thorough and comprehensive presentation.

Controlled Hydrogen Fleet & Infrastructure Analysis: Keith Wipke, National Renewable Energy Laboratory (NREL)



Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
One reviewer feels that the collection of vehicle and fueling data under realistic, real-life operating conditions is vitally important to assess the of the technology validation effort. They pointed out that the collected data provides critical information to both the hydrogen program participants and to the general public. Another reviewer said that the project is very relevant to DOE's objectives prior to phasing out hydrogen funds. They also feel that the project needs better marketing or promotion to let public and government officials know about the program, progress, etc.

Other reviewers also said that the data is enormously valuable in determining technology readiness and provides important information to the overall program by providing data collection which includes analysis on real world experience. They point out that a partnership with vehicle manufacturers important to success of program.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
One reviewer feels that the approach taken is both comprehensive and complete. They also note that the project has been responsive to input from the program participants and the approach has been adjusted as the project progresses as appropriate. Another reviewer said that there is a very thorough analysis and progression from the beginning of this program (6 years ago) - addressing all issues - range, durability, maintenance, cold start, etc.

Yet another reviewer noted that the project has a very focused effort on collecting, analyzing and disseminating data, but at the same time industry sensitive information is protected (by using composite data). They recommend that dissemination of data could be improved by providing information (a) on how to obtain results, (b) updating results more often and (c) going beyond web site to disseminate the information.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
One of the reviewers noted that the excellent progress continues and the project manages to keep current as extensive data submission from the various participants has increased. This is a vital component of vehicle technical validation program. One reviewer would like to see key decision makers on how much progress is being made to show worth and value of program.

A different reviewer noted that there was software developed (Matlab) which has a great custom user interface and that is was very impressive comprehensive data collection and display of results.

A reviewer felt that the overall progress over the course of the program has been good; they point out specific accomplishments such as the good number of stations brought on line, the significant quantity of hydrogen produced and distributed, and the significant mileage accumulated on vehicles. They also say that new results appear to be limited to data analyses on fuel economy range and fuel cell performance characteristics. They feel it is not clear whether some of the other analyses presented were performed this year or were a continuation of previous studies.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

Overall the reviewers noted that extensive collaboration has been ongoing and is absolutely essential to the success of this project. They commend the project for using different fuel cell vehicle manufacturers with different fuel providers, and point out that USFCC, CaFCP, and DLA connections are important partnerships. They also noted that there has been very good coordination and data sharing with other organizations involved in similar activities, some feedback from program areas has been used to supply specific analyses One reviewer says the project could enhance collaborations with other program areas of hydrogen program.

Question 5: Has the project effectively planned its future work in a logical manner?

Reviewers feel the plans for future activities are reasonable and appropriate, but wonder how to ensure funding and focus.

What are the project's strengths?

The reviewers note that the project has excellent data collection, data tracking, data analysis and information mining methodologies. They also point out that the project is addressing major technical issues facing fuel cell vehicles and making enormous strides. Furthermore they feel the project is responsive to input from participants and DOE.

One reviewer points out that the project has a good relationship between participants with great communication that gives the project the ability to handle proprietary data very well.

What are the project's weaknesses?

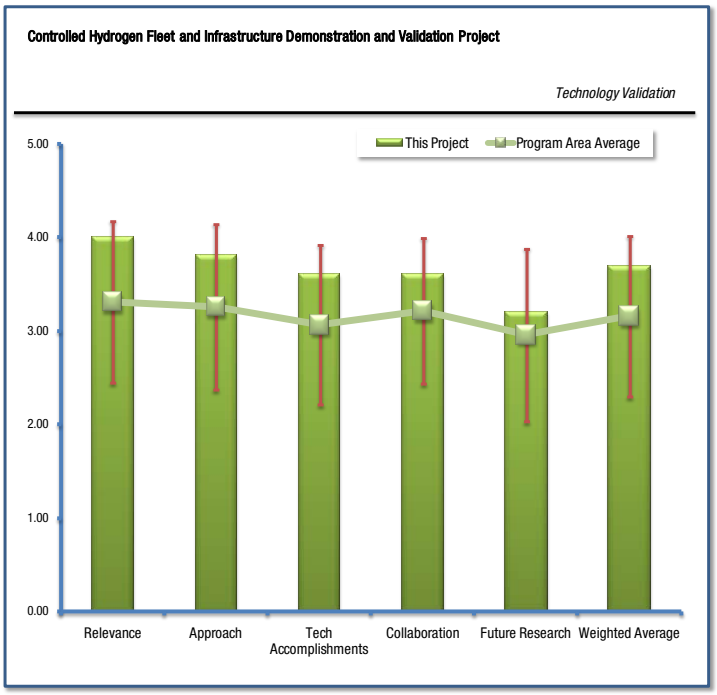
One reviewer points out that that there is not enough promotion or sharing of results - presenting results at fuel cell seminars and meetings is great, but need to do more to let public, media, policymakers and Congress know how much work is being done and the progress that is being made so people aren't so quick to write off fuel cells and hydrogen as a future technology with too many technical challenges - the challenges are being met yet not publicized very well so no one knows how much has been done. They say the project needs to present side by side with battery or plug-ins to show progress in vehicles but also quick hydrogen fills.

Do you have any recommendations for additions or deletions to the project scope?

One reviewer points out that vehicle and fuel cell system availability information would be useful. They also feel that inclusion of forklift, back-up power and stationary system operating data will be an important component of this project in the future as the program shifts emphasis to these areas.

Another reviewer feels that more education and publicity about data acquired in this project is needed and could help direct funding back to hydrogen if more people knew how much progress has been made in a few years. One reviewer feels that the project partners need to address the sulfur contamination in electrolysis. As mentioned in the project weakness comments above one reviewer feels that some of the results and analyses generated in this project should be disseminated in a format suitable for general-public consumption. They feel there has been much progress made in real world operating experience in terms of FC durability, vehicle range, miles driven, accident experience, etc. They think these results could go a long way toward getting public support and overcoming some misconceptions about the state of this technology.

Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project: Dan Casey, Chevron



Reviewer Sample Size
This project had a total of 6 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
Overall the reviewers feel the project is very relevant. Another reviewer points out the project appeared comprehensive and complete and fully addresses the goals and objectives of the technology validation section of the multi-year R&D plan. The reviewer especially appreciated the complete answers Mr. Casey provided for the few questions he was asked.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
The reviewers feel the project is a complete project in that nothing seems to be missing. They feel it is everything one could want for a well-run FCV program and it advances the United States towards deploying FCVs for consumers. They note that the approach to address barriers is logical and straightforward, they note that the addition of data submissions from non-DOE funded vehicles are a useful supplement to the body of data being collected for the program. One reviewer does point out that training drivers to fuel for themselves is an important component.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
One reviewer pointed out that the work on cold-start and data transfer were relevant and needed technical progress. Overall the other reviewers felt that there has been outstanding technical progress in the areas of hydrogen dispensing, station operation, demonstration of cold starts, safety and first responder training. One reviewer notes that the goals are high but the Chevron team appears to have responsible plans to meet their goals. Another reviewer says that the vehicles appear to be meeting fuel cell durability and range requirements, and have demonstrated freeze capability; they also note that the vehicle tank temperature sensor analysis is a useful addition to the body of knowledge for fuel cell vehicle and refueling.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?
One reviewer complements the project team for their vehicle operators like the government, Sea World, and the Orlando airport, all of which are high profile, well-known places. They feel this is crucial to education and outreach to have high profile demonstrations like this.

A reviewer also noted that Chevron assembled a well-rounded team and each team member appeared to have contributed as required. Similarly they feel that the University of Miami hydrogen modeling will also add to the body of knowledge, as well as the collaboration with DoD adds their perspective on vehicle operation.

Question 5: Has the project effectively planned its future work in a logical manner?

Overall the reviewers felt the future work outlined is appropriate and that the Chevron presenter seemed to represent the company well in that he knew where the company at least should be headed. The reviewers also feel that fuel cell bus deployment and technology development is key. One reviewer reminds the project team that reports must be publicized. One of the reviewers says that it would be great if there was another phase of this project, which would include next design iteration vehicles and fueling stations.

What are the project's strengths?

The reviewers feel that the project appeared like it was run by professionals through and through, noting 100% positive customer feedback and meeting of technical targets using varied hydrogen generation technologies across the country. They also commend the project for their work on the educational aspects, especially first responder training.

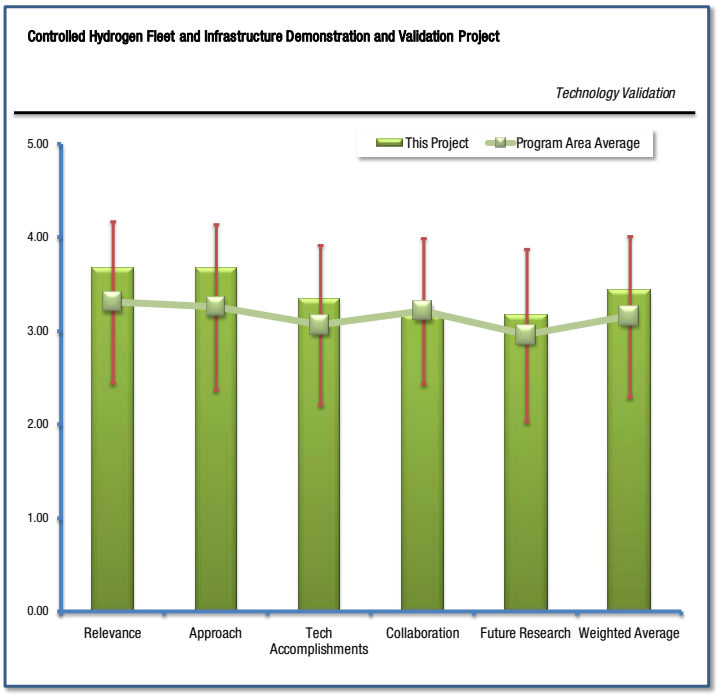
What are the project's weaknesses?

One reviewer did feel that the project needs to publicize accomplishments better - cold start, customer feedback, vehicle data - public and policymakers need to know technical challenges are being met and moving forward. Other reviewers commented that they could not identify any weaknesses.

Do you have any recommendations for additions or deletions to the project scope?

One reviewer feels that the project needs to promote the fuel cell bus by making data known, public needs to know more about buses. Another reviewer had the recommendation of integration of fueling with innovative renewable hydrogen sources, such as CHHP or biogas from waste streams. They also recommended the project consider the creation of clusters of hydrogen stations in targeted areas.

Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project: Mike Veenstra, Ford Motor Company



Reviewer Sample Size

This project had a total of 7 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

In general the reviewers felt that this project is very relevant to the goals and objectives of the Hydrogen and Fuel Cell Program in that it collects realistic operating data on vehicle and fueling performance. Another reviewer feels the Ford team project fully supports all aspects of DOE program requirements. They also note that all aspects of the project appeared solid and commendable and fully address the key technology validation targets.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

The reviewers feel that the approach is logical and reasonable by covering both current technology vehicles for operational use data collection and the development of technology demonstration vehicles to address critical development and design gaps. They also note that the data collection plan is good and thorough. The reviewers say the approach clearly demonstrates that Ford and its team focused on the task at hand in their presentation. The reviewers are impressed with Ford looking at various fuel cell designs in its demonstration fleet, including a PHEV hybrid. One reviewer does mention that the addition of a vehicle in Iceland provides an interesting data point, but is perhaps somewhat out of place in a US DOE-funded program.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

The reviewers stated that the progress in addressing some of the vehicle level performance goals is satisfactory with good investigation into total life of fuel cell technology. The reviewers also noted that the project made progress toward implementing more objective infrastructure at its demonstration sites. They feel the Ford team fully meets the expectations and goals one would expect for a team of their standing. They did well. One reviewer notes that it is unfortunate that financial issues have slowed or stopped progress on this technology development.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

The reviewers noted that the project assembled a solid team for the project to both gain and spread knowledge of fuel cell systems. Collaborations are adequate and include NREL for data collection. One reviewer said that the close, appropriate collaboration with its partners clearly rates as an outstanding aspect of the presentation.

One reviewer commented that the project featured limited collaborations with infrastructure site partners and did not incorporate partnerships with universities or laboratories. Similarly a different reviewer said that not a lot of information was provided about collaborative efforts. One reviewer did comment that the cooperation with the fuel cell manufacturer (Ballard) appears to be solid.

Question 5: Has the project effectively planned its future work in a logical manner?
The reviewers noted that the project is nearly complete but that Ford is clearly working to advance the future of its hydrogen program and the future plans appear satisfactory.

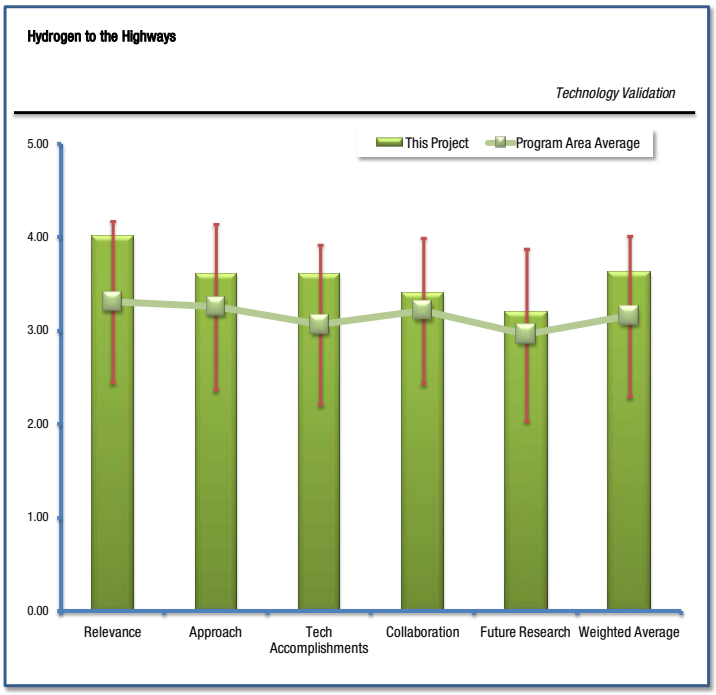
What are the project's strengths?
The reviewers generally agreed that the project assembled and utilized a good team by assembling a mix of fleet vehicles for mileage and use accumulation and technology demonstration vehicles to demonstrate progress in addressing critical barriers to introduction of purpose-built fuel cell vehicles. The reviewers commend the project team for solid technical work, tight focus on developing practical and functional vehicles, which were accomplished through a variety of design iterations that allowed the team to make significant progress as shown in startup times and stack life.

What are the project's weaknesses?
Some reviewers felt that there were no weaknesses but another commented that not much information was shown on project outreach, they reviewer assumed this is done mostly through NREL data collection efforts.

One reviewer did make the point that while not necessarily a weakness, the focus appears to be almost exclusively on vehicle design, as opposed to fueling station.

Do you have any recommendations for additions or deletions to the project scope?
One reviewer said they would like to see an effort at optimization of "transitional" design variations, such as a PHEV hybrid. None of the other reviewers had recommendations.

Hydrogen to the Highways: Ronald Grasman, Daimler



Reviewer Sample Size

This project had a total of 6 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

The reviewers agree that the project clearly meets all technology validation requirements necessary to advance DOE objectives and place FCVs throughout the consumer base in real-world applications.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed?

Is the project well-designed, feasible, and integrated with other efforts?

Overall the reviewers feel that the project has a good approach – placing vehicles on the road, and opening stations to support vehicles and raise public awareness. The reviewers felt the project has completely addressed all elements of the requirements to advance deployment of fuel cell vehicles. A reviewer also points out that the work on codes and standards appears to be unique to this project.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

Reviewers noted that the vehicle fleet is operating beyond the end date and performing above expectations. They also point out that Gen II vehicles will achieve the DOE target range. Overall the reviewers agree that the project has made outstanding progress towards objectives and the team seems determined to place these vehicles onto the roadway. They also commend the project for extensive progress and participation in the development of codes and standards. One reviewer does point out that the refueling station portion of this project appears to have had some problems (stations that have closed, obstacles in transferring stations from the project to other owners).

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

A reviewer felt this project fully met all expectations for assembling a comprehensive team to address requirements, including a strong partnership with fuel provider and other groups such SAE and other standards bodies on development if codes and standards. One reviewer felt that the collaborations are not very well-defined in this presentation.

Question 5: Has the project effectively planned its future work in a logical manner?

The reviewers generally agree that the future work appears logical to complete project and there is a good focus on education and infrastructure which is the key for success. Reviewers complemented the project team on a nice job of comparing past generations of vehicles to develop future FCV plans. They also mention that internal work is critical in case funding is not restored.

What are the project's strengths?

The reviewers feel that there is clearly a strong commitment to the technology and better, a strong commitment that Daimler will be moving forward with this technology. They also point out that the vehicles are surpassing expectations by showing fuel cell stacks lasting longer than goal.

They also point out that the outreach efforts have increased visibility of the project and the overall DOE initiative.

What are the project's weaknesses?

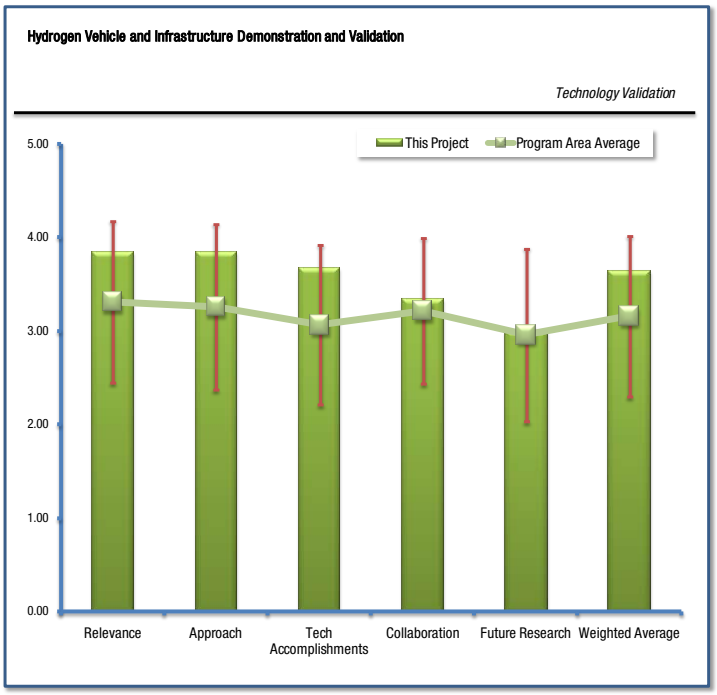
Reviewers question if stations will stay open and if Daimler will continue the introduction of vehicles in US if DOE terminates the hydrogen program? Another reviewer feels it is unclear how much of their infrastructure advancements cited in the project are the result of the project itself.

Other reviewers point out problems in getting stations completed and maintaining their access to FCV users (at least one station partly funded under the program has closed). They feel it is going to be a shame to see the fueling stations being decommissioned after a rather brief operating period.

Do you have any recommendations for additions or deletions to the project scope?

Most reviewers had no recommendations other than to not abandon this project, another reviewer is hopeful of "clusters" of hydrogen infrastructure in very targeted areas to allow the demonstration to progress to next gen vehicles and fueling.

Hydrogen Vehicle and Infrastructure Demonstration and Validation: Rosalind Sell, General Motors Corporation



Reviewer Sample Size
This project had a total of 7 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
Reviewers agreed that the project involving realistic performance testing of hydrogen fuel vehicles and refueling stations is very relevant to the ultimate goals and objectives of the Hydrogen and Fuel Cell Program. They also noted that General Motors is making great progress to the commercialization of FCVs so they clearly exceed the goals and objectives of the technology validation section.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
The reviewers commented that the project has an excellent approach, is sound and appropriate to execute vehicle demonstrations and hydrogen dispensing via various technologies. Reviewers also complement the project on training users, operators and the general public. They also said that GM appears to be making the transition from "science project" to early generation commercial project; thus they rate and deserve an outstanding grade for this area.

The reviewers also mentioned that the demonstration of some fuel cell vehicles in the hands of the public (Project Driveway) is a unique aspect of this project: it has received much good publicity (including MotorWeek discussion). The reviewers also felt that the identification of maintenance facilities for these vehicles was also unique to this project. GM's participation in codes and standards work with NextEnergy is important.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
Reviewers commented that the progress to date is satisfactory and consistent with the established schedule, and that the project is also meeting all DOE goals and targets. They also pointed out that the project has achieved improved power densities and performance. This project has resulted in an outstanding and comprehensive approach to exceeding the technology validation goals and overcoming technical barriers.

The reviewers also felt that the vehicles and project have made excellent progress in validating the technology and appear to be meeting or exceeding all customer expectations for operation, range, and utility. Reviewers also note that it is somewhat difficult to gain full appreciation of the technical accomplishments because of confidentiality issues, but this is understandable.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?
In general the reviewers feel that appropriate collaborations to accomplish the goals and objectives of the project are in place. The reviewers commended the fact that GM has made key partnerships (the Project Driveway drivers) with high profile agencies - EPA, Postal Service, etc. This is key for visibility and future fleet purchases. Project Driveway

gets vehicle in hands of general public which is crucial. Reviewers also mentioned the collaborations with NextEnergy on codes and standards efforts and other collaborations that include DoD and Quantum for maintenance facilities.

Question 5: Has the project effectively planned its future work in a logical manner?

Reviewer said that the future plans are good and will complete the project in a timely fashion and noted that GM is committed to fuel cell vehicles and infrastructure development. One reviewer also said: "With getting customer-drivers into their FCVs, it appears GM's future is now ... outstanding!"

What are the project's strengths?

Reviewers feel that the strengths of this project are the strengths and expertise of the project participants. They commend GM for having partnerships (the Project Driveway drivers) with entities like Disney, Virgin Atlantic and celebrity drivers. The reviewers see this as raising awareness and profile of FC vehicles.

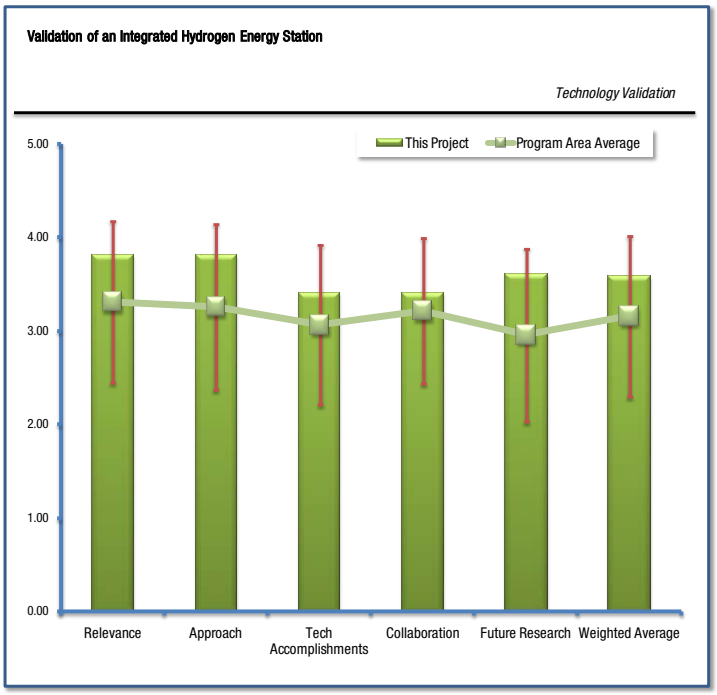
What are the project's weaknesses?

The reviewers felt that there was no real weakness apparent from this presentation.

Do you have any recommendations for additions or deletions to the project scope?

Reviewers recommend that in the future the project presentation should focus on technical aspects rather than contain so much promotional materials. Reviewers would also like the project to continue to be funded and for broader dissemination of results in the future.

Validation of an Integrated Hydrogen Energy Station: Edward Heydorn, Air Products



Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
One reviewer said that renewable H_2 production is key to the hydrogen economy as it can take advantage of renewable portfolio standards and other state and federal incentives. They also said that looking at leveraging stationary fuel cell production to produce hydrogen is an excellent way to avoid stranded H_2 assets -- especially in the near term. They feel that validating of the economics of this type of effort will help expansion of this concept or point to better ways.

The reviewers noted that the co-production of power and hydrogen is an excellent way to go. The system under development can employ fuels derived of renewable sources.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
One reviewer complemented the project team for getting the Orange County Sanitation District and Fuel Cell Energy onboard and for also going after CARB funding as it was wise in terms of realizing the vision of a working station using this renewable hydrogen. A different reviewer said the approach of coupling a molten carbonate fuel cell with a reforming operation is excellent. One reviewer felt that the project was presented in a logical and detailed manner. They also note that the DOE program 4 phases were employed and the presentation was detailed.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
One reviewer feels the project is making steady progress, but notes that the unit is still in Danbury, CT and it would be nice to see it in Fountain Valley soon. Another reviewer pointed out that this project is 85% complete, which may be problematic for Phase 4 operation, testing, and data collection.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?
The reviewers felt that the brief and briefer showed good knowledge of all the major players required working with in order to maximize chances for success and they felt that project had good collaboration with California. One reviewer noted the limited partnerships, but this was still not inappropriate considering the stage of project development.

Question 5: Has the project effectively planned its future work in a logical manner?
One reviewer thought that it's important to see this project through as there are no other CHHP (Combined Heat, Hydrogen and Power) plants that are operational. They see that the data from this demonstration will help identify the value proposition and the key criteria for similar projects elsewhere. Furthermore they feel fully funding his project will also advance the Technology Readiness Level of Molten Carbonate Fuel Cell CHHP. The reviewer pointed out that the case can be made that where appropriate, CHHP from renewable sources (at least in part) can fill

in many hydrogen infrastructure gaps where stranded assets are considered too high a risk. CHHP can "dial back" on hydrogen production when necessary and produce renewable heat and power at high efficiencies. They also point out that the Self Generation Incentive Program (SGIP) in California, CHHP can become a very economical option that also serves to further hydrogen infrastructure when needed.

A different reviewer strongly encouraged the economic analysis of the hydrogen production potential of the Fountain Valley station. The reviewer feels the potential for hydrogen extraction should enhance the value of the CHP investment to the customer because it provides a potential low-cost source of hydrogen.

The reviewers feel that since the project is coming to a close in March 2010 and given the decision by the DOE to eliminate vehicular hydrogen, future activities should perhaps focus on other uses of hydrogen. They also say that this project is just beginning the operational and data collection phase, so it is still at an early stage. This makes it difficult to judge in terms of current progress and future activities.

What are the project's strengths?

The reviewers feel that it is excellent teaming with a good host site and that there is great potential for scale up in hydrogen production. The reviewers also noted that the considerable expertise with hydrogen systems.

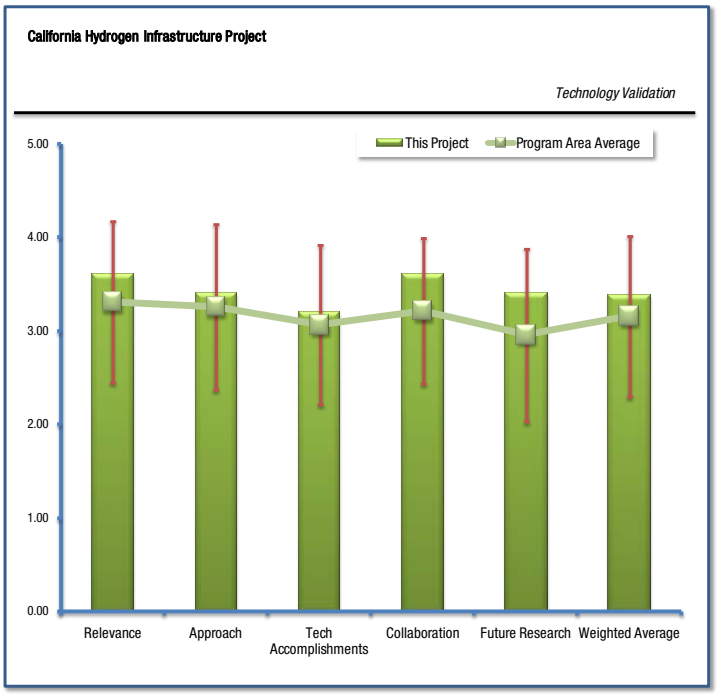
What are the project's weaknesses?

No project weaknesses were identified by the reviewers.

Do you have any recommendations for additions or deletions to the project scope?

One reviewer strongly encourages the economic analysis of the hydrogen production potential of the Fountain Valley station. They point out that the potential for hydrogen extraction should enhance the value of the CHP investment to the customer because it provides a potential low-cost source of hydrogen. The value of the hydrogen sales revenue to the CHP customer could enhance the value of the CHP investment.

California Hydrogen Infrastructure Project: Edward Heydorn, Air Products



Reviewer Sample Size

This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

The reviewers feel that the project is very relevant as the need for low cost H_2 infrastructure in the early market (state of California) is critical. They point out that multiple hydrogen storage and dispensing technologies need to be employed at various sites in order to find the optimum mix. The reviewers also say that the metric of "cost of hydrogen delivered" is a solid technical target and that the project objectives address one aspect of hydrogen fuel cell deployment, that is, to gain experience on hydrogen refueling stations. A different reviewer pointed out that if successful, this statewide approach could be duplicated across the country.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

One reviewer feels that the project has a good approach is some areas (UC Irvine, Torrance, Fountain Valley) -- not so good in others (Long Beach, Northern California). After hearing the briefing the reviewer said the Lake Tahoe idea does not seem as farfetched as there would be an element of demand in this pristine area. Another reviewer complements the project for the station locations being chosen based on specific criteria and project partners. They noted this approach has been effective and that stations have been sited for 350 bar and 700 bar.

One reviewer has a different concern pointing out that the dependence of the project on short term deployments of fueling systems not necessarily a good approach.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

One reviewer says the work accomplished at the Torrance Pipeline station is essential to demonstrate low cost hydrogen fueling station. In general, the reviewers note outstanding progress on all the tasks under this project.

One reviewer commented that the project has done a great job in getting three potential permanent stations underway. They also feel that involving UC Irvine to provide objective data on this project is also important. The reviewer also pointed out that the Long Beach deployment did not turn out so good and saw very few refuelings. This reviewer also feels that the Torrance project should be a great data point for retail production of hydrogen from a pipeline source.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

One of the reviewers did not fully understand all the relationships with the collaborators such as SCAQMD, OEM's, UC Irvine, Energy Companies. They note that CARB was also mentioned but there was no clarification of their relationship.

Another reviewer says that the project has done very good networking to achieve success at Torrance -- where Honda and Toyota maintain a large corporate presence, and OCSD -- where renewable production of hydrogen closely aligned with demand will occur.

Question 5: Has the project effectively planned its future work in a logical manner?

One reviewer agrees with the projects future work suggestions and points out that the instillation and commission of 350 and 700 bar systems at the Fountain Valley Renewable Station seems like a very important area to continue. Another reviewer says that the future activities appear to be essentially working towards completion of some of the project objectives.

A different reviewer points out that the future work seems pedestrian with simple follow-up to existing pathways. Similarly another reviewer said that the project has expanded beyond expectations during development and future expansion is planned.

What are the project's strengths?

The reviewers feel that the variety and quality of technical work is outstanding and the project has demonstrated good, methodical and well-delivered site choices in the cases of Torrance, UC Irvine and OCSD Fountain Valley. They also point out that the UC Irvine partnership ensures transparency and objectivity in reporting results.

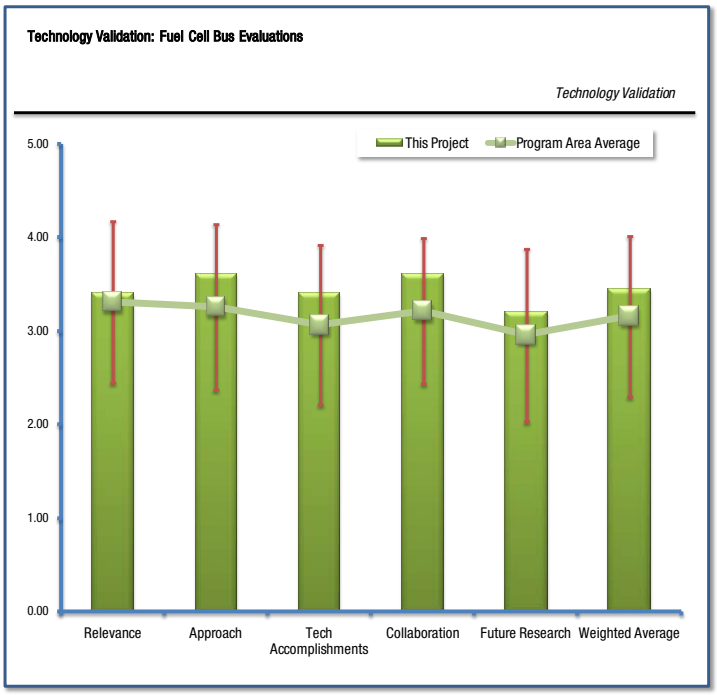
What are the project's weaknesses?

The only weaknesses mentioned by the reviewers are that the efforts in Northern California and Long Beach did not produce promising results for hydrogen infrastructure deployment in California.

Do you have any recommendations for additions or deletions to the project scope?

One reviewer asked if the project needs repetition of low pressure tube-trailer options (Placerville and Long Beach). They elaborate by asking what more can we learn from such systems within the same "geographies". Another reviewer feels the project should keep doing what it has been.

Technology Validation: Fuel Cell Bus Evaluations: Leslie Eudy, National Renewable Energy Laboratory (NREL)



Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
The reviewers feel that this project meets the TV objectives as well as assists with market transformation by providing third party data collection and analysis by a third party. They point out that project consistently provides essential operational and technical data feedback for the program level validating critical technical targets.

A different reviewer says that this appears to be a "score keeping" exercise to develop a methodology for compiling performance data for these early market vehicles. The reviewer feels it would be helpful if the mission was stated more clearly.

A few of the reviewers commented that niche markets can be vital to the deployment of new technologies. They note that transit buses are especially important because they use significant amounts of petroleum and can be an important success story to be included in outreach efforts.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Most of the reviewers feel that the evaluation approach for costs and reliability is comprehensive and clear. They note that there are well defined milestones that guide the project and measure performance and in general the project is disseminated well. A different reviewer is concerned about the variability of the data among the survey group and says there appears to be differences in the inputs among the bus sites. One reviewer mentioned that it was a very thorough presentation that discusses all aspects of the project.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
A few of the reviewers feel that project appears to be on schedule and gives a good evaluation of durability, availability, MBRC, and summary of costs. One reviewer points out that the data on infrastructure was clear and well developed. A different reviewer complements the project by saying that the data collection efforts and analysis are substantial, noting that the project would benefit from access to additional buses/fleets.

One reviewer does point out that the analysis is excellent, but the results would suggest that the fuel cell buses are not ready to compete effectively with alternative energy technologies at this time. They fear this could discourage bus fleet managers from purchasing fuel cell buses. However, a different reviewer felt that the fuel economy comparisons to natural gas and diesel fueled buses were impressive.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

The reviewers feel that there is very good participation from many collaborators, especially from bus lines. One of the reviewers feels that DOE needs more projects like this that develop technologies in the real world situation with tangible results and general public benefit and education. One reviewer points out that it is about time that FTA started to provide some funding for analysis of renewable transit bus systems.

Question 5: Has the project effectively planned its future work in a logical manner?

One of the reviewers said that DOE should piggyback on the FTA funding to evaluate the durability and other DOE technical targets. Another reviewer noted that it would be helpful to put in steps to share information with the fuel cell bus industry and make it part of the mission. Other reviewers feel that the project presented a good plan for continuing the data acquisition and analysis work and that the process and number of data points appear to be robust. One of the reviewers also feels that additional buses/fleets are needed.

What are the project's strengths?

Reviewers commented on the excellent management, data evaluation and participation from NREL staff. They also complemented the outstanding project partners (transit bus partners, H_2 suppliers, and fuel cell companies).

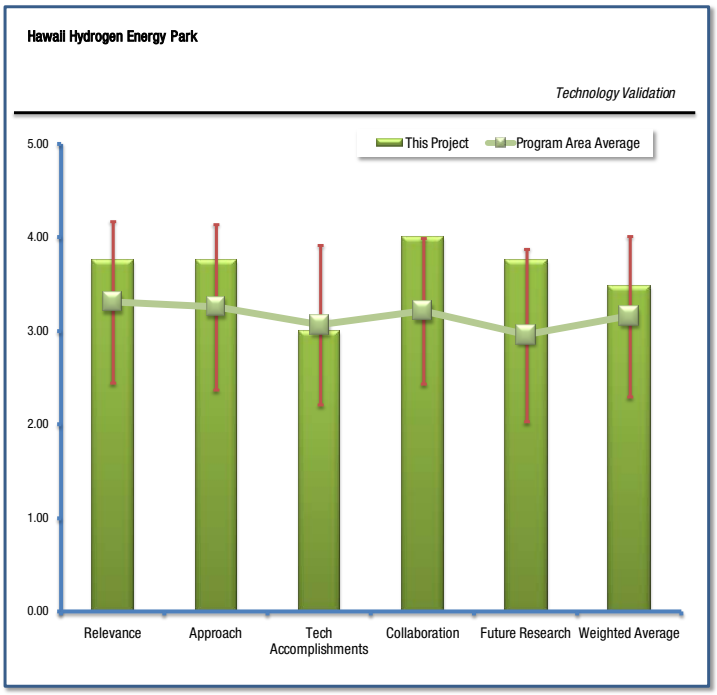
What are the project's weaknesses?

Most reviewers did not point out any weaknesses but one did mention the apparent variability of the data inputs from the bus fleets.

Do you have any recommendations for additions or deletions to the project scope?

Reviewers would like to see the continuation of data collection/analysis. One reviewer also mentions that workshops with industry to share performance data and help them improve technology would be good.

Hawaii Hydrogen Energy Park: Richard Rocheleau, Hawaii Natural Energy Institute



Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
A reviewer notes that the relevance is outstanding. They point out that Hawaii has high electricity rates and if renewable hydrogen is going to work anywhere, it is here.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed?

Is the project well-designed, feasible, and integrated with other efforts?
One review said that the team has been working on this project since 2004 when they won the first hydrogen power park award. They note that the project has had many setbacks but this plan is tested and looks feasible economically, politically, socially and technically.

A different reviewer would like to better understand what is meant by "plug-in hybrid electric vehicle (PHEV) shuttle buses using hydrogen". They also want to know how many shuttle buses will be used.

One reviewer asked if the H_2 fueling station is the electrolyzer. The reviewer also queried that, if given the project's past experience with electrolysis, how hopeful the project team is that this equipment will be of value to overcome DOE's technical targets.

One reviewer said that the involvement of stationary and transportation demands as well as focusing on renewable hydrogen is excellent approach.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
A reviewer pointed out that the project team is taking advantage of the many lessons learned so far and have reached a high level of success, these results are helping DOE to achieve their technical targets.

Another reviewer mentioned that the project is making good but not outstanding progress. They see the H_2 speciation completion as an important step. The reviewer also liked the goal of 10-20 kg H_2 per day and bringing the cost of hydrogen down to $6/kg. They also liked that the DoD and NPS are two non-DOE agencies that can trumpet the successful results. The same reviewer also said that getting ONR involved recently on the FROG building is also a great addition. The reviewer has concerns that the Proterra bus may be a problem.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?
The reviewers felt the long and impressive list of diverse and complimentary partners speaks well for this project. They point out that each partnership is also a long term potential partner for even greater deployments of hydrogen

and fuel cells and other renewables. The reviewer also noted that the Hawaii Natural Energy Institute (HNEI) has gone beyond the original collaborating partners to now include the Office of Naval Research (ONR).

Question 5: Has the project effectively planned its future work in a logical manner?
A reviewer points out that the project plans are based on many lessons learned and practical input from their collaborators. This reviewer feels the future plan is achievable in the period and budget allocated.

One reviewer is concerned that the presenter mentioned that the installation of the fueling station might slip.

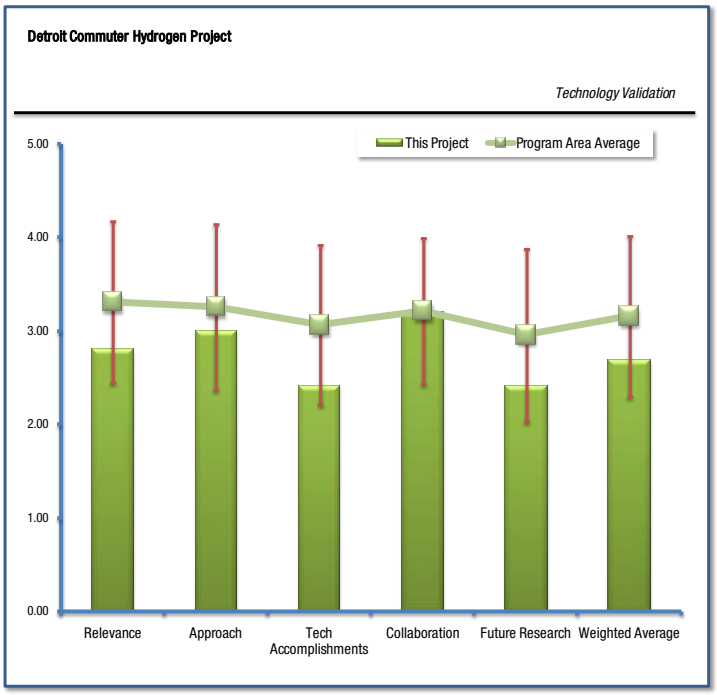
Reviewers also point out that there are a large number of visitors to both Hawaii Volcano National Park and the KMC military camp and if they ride the fuel cell bus or see the FROG building or any associated presentation material they will know that hydrogen and fuel cells are for real.

What are the project's strengths?
Reviewers point out many project strength such as; great collaboration, excellent management team, good use of resources, good public outreach, clear vision of how to complete the project and help DOE reach technical targets. Another reviewer points out that lessons learned will be made about getting a project like this going.

What are the project's weaknesses?
Reviewers point out few project weaknesses but mention that changing politics have affected the success of this project in the past (in the forms of permitting delays and funding issues).

Do you have any recommendations for additions or deletions to the project scope?
The only recommendation is to write up lessons learned (noise permitting).

Detroit Commuter Hydrogen Project: Jody Egelton, Southeast Michigan Council of Governments (SEMCOG) - POSTER



Reviewer Sample Size
This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?
Reviewers agree that the project relevance is good and addresses main objectives of DOE in Tech Validation efforts. They point out that H_2 ICE and hythane buses could be an early way to bring in hydrogen infrastructure and educate the public about hydrogen. One reviewer points out that Michigan houses the big three automakers and one would think the surrounding area would be early adopters of hydrogen technology.

Another reviewer points out that the technology evaluated could help increase use of hydrogen. But they feel it is unclear if H_2 ICE vehicles are on a path to commercialization and the project would need to see a committed OEM before continuing funding.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?
Reviewers feel that the project appears to be well designed as it attempts to break some of these barriers to acceptance by running regular bus routes that could be part of a larger mass transit system linking Detroit, Ann Arbor and the Detroit Airport. One reviewer says the since the project has only begun collecting data for the past few months, ultimate success will depend on detailed data collection - usage, maintenance (both preventative and repairs), fuel economy and cost of operation are all important criteria that should be monitored and reported. They also say a plan for data collection should be prepared and approved (if this hasn't already been done). One reviewer does feel that there is too much dependence on fuel supplier and "good will" of partners. A different reviewer said this project is a needed demonstration of a niche application, short haul buses within a regional public transportation system. They also feel the ICE approach will be very useful in comparison with the many FC validation activities being pursued in the DOE TV effort. One reviewer points out the fact that hythane as a fuel can be an educational precursor to hydrogen at a station. The comment on the bus route selected as it is a very busy one (airport runs) and would see a lot of customers. Reviewers also say that the comparison to a baseline (conventional) vehicle is good, but it would be nice to see a comparable gasoline vehicle instead of Propane.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.
Reviewers understand that the project is just beginning and in the early stages, but the progress to date appears to be satisfactory. They recommend that the project could provide more details on the implementation of the project from fleet perspective: early experiences, challenges overcome, training accomplished. There was no suggestion as to what else might be an H_2 source. Also, no information on ridership is provided or any data for that matter other than it is running 8 hours daily. The reviewers have a lot of concerns and questions of the loss of the BP fueling station, this seems to be a serious problem.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

The reviewers feel that this project appears to have appropriate partners and benefits from good collaboration. There are serious concerns over the future ability to get fuel, and the reviewers feel the project should work quickly to identify other solutions to avoid further delays in schedule. Reviewers feel there will be a problem with the continued involvement of the hydrogen provider (BP). One reviewer did point out that the poster session did discuss outreach efforts to secure a replacement to the BP operation for hydrogen.

Reviewers agree that being associated with the SEMCOG (with 50% cost share) will encourage collaboration across municipalities as to how this project is going. One reviewer did not see anything specific about an outreach plan. Another reviewer points out that project is getting user input with onboard user feedback cards but again, no data on what the riders are saying was provided.

Question 5: Has the project effectively planned its future work in a logical manner?

The reviewers say that the future plans are adequate with the possible exception of fuel (hydrogen) availability and that is fuel is not available the buses should be transferred to somewhere useful before their lease is up. Reviewers also point out that operation during summer months (air conditioning requirements) and winter months (adverse weather conditions) will be especially important.

What are the project's strengths?

Reviewers feel there is a good project plan and good partners. One reviewer points out that according to poster session the project has the most ridership of any Ford Hydrogen ICE bus to date. Reviewers also commend the project for introducing hydrogen in metropolitan Detroit, MI. Reviewers feel that this project is a good application for demonstrating this technology in real world validation with good comparison to baseline technology.

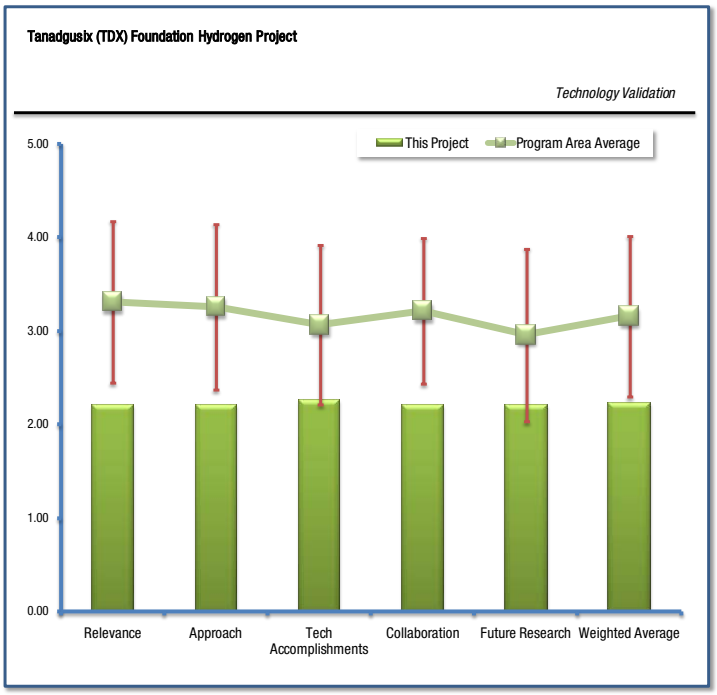
What are the project's weaknesses?

Almost every reviewer brought up concern with fuel availability. They feel the lack of hydrogen infrastructure and the lack of contingency planning with major partner (BP) hampered project and will shorten the project. Reviewers point out that not enough detail on data collection included in presentation and it appears the project does not share data with other groups.

Do you have any recommendations for additions or deletions to the project scope?

One reviewer recommends developing a detailed data collection plan. While another reviewer feels that the project could benefit from gasoline comparison vehicles in similar service. Reviewers also recommend that the project should discontinue if a reliable fuel supply cannot be secured resulting in inadequate data being collected.

Tanadgusix (TDX) Foundation Hydrogen Project: Katherine Keith, Tanadgusix Foundation - POSTER



Reviewer Sample Size

This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

Reviewers say that this is an interesting demonstration of renewable hydrogen used in a public transportation. However the unique setting (a small, sparsely populated island in the Bering Sea) severely limits the benefits of the projects as an example that could be replicated in other locations. Another reviewer said that this project only partially supports the DOE Hydrogen Program objectives, as only 1/4 of project is focused on hydrogen. As such another reviewer points out that this project helps analyze the wind to hydrogen technology pathway, which relates to many DOE targets for renewable hydrogen. One of the reviewers says that the PI reported that assuming a 20 year project life, the cost to run the leased H_2 hybrid ICE is $13 million. This is a high risk/low value project.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewers feel that the approach is sound and reasonable, however the costs associated with the project may be unreasonably high due to the geographical location and the project team should have conducted a good economic analysis. They point out that this project illustrates the technical viability of wind/electrolysis production of hydrogen.

One reviewer says all the major steps are laid out, but details of the execution plan, analysis methodology and cost calculations could be clearer. One of the reviewers wondered if the H2A model was being used for cost estimations.

A different reviewer felt that this project appears to simply be using data on various fuels, vehicle types, approaches for the TDS Corporation to make a purchasing decision.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

Reviewers agree that it is very early in the project, but that the progress to date seems to be reasonable. One reviewer points out that the methodology for determining the assessment metrics and "scores" for the four transportation alternatives is not clear. A reviewer raised the issue that the VESTA Turbine works well but the project is not using electrolysis to make the hydrogen.

Other reviewers raise issues with the initial costs of the project by pointing out that motor gasoline costs $13 per gallon and four HICE Ford buses were purchased at a cost of approximately $250K each (this cost appears to be too much). A different reviewer points out that if the project is going to state the $13/mile H2ICE path cost, they should state the cost per mile from the other three technologies, which look like they would range from ~$1/mile to $6/mile (to keep things in perspective). Yet another reviewer said it is hard to imagine all three buses have same estimated maintenance cost of 55 cents/mile.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

One reviewer pointed out that there are local partners in this project - however a vehicle provider partner would strengthen the project as opposed to just leasing the hydrogen-fueled ICE shuttle buses. One reviewer pointed out that there was no mention of the nature of the collaborations.

Question 5: Has the project effectively planned its future work in a logical manner?

The reviewers say that the future plans appear to be reasonable and looks like it will yield answers to interesting and relevant questions.

What are the project's strengths?

The reviewers feel that there is good engagement by the collaborators and that they are overcoming weather related obstacles such as cold weather and the remote location. A different reviewer feels that for the low budget of this project, it could yield some interesting results to guide this and other future standalone wind to hydrogen projects.

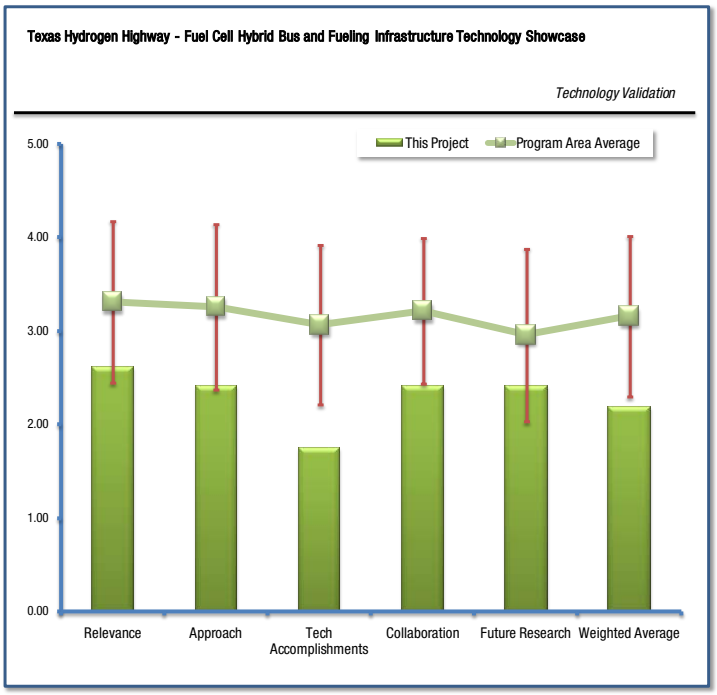
What are the project's weaknesses?

Reviewers point out that the extreme geographical location is a project weakness. They also feel that there is a need for stronger awareness and collaboration among other related wind-to-hydrogen projects that have already demonstrated working systems. One of the reviewers sees no depth of knowledge that can supplement the existing body of expertise. Further, the reviewer believes there is little potential to demonstrate the use of hydrogen via various product applications, as the sponsors appear to be totally focused on attracting hydrogen vehicles to this remote area of Alaska. The reviewers believe this will not happen.

Do you have any recommendations for additions or deletions to the project scope?

A reviewer says the project should ensure that detailed performance and cost data are collected and reported. Another reviewer feels the project should buy an electrolyzer and hook up to the wind turbines to generate hydrogen. They say that this will help DOE with their cost and technical production targets from renewable resources. One reviewer says that if this project was to continue (and they would not recommend continuance), the sponsors need to identify early market hydrogen-using products for the customers in this area. Another reviewer recommended that the project should have an outside review of results by project collaborators, particularly NREL.

Texas Hydrogen Highway - Fuel Cell Hybrid Bus and Fueling Infrastructure Technology Showcase: David Hitchcock, Texas Hydrogen Highway - POSTER



Reviewer Sample Size

This project had a total of 5 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

One reviewer stated that the project did not identify technical target goals. Another reviewer said the project contributes to data collection efforts within TV. One of the reviewers said that FC buses are one of the early markets for transportation fuel cells and it is good to have another bus being demonstrated and evaluated. The reviewer said that the project needs to flesh out the nature of the "performance evaluation" listed as one of the milestones; what data will be collected, how will it be compared on ongoing bus evaluations?

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Two reviewers say the approach appears to be logical and reasonable. They feel it will introduce hydrogen/fuel cell technologies in a location that traditionally has a petroleum-based economy. Another reviewer makes the point that the barriers to using hydrogen fuel cell buses in public have already been proven in many places already in the US. The reviewer questions why DOE would want to spend money to cover the same educational public awareness ground.

One reviewer mentioned the unique aspect of the project appears to be the inclusion of plug-in electric capability (which a very popular concept these days).

Two reviewers felt that the approach is a bit vague on details and could be more detailed, such as explaining how additional potential transit applications would be evaluated for the future based on results from this project (cost, public awareness, CO_2 reduction, etc.).

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

Reviewers understood that the project just started and had been waiting for funding. One reviewer did note that the hydrogen fuel cell bus and refueling infrastructure have been procured (from non-DOE resources).

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

Reviewers did note the partners, but mentioned that no information is given regarding roles and responsibilities of partners. Again, a reviewer did note that the fuel cell bus and infrastructure have been funded by non-DOE sources. One reviewer recommended that the data should plan on feeding FC bus data to NREL for use in their overall evaluation of FC buses.

Question 5: Has the project effectively planned its future work in a logical manner?

Reviewers commented that the future plans and schedule appear to be adequate, logical and straightforward. One reviewer makes a statement that this project is unlikely to start, given the DOE decision to eliminate funding for hydrogen-powered vehicles.

What are the project's strengths?

Reviewers identified many project strengths such as; GTI is involved, bus being available, hydrogen source is available. Reviewers also note that the project contributes to the body of knowledge about fuel cell operation in a different vehicle application. Reviewers also note that the inclusion of PHEV aspect to the bus operation should increase interest in the project.

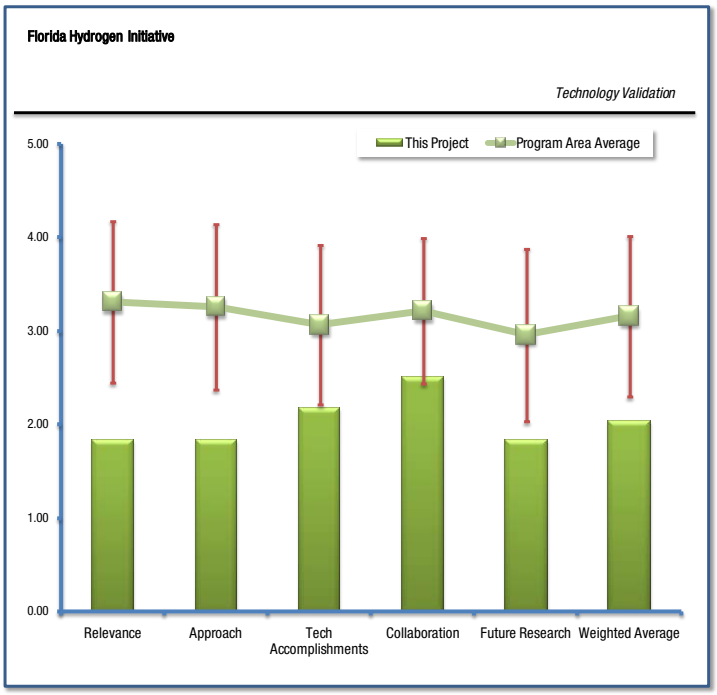
What are the project's weaknesses?

Multiple reviewers noted that while it is a fairly small project there is an overall lack of details such as no technical targets or outreach and education activities, except overcoming public awareness. Reviewers would like to have more details about how progress on this project will be measured and how it will be integrated into the overall DOE program and H_2 community. One reviewer would also like to have the roles of the partners clarified.

Do you have any recommendations for additions or deletions to the project scope?

Reviewers recommended that the project cater to educational institutions and should train bus and maintenance crew based on Palm Springs experience and readily available training manuals. One reviewer would like to see a detailed plan of how the bus performance will be measured, how it will be compared to some sort of baseline, and how the results could be used as a basis for future decision making about fuel cell bus deployment in similar applications.

Florida Hydrogen Initiative: Pam Portwood, Florida Hydrogen Initiative - POSTER



Reviewer Sample Size

This project had a total of 6 reviewers.

Question 1: What is your assessment of the relevance to overall DOE objectives – the degree to which the project supports the goals and objectives of the Multi-Year RD&D plan?

Reviewers agree that there is moderate relevance to DOE Goals and note that two out of three of the areas do not validate technical targets. Reviewers felt that the projects are not coordinated. They point out that on-site reformation of diesel to hydrogen is not a high priority and the museum exhibit is educational, but suffered from lack of rotation among other museums. The HyTech Rest Area did not end up as planned.

Overall the reviewers feel that, while some aspects are interesting, the full impact of these projects may not be that significant and the technologies are unlikely to become a commercial product. Furthermore multiple reviewers point out that these projects do not actually support DOE's objectives in any meaningful way, issues were raised with diesel as a feedstock.

Question 2: What is your assessment of the approach to performing the work? To what degree are technical barriers addressed? Is the project well-designed, feasible, and integrated with other efforts?

Reviewers point out that two out of three project areas are educational in nature and only the On-site Reformation of Diesel Fuel for Hydrogen Fueling Station has any technology validation relevance. They also point out that DOE does not have a technical target for producing hydrogen from citrus or methanol.

The reviewers do say that using a competitive process to solicit ideas is good, but the resulting projects seem arbitrary/unrelated. They note that teams formed around each project that appear to be sound in the beginning. To be successful the reviewers thought that there should be a roadmap/plan to increase hydrogen use in the state that meet goals for the state and align with DOE objectives.

Question 3: Characterize your understanding of the technical accomplishments and progress toward overall project and DOE goals – the degree to which progress has been made, measured against performance indicators and demonstrated progress towards DOE goals.

A reviewer points out that the project has set out to do what it said in the most basic ways, but the project has had a number of changes in contractors (Orlando Science Center changed hands) and that caused a loss of interest in seeing the project through. Reviewers note major problems like the citrus waste is not working out and then more fuel cells are needed to power the rest area. They also point out that the exhibit never left the first museum yet they proposed that it would tour 18 museums.

In general the reviewers noted that there has been some success with the education and outreach attempts but in general the projects have had varying levels of progress. Project partners should consider if continuing is feasible since original objectives have changed. One reviewer points out that the first two projects that began in 2006 (citrus and H_2 assessment) are behind schedule. The diesel project is completed, but metrics including costs were not provided.

Question 4: What is your assessment of the level of collaboration and coordination with other institutions: the degree to which the project interacts with industry partners, universities and laboratories?

Reviewers said that the collaboration and coordination with project partners are good for all selected projects and are working well. The reviewers mention that partnerships outside of the project team were identified, but specific tasks completed by each partner were not. Furthermore reviewers point out (again) that collaboration with the other 17 museums did not occur as planned. One reviewer points out that it was explained at the poster session that the exhibit didn't travel because it is costly to do so and the museums charge fees to host exhibits. This should have been known up front and at least collaborating with museums in Central Florida could have been accomplished.

One reviewer stated that they could personally verify that the Orlando Science Center piece is in place. They commented that it seemed to be geared to young students 5th grade to 8th grade.

Question 5: Has the project effectively planned its future work in a logical manner?

Reviewers said that in some cases the project is over and doesn't need more funding (the museum exhibit, for example, only needs a future assessment). They point out that reforming diesel to produce hydrogen is not a high DOE priority nor is methanol fueled fuel cells. One reviewer does mention that during the Poster Session there appeared to be no interest in performing another education hydrogen project in the future. In fact, the new Contractor for the Orlando Science Center didn't know a lot of the required details.

Reviewers brought up that there should concentrate on fuel cell durability and that in general any follow-on activities should be weighed based on applicability to wide-spread use and potential for commercialization. However, a different reviewer noted that future work and these projects overall have little relevance toward eliminating barriers.

What are the project's strengths?

In generally the reviewers pointed out many project strengths such as Chevron demonstrating reforming of diesel at the bench scale, sulfur reduction reported in the on-site reformer, good partners and considerable cost share (from one project). One reviewer noted that the project was multi-dimensional and their approach worked state-wide.

What are the project's weaknesses?

Overall the reviewers found quite a few project weaknesses. Reviewers pointed out that besides having a lack of commitment from many stakeholders the project was also buying methanol from the Netherlands and importing to run through their fuel cell.

Reviewers felt that the projects could benefit from an overall plan to meet goals of increased H_2 use in state. They also point out that the project demonstration periods should be longer to allow adequate data collection for analysis. Similarly the reviewers thought that the lack of follow through in executing educational projects that could have reached large audiences was a project weakness.

One reviewer also pointed out that liability insurance was an issue for this program. They point out that the lack of an entity to take on this responsibility holds the project back.

One reviewer summed it up by saying; that by providing funding for another entity to provide funding had led to small, disparate projects that were not very compelling and did not assist DOE in meeting their goals. Reviewers also thought that the projects will not have much impact on the technical development of hydrogen-fueled vehicles.

Do you have any recommendations for additions or deletions to the project scope?

Reviewers realize that the projects are more or less complete and provided suggestions for moving forward. One reviewer recommends the scope of each project could be analyzed for ability to address DOE goals, and lead to potential commercial products. Reviewers also feel that any separate projects that are similar, can be integrated in the

future, and benefit from shared lessons learned. They note that any funds that carry over into FY2010 should be directed to fuel cell activities.

One reviewer feels that the program should be eliminated or scaled back to only those areas that do not need liability insurance. The recommend that perhaps just public outreach should be done and note that the program is too diffuse and lacks effective leadership.

One reviewer felt that the project still needs to complete a final report. The reviewers also suggested getting funding from state to continue the maintenance of the kiosk at the Florida turnpike.