

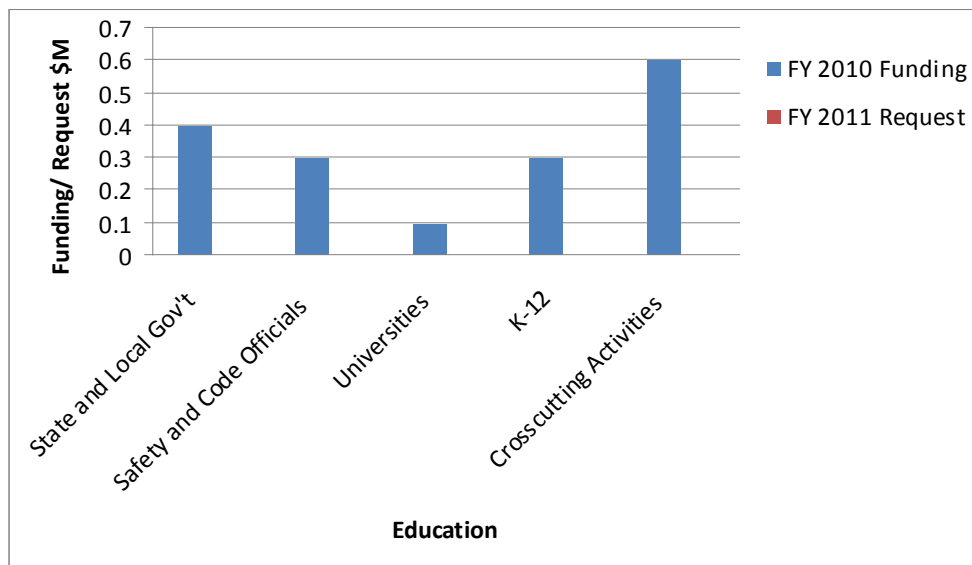
2010 Education Summary of Annual Merit Review of the Education Sub-program

Summary of Reviewer Comments on the Education Sub-program:

Reviewers consider the Education sub-program to be focused, well-managed, and effective in meeting clearly delineated goals and objectives. They commended the broad project portfolio for its diversity of target audiences, and the reach of the projects was viewed as significant, with no evident gaps. However, in general, progress was not explicitly communicated and reviewers recommended data and quotes to measure the impact of education efforts on perception and knowledge. Reviewers noted the potential opportunity to strengthen end-user outreach efforts using performance data collected from ARRA and other deployment projects to build the business case for the use of fuel cells and hydrogen technologies. Concerns about limited funding appeared repeatedly in the overall sub-program review, and the individual project comments encouraged continuation of efforts across all target audience projects. Reviewers suggested increased and integrated education activities across EERE—they noted that incorporating messaging for hydrogen and fuel cells with other energy efficiency and renewable energy technologies, while emphasizing the complementary nature of the technologies, is key to an efficient and effective public education campaign.

Education Funding by Technology:

The Education sub-program efforts are prioritized to focus on the target audiences involved in facilitating the use of hydrogen and fuel cell technologies for near-term applications as well as for longer-term light-duty transportation applications. The FY 2010 appropriation allowed for support of mortgage obligations for projects across the education portfolio, including outreach to state and local government officials, university hydrogen and fuel cell education programs, in addition to ongoing efforts to educate first responders and code officials, and teachers and students at the middle and high school levels.



Majority of Reviewer Comments and Recommendations:

Education projects scored 3.6, 3.2, and 2.6 for the highest, average, and lowest scores, respectively. Scores reflect progress made over the last year and reported plans for future activity. Key comments and recommendations are summarized below. DOE will act on reviewer recommendations as appropriate to the overall scope, direction, and coherency of the Education effort.

Universities: Reviewers recognized the need for “a range of hydrogen and fuel cell educational opportunities for university students with the objectives of both general and specific training. There is an acknowledged need for educated trainers, engineers, and scientists to work in hydrogen and fuel cell technology areas.” The projects were commended for their efforts to address these issues through a multi-element, hands-on approach, which allowed the project to reach a large group of general and engineering students in a meaningful and relevant way through lab kits, internships, textbook modules, seminars, general engineering curriculum modules, and specialized engineering classes. Reviewers acknowledged the strong contributions of each of the projects toward Education sub-program goals and viewed the education materials to be comprehensive, well-designed, and well-reviewed. In general, collaboration with industry and other stakeholder groups was viewed as well-developed, but reviewers strongly encouraged projects to engage with other educational institutions as a means for material distribution. Although reviewers thought the projects were successfully executed at each respective university, they noticed a lack of outreach to other universities, and recommended a more proactive effort toward disseminating the curriculum materials to other educational institutions and through remote teaching to optimize national impact. Additionally, reviewers wanted to see performance metrics measured through student information retention and opinion feedback on coursework.

End Users: Reviewers commended this project for providing an invaluable combination of education and direct hands-on experience through demonstrations with well-chosen lift truck users from a range of industries. They thought that the market sector, material handling equipment, was well chosen as a promising area for commercial growth and ideal for targeted outreach. The educators, from an established forklift distributor, were situated to reach out to potential buyers as trusted spokespeople in the industry. Furthermore, reviewers noted the broad target audience, which included forklift operators, end-users, and the first responders and fire marshals who would be involved in permitting potential installations. Reviewers would have liked to see more interaction with material-handling trade associations and workshops at lift truck conferences rather than at hydrogen and fuel cell venues. They suggested a better developed performance data collection effort and recommended tracking education impact by measuring changes in opinion and knowledge. Reviewers encouraged similar follow-on projects.

State and Local Government Officials: Since state and local leaders are potential technology deployment facilitators, their education was seen as essential to the future success of hydrogen and fuel cells. The locales of the projects were well-chosen, in states with an existing hydrogen and fuel cell presence, with the addition of complementary national efforts to reach the broadest audience possible. Reviewers commended the multi-pronged approach of all the projects implementing outreach through face-to-face meetings, webinars, conference presentations, fact sheets, case studies, best practices, financial and feasibility models, and traditional and new media. Real-world experience—both actual and virtual, through ride-and-drives and nationally broadcast video segments—was viewed as especially effective in educating state and local leaders. Reviewers valued the honest communication imparted through these hands-on experiences and the financial and feasibility models—these elements provided a realistic basis for recommending fuel cells without overselling the technology. Collaboration was considered to be comprehensive within the state, but many suggested increased cooperation with other neighboring states. Reviewers encouraged the individual state projects to serve as a model for other states by sharing best practices and lessons learned. Some activities were considered to be too focused within

the hydrogen, fuel cell, and clean energy community; reviewers suggested moving beyond this already educated group to reach out to state and local leaders through established local government meetings and organizations.

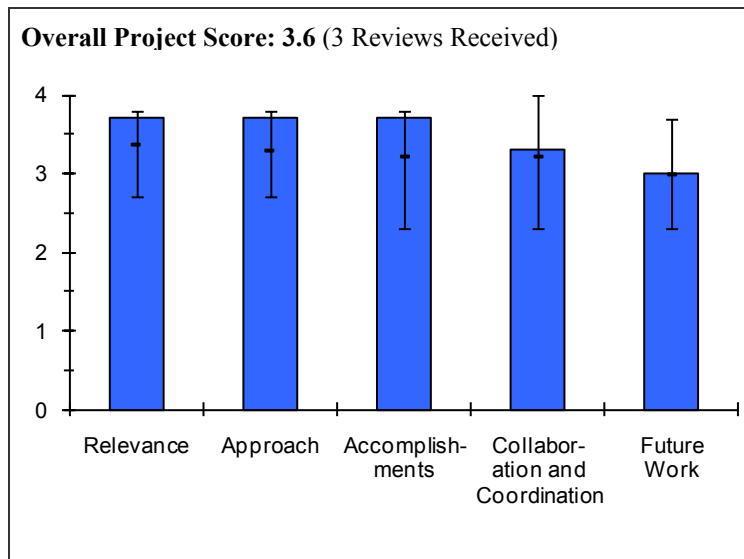
First Responders and Code Officials: These co-funded projects were reviewed under the Safety, Codes & Standards sub-program at the 2010 AMR. See the Safety, Codes & Standards section of this report for reviews and comment summaries.

Project # ED-03: Hydrogen and Fuel Cell Education at California State University, Los Angeles

David Blekhman; California State University-Los Angeles

Brief Summary of Project

The overall objective of this project is to implement a comprehensive set of curriculum development and training activities. Objectives include: 1) developing and offering courses in fuel cell technologies, hydrogen and alternative fuels production, alternative and renewable energy technologies as a means of zero-carbon emissions economy and sustainable environment; 2) establishing a zero-emissions proton exchange membrane (PEM) fuel cell and hydrogen laboratory supporting curriculum and graduate students' teaching and research experiences; 3) providing engaging capstone projects for multi-disciplinary teams of senior undergraduate students; and 4) fostering partnerships with automotive original equipment manufacturers (OEMs), energy providers, community colleges, government agencies and other stakeholders.



Question 1: Relevance to overall DOE objectives

This project earned a score of **3.7** for its relevance to DOE objectives.

- This is a good project for fuel cell and hydrogen education, but it is limited to California State University (Cal State), Los Angeles, and not much else.
- It is an outstanding educational program with good attendance and curriculum.
- Ensuring that universities have courses in hydrogen and fuel cells is critically important to meeting DOE RD&D objectives.

Question 2: Approach to performing the work

This project was rated **3.7** on its approach.

- The PI is working with the College of Engineering and Department of Technology and weaving course curriculum into a variety of lower and upper division course work. Three different courses are offered. GM Corporation, Honda, Southern California Edison, and the California Fuel Cell Partnership are good partners. The location in the center of a future hydrogen fuel cell vehicle rollout site is ideal for an educational thrust.
- This is absolutely appropriate for an educational institution. The course work combined with laboratories is right on.
- The approach addresses several DOE barriers in a logical, effective manner.

Question 3: Technical accomplishments and progress

This project was rated **3.7** based on accomplishments.

- The PI met the objectives that were in the proposal. There is a question as to the relevance of writing an operating manual for an electrolyzer when that is usually the company's responsibility. But it was educational for the graduate student who did it. Out of 800 engineering students, 150 took the courses. There are 22,000 students total at Cal State LA. The focus was mostly on light-duty vehicles, not other fuel cell applications.

- The project showed outstanding progress in the development of these curriculum elements. While there is some concern about sending the correct message around hydrogen safety, this program at least attempts to address the issues in a balanced manner. It is strongly suggested that the PIs familiarize themselves with the unintended release work done under the codes and standards Fuel Cell Technologies sub-program element. While the basic flame properties, buoyancy, and diffusivity are important pieces of information to impart, they can be very misleading with respect to predicted behavior. Predicted flame and/or hydrogen diffusion behavior is almost always dominated by the combustion fluid dynamics of the particular scenario, which could differ markedly from the behavior expected when considering only the molecular properties.
- The project team is doing great work reaching the maximum number of students that can be accommodated with the course and laboratory setup. It is good to know what graduates have decided to do in the workforce. It would be good to share more data on that in future presentations.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.3** for collaboration and coordination with other institutions.

- Collaboration with partners was good to ensure accuracy of curriculum and displays. Demonstrations of hydrogen fuel cell vehicles help drive the education point home.
- The project has developed good collaborations where appropriate, such as the hydrogen fueling station and the hydrogen internal combustion engine program. The team is commended particularly on the collaboration with the National Fuel Cell Research Center at the University of California-Irvine.
- There is a lot of coordination. It was good to see that the PI took advantage of events that came to the southern California region for his coursework and expanded education by exposing students to hydrogen and fuel cell professionals at the National Hydrogen Association Conference and the Huntington Beach event.
- It would be good to see coordination with Humboldt State University (HSU). They did not seem to be included among the collaborators listed. In the presentation by HSU's Schatz Energy Research Center (Schatz/HSU), future work with other CSU campuses was mentioned, so it seems like there is an opportunity here to build on the successes. Perhaps the group will present all courses together to other campuses that may wish to replicate part or all of the different courses developed by this group and Schatz/HSU.

Question 5: Proposed future work

This project was rated **3.0** for proposed future work.

- This is a point solution that will serve only Cal State L.A. Federal hydrogen and fuel cell education funding should be used to maximize the breadth of outreach that is accomplished. This is not the normal way universities operate because course curriculums are tightly held and not readily shared.
- This project is scheduled to end September 2010. The list of future work might be a bit aggressive for three months of work. It would be good to see them thoroughly complete a smaller list rather than leave some items partially done at the end of this project. On the other hand, it appears that this work may continue beyond the current project life, which is excellent.
- It looks like future work is a continuation of current work. That's good because more outreach is needed. However, there's an opportunity to take the courses developed at this school to other campuses. See the Collaboration section for more specific ideas.

Strengths and weaknesses

Strengths

- The education effort is in the center of a prime region for initial commercialization of hydrogen fuel cell vehicles.
- The project is teamed with GM Corporation, Honda, Southern California Edison, and the California Fuel Cell Partnership to ensure good curriculum and educational events.
- This is a much-needed, well-thought-out undergraduate curriculum for hydrogen technologies. The coursework is combined with substantial laboratory work, which is excellent.
- There is a lot of coursework; students seem to enjoy the courses.

Weaknesses

- This is a point solution not readily transferrable beyond Cal State L.A.
- There is a previously mentioned concern about making sure that they do not send a misleading message with respect to hydrogen behavior in the real world. The reviewer is not penalizing the project for this concern; however, he/she does want to see real-world behavior embraced in the teaching of hydrogen behavior. For example, it can be very misleading, and dangerous, to compare hydrogen releases to methane releases. Under the same release conditions, a hydrogen flame extent is significantly larger than methane.
- None noted. There are opportunities to gather more information on the reception of the students to this coursework, including what they are learning from the courses, and coordination with the Schatz/HSU project.

Specific recommendations and additions or deletions to the work scope

- It would be good to see coordination with HSU. HSU didn't appear to be listed among the collaborators. In the Schatz/HSU presentation, they mentioned future work with other California State University campuses, so it seems like there's an opportunity here to build on the successes. Perhaps they should present all courses together to other campuses who may wish to replicate part or all of the different courses developed by this group and Schatz/HSU.
- It would be good for students to be surveyed on what concepts they retained from the course and whether they would recommend the course to other students.

Project # ED-04: Hydrogen Energy in Engineering Education (H2E3)

Peter Lehman; Humboldt State University Sponsored Programs Foundation

Brief Summary of Project

The objectives of this project are to: 1) deliver effective, hands-on hydrogen energy and fuel cell learning experiences to a large number of undergraduate engineering students at multiple campuses of the California State University (Cal State) and the University of California (UC); 2) provide follow-on internship opportunities for students at hydrogen and fuel cell companies; and 3) develop hydrogen teaching tools to be used commercially, including a basic fuel cell test station and a fuel cell/electrolyzer experiment kit suitable for use in university engineering laboratory classes.

Question 1: Relevance to overall DOE objectives

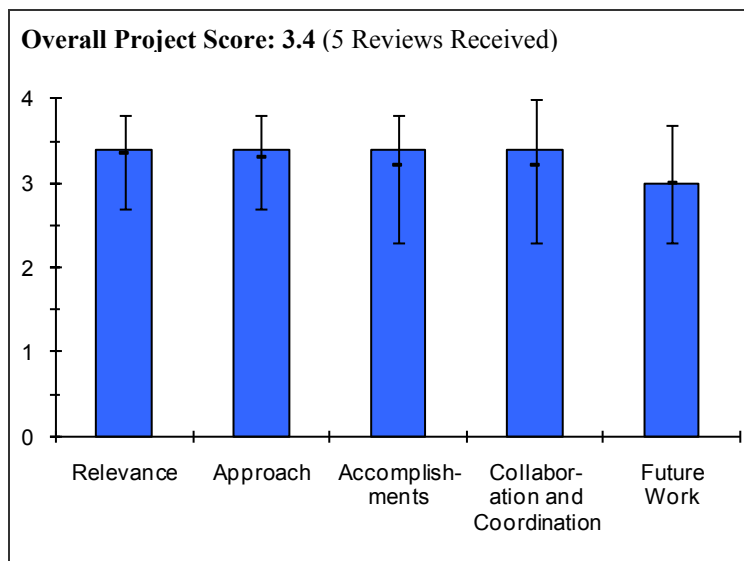
This project earned a score of **3.4** for its relevance to DOE objectives.

- This project is relevant because it is directed toward providing a range of hydrogen and fuel cell educational opportunities for university students with the objectives of both general and specific training. There is an acknowledged need for educated trainers, engineers, and scientists to work in hydrogen and fuel cell technology areas. This project attempts to address both of these recognized needs.
- The goals are aligned with producing an informed set of engineers and citizens.
- Given the short nature of the units, the actual progress toward the objectives would be slow.
- California is a leading state in hydrogen technology, and Cal State's program provides good reach for education curricula within the state. However, the level of reach outside of California is unclear, even if the project is successful in penetrating the state university system.
- This project is highly relevant to the DOE Hydrogen Program education objectives.
- The PI's ability to connect with engineering students is unmatched. It's their "bread and butter," and they seem to be doing a great job at execution. It's important for DOE to make sure that outreach is conducted with this important target audience.

Question 2: Approach to performing the work

This project was rated **3.4** on its approach.

- This project has adopted a multi-element approach to provide educational opportunities for students. The approach effectively provides classroom instruction, laboratory experimentation, hands-on experience in fueling station analysis, and potential industry internships.
- They intend to reach their goals by delivering fuel cell test stations and electrolyzer/fuel cell kits and by providing training to maintain them.
- The project is available to many students at UC Berkeley, and Humboldt State University (HSU), but it not as valuable anywhere else. That means there is a limited impact on the need for educated workers. The real value is probably in acting as a model that others might imitate, but that would require actual dissemination of the program and instructions on assembling the equipment it takes to implement the modules.
- It is good to lead with hands-on tools like kits and test stations.
- The focus is hands-on, fuel cell-related activities with students.



EDUCATION

- The curriculum module approach is an effective one.
- Part of what makes this approach outstanding is that hydrogen education has been built into all engineering disciplines, not just as a stand-alone course. It makes the education more effective and reaches more students in a way that's relevant to them. Another outstanding element is the electrolysis and fuel cell demonstration unit.

Question 3: Technical accomplishments and progress

This project was rated **3.4** based on accomplishments.

- The project has made substantial progress in its instructional activities. Several hundred students have taken coursework and laboratories that are developed and integrated by the project as part of the existing engineering program. In parallel, the project has developed and fabricated hydrogen production/fuel cell demonstration kits. The project has also made information regarding its courses and activities available to the educational community and general public through online sources.
- The project made and delivered the kits, then informed a significant number of staff members.
- The curriculum was well received by its target audience.
- The video may be used for general information.
- The project was evaluated on its effectiveness, and the results included a 25% increase in the ability to answer basic questions.
- Students are educated on the basics of fuel cell technology.
- There is concern that the team has made little penetration beyond two universities.
- There are significant accomplishments and progress. The teaching kits are very good for hands-on student experience.
- The electrolyzer and fuel cell kits are top notch. There is great outreach to more than 250 students. They have made great progress since last year, and this should be a sustainable program reaching many more HSU students and students in other universities. The connection between the lab program and the station and vehicles is vital.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.4** for collaboration and coordination with other institutions.

- Collaboration with other California universities and with industry partners was reported.
- There is reasonable collaboration with good value.
- The difficult economy has probably hurt the efforts here. At least one of the industry partners has been experiencing financial difficulty and downsizing. It appears that the project team's progress is mostly at two universities, so many more active university partners need to be recruited.
- There are excellent collaborations with other institutions.
- There is great collaboration with a variety of different organizations.

Question 5: Proposed future work

This project was rated **3.0** for proposed future work.

- The plans for future work focus on continuing the effort and activities already underway. This seems reasonable and appropriate to complete the project. The plans to widen the dissemination of project information at educational conferences and on the Internet are especially pertinent.
- The project is going to expand the implementation at allied campuses.
- This is probably the best they can do with funds available. Dissemination to others is probably the most valuable and should be favored.
- The project really needs to penetrate into many other universities and colleges in the Cal State system. It has impacted fewer than 300 people so far.
- The future work looks good.
- It's good to hear that outreach to other California universities is planned for next year, as is outreach to additional faculty to teach these courses. The reviewer hopes the internship program situation can improve.

Strengths and weaknesses**Strengths**

- This project has dedicated and experienced staff with demonstrated knowledge and expertise.
- There is hands-on impact.
- The project involves developing hands-on tools such as fuel cell/electrolyzer kits.
- There is an excellent focus on activities that make an impression on students.
- The hands-on experience is critical to retaining information about hydrogen and fuel cells and encouraging students to share it.

Weaknesses

- Financial support for the industry internships is needed.
- There is a limited area of impact geographically.
- There is limited penetration into college campuses within the state's university systems.
- The poor economy has hindered the potential for internships.
- None.
- None noted.

Specific recommendations and additions or deletions to the work scope

- The project team should strongly encourage DOE to consider earmarking funding for sponsoring industrial internships. Relatively little funding would be required to support several internships, and industrial sponsors could be required to provide like-minded support.
- The project should be encouraged (allowed) to broaden its work to include educational institutions outside of California.
- There is a need to recruit other industry partners. For example, Altery Systems is located near Jadoo Power, and they have made good progress in the backup power market. Oorja Protonics is another possibility. Bloom Energy could be recruited to be an industry partner, because it is focusing its sales effort in California for the time being. The national laboratories in California may be candidates for collaboration or for placement opportunities for interns.
- It is recommended that the Schatz Energy Research Center looks in more detail at the results of the National Hydrogen Association's U.S. Market Report, specifically the education section that shows the states that have the most university-level hydrogen or fuel cell courses. Perhaps there's an opportunity to use these schools as way to reach further with the curricula and other parts of the Hydrogen Energy in Engineering Education (H₂E³) program.
- The quotes from students are great, but it would be better for students to be surveyed on what concepts they retained from the course and whether they would recommend the course to other students. Feedback would tell all of us what's being learned and also provide valuable information to the instructors.
- It is suggested that coordination with other southern California university campuses, as outlined in future work, to include the Cal State coursework by David Blekman specifically, which seems to be complementary. Pitching the combined coursework that has been developed to other schools could really help spread these successful projects more effectively.

Project # ED-05: Hydrogen Education Curriculum Path at Michigan Technological University

Jason Keith; Michigan Technological University

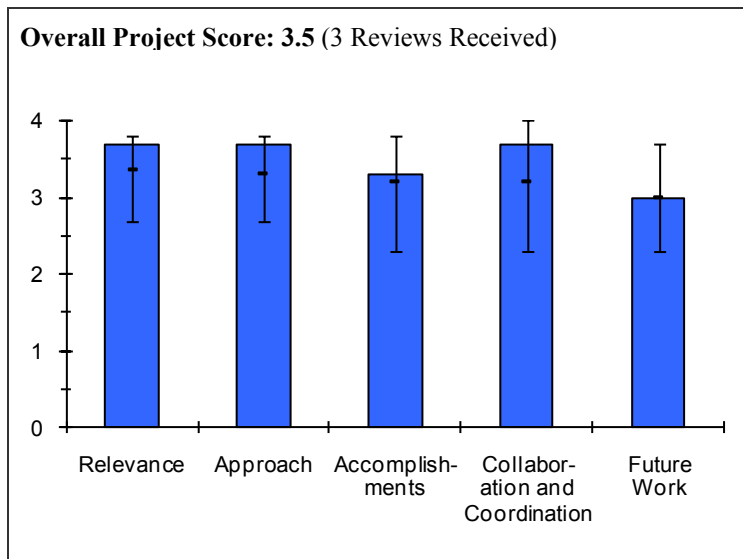
Brief Summary of Project

The overall objective of this project is to expand existing university programs in fuel cell and hydrogen technologies. Objectives are to develop: 1) courses in hydrogen technology, 2) curriculum programs in hydrogen technology, 3) hydrogen technology-related modules for core and elective engineering courses, and 4) hydrogen technology modules to supplement commonly used chemical engineering texts.

Question 1: Relevance to overall DOE objectives

This project earned a score of **3.7** for its relevance to DOE objectives.

- This project is relevant in that it is developing university course materials in hydrogen and fuel cell technologies for use at both the undergraduate and graduate levels. There is a recognized need for training in hydrogen and fuel cells for future engineers.
- The project is well aligned for the school.
- There is good alignment looking at a national perspective.
- The project is highly relevant to DOE Hydrogen Program education objectives. There is potential for a widespread impact.



Question 2: Approach to performing the work

This project was rated **3.7** on its approach.

- The approach adopted by this project has been to develop course modules that can be used at the university level to inform and educate students on hydrogen and fuel cells. This is in an effort to help prepare for a future need for technologists in these areas. The modules have been used and tested in courses offered at Michigan Technological University (Michigan Tech). The modules they developed incorporate hands-on hardware experiments and demonstrations in partnership with fuel cell suppliers.
- This project directly attacks the problems targeted in Michigan, but there is also substantial outreach, that is not dependent on hardware, to the United States as a whole.
- This is a full curriculum, not a one-day or one-week module.
- The module approach is excellent. It makes the hydrogen information convenient to incorporate into a variety of education courses and allows for widespread dissemination.

Question 3: Technical accomplishments and progress

This project was rated **3.3** based on accomplishments.

- The progress in this project appears to be consistent with the approved project schedule. Approximately half of the project is completed (56% specifically), and completion is scheduled for July 2011.
- This project is implemented at undergraduate and graduate levels.
- The modular format allows other institutes to pick up as much information as they need that fits their program.

- The curriculum has been developed for multiple disciplines, integrated into accepted texts, disseminated to other universities by Internet as drop in modules, and tested at approximately 10 places.
- Significant progress has been made.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.7** for collaboration and coordination with other institutions.

- The project has involved a large number of collaborators including equipment supplier and external reviewers from both academia and industry. Discussions with industrial stakeholders regarding project goals and objectives were conducted. A number of presentations were listed with co-authors and co-presenters from several academic institutions.
- There is a long list of reviewers. They did help refine the program.
- It is not clear whether the reviewers had much up-front input to shape the work.
- The modules will be disseminated to other universities throughout the country.
- The project is attempting to develop more industrial interactions.

Question 5: Proposed future work

This project was rated **3.0** for proposed future work.

- Plans to complete this project were stated as continuing the activities underway and appear to be consistent with the stated project goals and objectives. This includes completing module development for supplements to existing engineering texts.
- The plans are on track for the program.
- The plans are suitable.
- The future work is consistent and well integrated with the project objectives.

Strengths and weaknesses

Strengths

- There is a strong approach to preparing course modules with an external review to guide and direct the effort.
- The module approach is excellent.

Weaknesses

- The schedule seems somewhat relaxed. Some effort should be taken to ensure that the project is completed on-schedule with maximum effort devoted to disseminating information regarding the availability of course materials and encouraging the inclusion of course modules in engineering classes at other institutions for additional testing and verification.
- There is a need to continue to work on strengthening industrial interactions.

Specific recommendations and additions or deletions to the work scope

- Testing and validation of the module's effectiveness should be accelerated as much as possible.
- A proactive approach to promoting and advertising the availability of the course materials is recommended, including encouraging the testing and evaluation of the materials at other educational institutions.
- It would be beneficial if the module information could be incorporated into a stand-alone book that is an introduction to fuel cells and that can be purchased online on Amazon.com®, for instance. This might be quite valuable to students at other institutions and in other disciplines.

Project # ED-06: Hydrogen and Fuel Cell Education Program Concentration

David Block; University of Central Florida

Brief Summary of Project

The overall objectives of this project are to: 1) develop and sustain an education concentration in Hydrogen and Fuel Cell Technology (HFCT); 2) prepare students who can successfully work as HFCT professionals in government, industry, and academia, 3) produce graduates who will demonstrate knowledge, techniques, skills, and modern tools related to HFCT, and who will be able to apply current knowledge and adapt to emerging applications of HFCT.

Question 1: Relevance to overall DOE objectives

This project earned a score of **3.0** for its relevance to DOE objectives.

- The project is aimed at the right goals.
- It wasn't clear whether the initial program was positioned to be a substantive contributor to the program's goals. The fact that the University of Central Florida (UCF) discontinued the program made it even less relevant. While the co-PI appears to be giving good effort in trying to relaunch the program in North Carolina, the University of North Carolina at Charlotte (UNCC) has not shown much interest in being a leader in terms of considering hydrogen and fuel cells for economic development. UNCC is a small campus, and there is little industry interest or presence in fuel cells in the Charlotte area.
- These courses are vital to addressing the DOE's RD&D objectives.

Question 2: Approach to performing the work

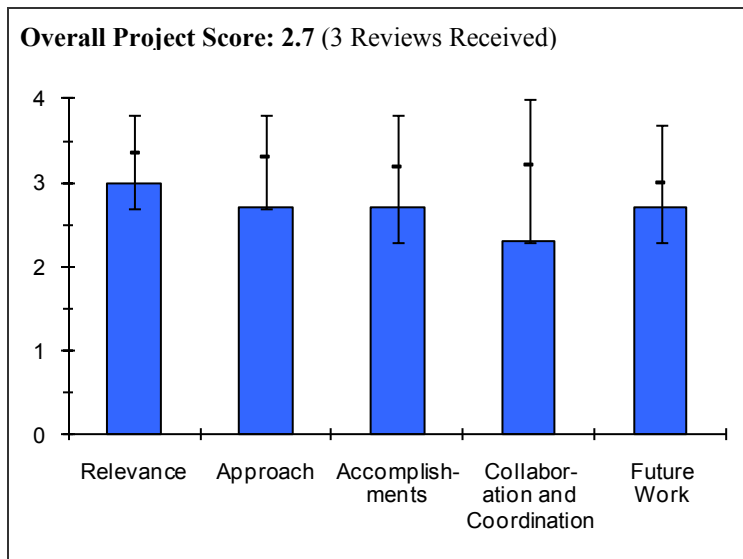
This project was rated **2.7** on its approach.

- The approach is to develop and/or offer a series of courses supporting fuel cell technology, including laboratory and text courses. To some extent, these are available to local junior colleges, too.
- Any impact outside of the UNCC area seems limited at present, so the impact of this approach is also limited.
- The decision by UCF to discontinue the program has been a substantive handicap, despite the co-PI's efforts to re-launch at UNCC. There needs to be a presence and reinforcement by active industry partners for a college curriculum to be effective. This doesn't seem to be happening in Charlotte.
- It is good to see that the PIs were able to find a creative way to handle a difficult budget issue at UCF. The approach to incorporate hydrogen and fuel cell information into many different courses to reach more students and show the integration of the technology in many areas is admirable.

Question 3: Technical accomplishments and progress

This project was rated **2.7** based on accomplishments.

- From what can be learned through the AMR process, the courses have been developed and offered as planned and seem to be of good quality.
- It appears that the courses are being executed and received well.



Question 4: Collaboration and coordination with other institutions

This project was rated **2.3** for collaboration and coordination with other institutions.

- There is collaboration that exists. Some of what is listed is similar to grant sources and not true collaboration. Grants are valuable, but they do not drive to the heart of what DOE is after in collaboration, such as intellectual cross fertilization and program improvement.
- It would be much better having them [collaborators] help shape or even write portions of the curriculum, offer lecturers, among other kinds of support.
- The project did place interns with a collaborator, but not a true collaborator as defined by the DOE.
- The project team does get some feedback from advisors.
- The Florida Solar Energy Center does not appear to be an active collaborator. The co-PI has made little progress in attracting other collaborators. It seems that he overstates the progress he has made; in several instances he appeared to be attributing phone contacts as collaborators. Having a meeting with a company or an institution is not a collaboration.
- The project team demonstrated good collaboration with Savannah River National Laboratory and other organizations. As with other projects in this area of university-level coursework, it is recommended that they collaborate with Humboldt State University and California State University, Los Angeles, that have other projects in this area. It seems like there's an opportunity here to build on their successes, and perhaps present all courses together to other campuses that may wish to replicate part or all of the different courses developed by this group.

Question 5: Proposed future work

This project was rated **2.7** for proposed future work.

- The plans are on track with funding and with the program plan.
- It is good to see that outreach through coursework will continue.

Strengths and weaknessesStrengths

- The effort by the co-PI to sustain the project is a strength.
- The fact that university-level students are learning about hydrogen and fuel cells is good.

Weaknesses

- There are no collaborators.
- There needs to be more data and information on how students are reacting to the coursework. What are they learning? Would they recommend the course to a friend?

Specific recommendations and additions or deletions to the work scope

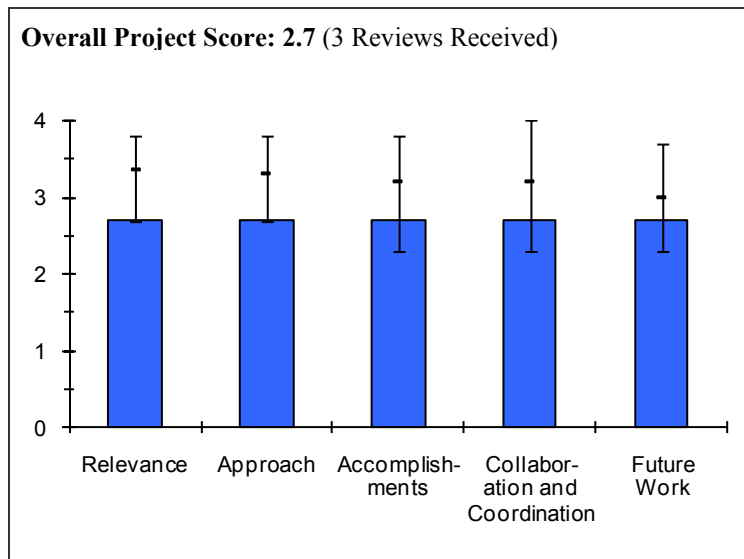
- The project should work to move the value in these courses to other teaching locations by exporting the curriculum or by remote teaching.
- This project will not be a substantive contributor to the DOE Fuel Cell Technologies Program mission and objectives.
- As suggested in the collaboration section, the PI should coordinate with projects underway at Humboldt State University and California State University, Los Angeles.

Project # ED-07: Development of a Renewable Hydrogen Production and Fuel Cell Education Program

Michael Mann; University of North Dakota

Brief Summary of Project

The primary objective of this project is to provide formal multi-disciplinary renewable hydrogen production and fuel cell training to undergraduate and graduate level engineers and scientists. The project includes training at three levels to maximize program benefits including: 1) a broad overview to expose a large number of students to the basics of hydrogen technologies, 2) mid-level training for a moderate number of students, and 3) detailed training for a smaller subset with interest and potential to make significant contributions to technology development.



Question 1: Relevance to overall DOE objectives

This project earned a score of **2.7** for its relevance to DOE objectives.

- North Dakota is a good location for renewable energy—specifically wind—and hydrogen and fuel cells could help store and utilize excess electricity. It’s a rural midwestern state and most hydrogen education activities have not occurred in this area.
- There is a good and varied range of target students.
- It is not clear how far the results will go outside North Dakota.
- Outreach to middle school is good, and including tribal colleges is excellent.
- Reaching out to university students is very important. However, this presentation seemed so much weaker than the Humboldt State University and California State University, Los Angeles, projects that it seems less relevant.

Question 2: Approach to performing the work

This project was rated **2.7** on its approach.

- There is a solid approach to provide educational materials on hydrogen and fuel cells.
- Multiple approaches, such as several levels of courses (general, engineering, and advanced engineering), are good.
- Using trained PhD students to teach this curriculum adds another dimension toward achieving the goals.
- Associated information streams, such as seminars, are probably helpful, though hardly extraordinary.
- This project may address the technical barriers better than the presenter conveyed. Based on the information conveyed, it’s not clear that this project is doing as aggressive a job of breaking down technical barriers as other similar projects.

Question 3: Technical accomplishments and progress

This project was rated **2.7** based on accomplishments.

- The PI met most of the deliverables envisioned. However, these will not translate well outside North Dakota.
- Several courses are in place including classroom and laboratory courses.
- The curriculum shown was relevant and meaningful.
- The project was taught to engineers in several disciplines successfully.

- The project uses students to teach.
- Interns are placed in good locations, and one has been employed.
- The project is delivering some content to rural ND locations.
- There is modest progress in overcoming barriers; yet the rate of progress appears to have been slow.

Question 4: Collaboration and coordination with other institutions

This project was rated **2.7** for collaboration and coordination with other institutions.

- The project partners are diverse and provide real value.
- The collaboration could be better. The existing collaborators are high quality, but there seem to be few people outside of this sphere who may know about this project.

Question 5: Proposed future work

This project was rated **2.7** for proposed future work.

- The work is aligned correctly and follows the plan that was established.
- It is suitable for the funding level.
- If the plan for future work is executed more aggressively, many more results could be realized.

Strengths and weaknesses

Strengths

- This is a rural state with the potential to use hydrogen for excess wind energy storage and/or fuel cells with agricultural waste.
- The project hits many levels of students and many disciplines, so it is informing a wide range of people from laymen to experts.
- It's important that coursework exists at the university level, but the specific strengths of this project were hard to understand.

Weaknesses

- It is difficult to disseminate this educational material funded with federal dollars beyond the state.
- The project helps promote DOE goals in the area of the university and part of North Dakota but not nationally. It would benefit from a viable and meaningful dissemination plan.
- To be honest, the presentation was weak and the presenter was only able to get to half of the slides. More information needed to be conveyed on what was actually accomplished with this project. Some tables indicated that work was completed, but no real information was offered on what's been done. Case studies have been completed but aren't available anywhere. Questions about how many students have been reached and what they have learned in the courses remain unanswered.

Specific recommendations and additions or deletions to the work scope

- The team needs to make the project better known to educators so it can be used more extensively.

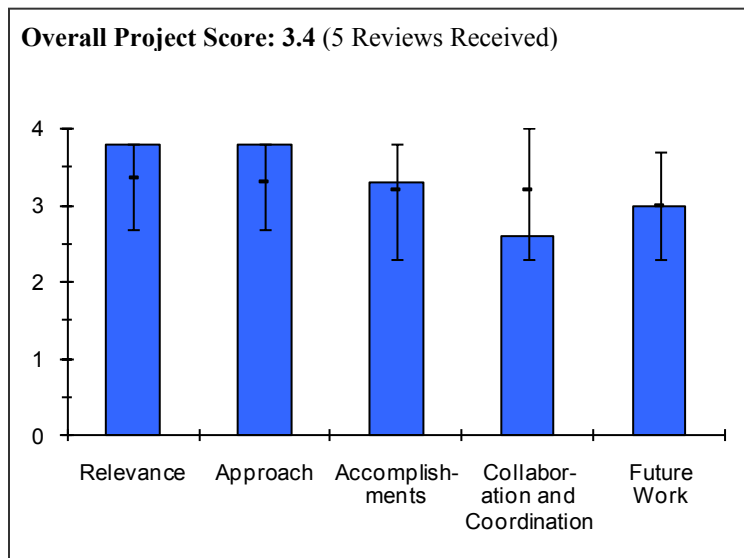
Project # ED-08: Dedicated to the Continued Education, Training and Demonstration of PEM Fuel Cell-Powered Lift Trucks In Real-World Applications

Tom Dever; Carolina Tractor & Equipment Co. Inc.

Brief Summary of Project

The LiftOne program objectives are: 1) to educate a broad group of stakeholders on the benefits of fuel cell and hydrogen technology by conducting hydrogen education seminars at various locations, 2) to demonstrate clean energy through the execution of a series of month-long deployments of two hydrogen fuel cell-powered lift trucks at large, strategically selected electric fleet user locations, and 3) to assist in the commercialization of fuel cell and hydrogen technology through longer and geographically diverse deployments in real-world applications.

Question 1: Relevance to overall DOE objectives



This project earned a score of **3.8** for its relevance to DOE objectives.

- This is an excellent project for educating potential purchasers of hydrogen fuel cell-powered lift trucks. LiftOne is in a perfect position to show its warehousing clients new technology and have the experience and credibility to educate these potential future customers.
- The project is an excellent example of a market transformation and education activity. The use of a forklift marketer offers a good opportunity to inform the market. This helps to expand consideration for the technology.
- Hands-on education of hydrogen technologies is critically important to accelerate the deployment of these technologies. This is important for users, fire marshals, operators, and nearby communities.
- Material handling equipment (MHE) providers have continued to be a strong and successful early market for fuel cells and hydrogen. There is a lot of interest by the MHE industry and its customers on the benefits of fuel cells. American Recovery and Reinvestment Act (ARRA) projects should provide a substantial amount of data that could support a continued and sustained educational program.
- Education about hydrogen and fuel cells in the material handling sector is crucial to the success of this early market.

Question 2: Approach to performing the work

This project was rated **3.8** on its approach.

- Giving the potential clients a chance to use a hydrogen fuel cell lift truck — try before you buy — is a great approach to both educating and marketing these new early market applications. The battery industry people showing up allowed for a lively exchange. They provided great feedback on what the rank and file think about hydrogen and fuel cells and their perceived utility in industrial warehouse settings. Ingersoll Rand, Stanley Tools, Lowe's, Bausch & Lomb, BMW, and Electrolux represent a wide variety of potential large users of this technology.
- Although the demonstrations seem to provide some amount of exposure, it's not clear whether the project is collecting sufficient information for deployment considerations. The PI should reveal more data that can be shared on fuel cell performance.
- The coincidental deployment, education, and cost evaluation is a powerful way to get this technology recognized by the general public. This approach is good.

- Given the early market potential of fuel cells for MHE applications, the specific focus on this market is worthwhile.
- The approach of using hardware to increase education is a proven technique. The PI is a natural educator and spokesman for the technology.

Question 3: Technical accomplishments and progress

This project was rated **3.3** based on accomplishments.

- LiftOne diligently performed this project with multiple potential users and did so on-schedule with very good feedback received. The BMW demonstration eventually led them to a purchase, albeit a Plug rather than a Hydrogenics fuel cell power pack was used. The PI would receive an "A" for the delivery of Electrolux and Stanley Tool demonstrations as well.
- Of the three elements, there have been accomplishments on education and deployment demonstrations, but there wasn't much evidence that the work has assisted in commercialization. There are no indications of continuing or expanding deployments.
- They have had a minor bump in their deployment plans for reasons outside their control. It's disappointing that they were not a little faster in finding a new deployment site when it became clear that the planned deployment site needed to withdraw from the program because of internal production demands.
- In the targeted areas of North Carolina and South Carolina, the delivery has been successful in terms of working toward the adoption of fuel cells by the customers in this region. It may have been helpful to have made presentations at MHE conferences instead of at the National Hydrogen Association and the U.S. Fuel Cell Council conferences.
- There is great information and candor about the problems experienced. The PI should be commended for sharing these challenges. The accomplishments for the deployment are really impressive. It would be good to show the reactions and results from the educational parts of the program. Testimonials of the operators' experiences were presented, but information on how education improved their perceptions would be good to show in the future.

Question 4: Collaboration and coordination with other institutions

This project was rated **2.6** for collaboration and coordination with other institutions.

- LiftOne collaborated well with each of the client sites to which they brought the Caterpillar Class I Hydrogenics fuel cell lift truck. They also rebounded well when their partnership with Michelin fell through, and they quickly identified Ingersoll Rand as a suitable replacement. Safety education was a large part of this effort, and they made tremendous inroads with rank and file workers in this regard.
- The only real coordination mentioned was with Hydrogenics. There must be trade associations and material handling venues that would be good to research for more potential collaborators.
- The collaboration is not extensive, but that is the nature of this project.
- There is concern that Hydrogenics is the partner because Plug Power and Nuvera appear to be making much more progress in this market. However, at the time the work was awarded, Hydrogenics was in a better competitive position.
- Collaboration with companies involved with deployments has been excellent. The project could use more collaboration with the educational elements. Perhaps they could seek out national associations or other entities doing similar DOE education projects.

Question 5: Proposed future work

This project was rated **3.0** for proposed future work.

- During the Q&A, the PI pointed out that a future effort would require the opportunity to let the clients use the lift truck for a longer period of time. A follow-on, two-year opportunity was recommended. A fuel cell forklift leasing program would be an ideal part of such an effort.

EDUCATION

- The project seems to be pursuing the same course for the duration. No efforts appear to exist to work harder toward commercialization.
- This program is moving ahead nicely. It's recommended that the project team be aggressive in getting its last planned deployment executed.
- With the amount of data reporting from the Defense Logistics Agency (DLA) pilot and the ARRA projects being delivered during FY 10, it may be strategically advantageous to have a conduit for a targeted public outreach effort.
- The presentation could use more detail on the educational part of this project. Other future work seems logical, and the reviewer looks forward to hearing the results.

Strengths and weaknesses

Strengths

- The project is going directly to a potential buyer of fuel cell lift trucks.
- The PI's reputation of working in the customer's best interest—to gain and/or retain their business—gave great credibility to the effort.
- The PI is outstanding.
- The targeted education objectives were twofold: 1) educate the future users of fuel cell lift trucks, and 2) help sell them at the same time.
- The area of material handling is an area where significant deployments could be made and supply chains energized for broader benefit. The stranded fleet issue is not present, which makes this an ideal opportunity to learn more about fuel cell deployments and benefits.
- The hands-on educational approach to get the commercial handling community familiar with this technology is good. The combination of hands-on experience and the educational model targeted toward operators and end-users, plus first responders and fire marshals, is excellent.
- There is a focus on the specifics and arcane needs of the MHE customers.
- Certainly, the deployment of the vehicles and the data shown on the use and performance of the lift trucks is a strength.

Weaknesses

- Having only one fuel cell power pack OEM involved limits the evaluation to just that product line.
- The project does not seem to be expanding much knowledge in the actual performance and business case areas for fuel cells in forklift deployments.
- There is concern that some information that is not really necessary for the safe use and familiarity with the technology is imparted to the community (hydrogen 101). A message that needs to be sent is one of excitement for the technology and how it is better than, or competes with, existing technologies. Another concern that in a safety discussion the comparison among propane, gasoline, natural gas, and hydrogen could be creating a wrong and confusing picture. It would be advisable to limit a hydrogen safety discussion to those issues that are needed for the operators and end-users to ensure a safe response in case of an inadvertent accident. Those in the organization who are responsible for the safe installation and fire accident responders would need the more detailed discussions. However, it does appear that the recipient of this educational module received it well.
- There is a regional focus. The project is not giving presentations at MHE industry conferences.
- The timing of the project preceding the availability of cost and performance data, such as the data that will be provided by the ARRA and DLA pilot projects, is a weakness.
- The presentation could use more detail on the education components. There is no doubt that education was provided, but more information on the 101 course and results should have featured more prominently.

Specific recommendations and additions or deletions to the work scope

- Further continuation of this type of education scope is highly recommended.
- The project should try to capture a little more technical information during the demonstration pilots.
- The educational message should be reviewed and refined for appropriateness depending on the target audience.

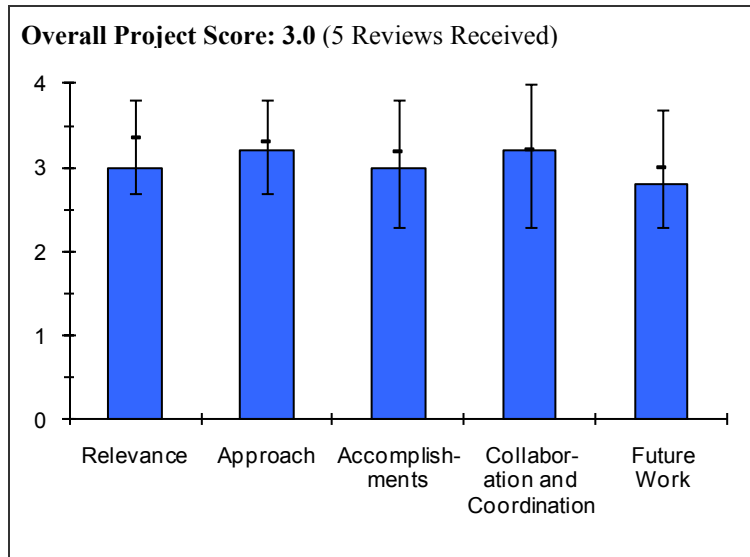
- They should create tailored messages that differ among users (i.e., operators, refueling, etc.), as opposed to a one-size-fits-all message.
- With the amount of data reporting from the DLA pilot and the ARRA projects being delivered during FY 10, it may be strategically advantageous to have a conduit for a targeted public outreach effort.

Project # ED-09: Hydrogen Education in Texas

David Hitchcock; Houston Advanced Research Center

Brief Summary of Project

The goal of this project is to support the DOE goal of reduced petroleum use, greenhouse gas emissions, and air pollution and to contribute to a more diverse and efficient energy infrastructure by enabling the widespread commercialization of hydrogen and fuel cell technologies. This is done by increasing basic knowledge and awareness of hydrogen and fuel cell technologies among Texas state and local leaders. The project objectives are to: 1) establish target audiences; 2) assemble accurate and consistent educational materials and presentations for the Web, workshops and Webinars, and meetings; 3) conduct workshops and Webinars for five major metropolitan areas to reach different regional audiences; and 4) assess how hydrogen knowledge has improved as a result of project activities.



Question 1: Relevance to overall DOE objectives

This project earned a score of **3.0** for its relevance to DOE objectives.

- Texas is a big state and a potential big user of hydrogen and fuel cells in the future. The Texas Hydrogen Coalition needs an education effort to complement their objectives.
- Because Texas is known as an oil state, hydrogen education is valuable in this location.
- The project clearly addresses the major DOE educational barriers of information availability and dissemination. It also addresses barriers at the state and local levels.
- The relevance of this project to DOE Hydrogen Program education goals was good. It was targeted at institutions in Texas.
- Educating Texas government leaders and other interested audiences in the state could result in early adoption of fuel cell and hydrogen technologies there. Texas might also serve as a model for other states and regions.

Question 2: Approach to performing the work

This project was rated **3.2** on its approach.

- The PI took advantage of a number of outreach opportunities across the state.
- The project has various methods for outreach and information dissemination to the target audience. It had a diverse audience with a majority of state and local officials at the workshops.
- The approach is logical and thorough. It addresses key stakeholders but doesn't break any new ground. The connection to DOE Clean Cities coordinators is a plus. The project team showed willingness to alter the project approach based on lessons learned.
- The project team is conducting workshops and events targeted at increasing knowledge of hydrogen.
- Multiple venues and face-to-face communication have resulted in, or supported, three fuel cell fork lift deployments.
- Twelve partners have been incorporated. This high number of partners is exemplary.

Question 3: Technical accomplishments and progress

This project was rated **3.0** based on accomplishments.

- There was good information dissemination at a variety of events.
- The project has a small reach but seems to be well received and effective. It definitely grew in several performance measures from 2008 to 2009.
- Having a couple of real demonstrations (busses and forklifts) helps people experience the technology firsthand, which is invaluable.
- The project has only reached 500 people, which seems to be fewer than other similar DOE-funded projects. It would have been good to see more people reached, especially in such a large state. The project has helped encourage three hydrogen projects in the state, which is good.
- The project has addressed previous concerns about performance measures. The measures identified are appropriate and show progress.
- The project has hosted workshops in four main Texas metropolitan areas with a diverse set of workshop attendees. The project measured the knowledge base of participants.
- A significant number of people (500) were exposed to hydrogen activities at the workshops and events.
- Participation in project activities may have been negatively effected by the recession and by the lack of government support for the development of a hydrogen infrastructure.
- Efforts by a good number of partners and presentations, has been able to reach approximately 500 people in 2009. This is good performance.
- The majority of presentations have been given at events and venues where “clean” or “green” audiences might be present. It could be helpful to target some venues where audiences who know less about the technology might be present to broaden the knowledge about fuel cells and hydrogen beyond the "clean/green" audiences.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.2** for collaboration and coordination with other institutions.

- There are good partnerships with numerous Texas organizations and universities, as well as the Gas Technology Institute (GTI) and the National Renewable Energy Laboratory (NREL). This helps with providing quality speakers and information at workshops. Sysco is a crucial industry partner.
- The project is coordinated regionally with Clean Cities and other regional organizations.
- There is collaboration with a wide range of organizations: Texas Hydrogen Coalition, GTI, Texas state organizations, and private companies.
- There is good collaboration with Texas institutions.
- Having 12 partners is excellent and outstanding.

Question 5: Proposed future work

This project was rated **2.8** for proposed future work.

- The project plans for future work are not impressive.
- With several months left in the program, they are laying the groundwork for future education efforts and collaborations.
- The future work looks good. The project is close to the closeout phase.
- Following up with workshop participants will be useful, as will the summary report of lessons learned.
- The project ends in FY 10. The final project activities are reasonable.
- Several additional presentations, tours and interactions are planned.

Strengths and weaknesses**Strengths**

- Texas is a very populous state with a need for hydrogen and fuel cell education.

EDUCATION

- A lot was accomplished in a short amount of time, which was expanded and improved from the previous year.
- The connection with Clean Cities coordinators and a wide variety of stakeholder types is a strength.
- There is an ability to spur development of hydrogen projects with several organizations.
- The exposure of participants to vehicles and equipment in real-world applications is a strength.
- The focus on Texas institutions is a strength.
- The high number of partners and presentations given is a strength.

Weaknesses

- None.
- There is small attendance. It would be good to maybe expand the audience to the oil and gas crowd in Texas.
- There is a limited reach of project workshop attendees, but this may be because of the economic climate.
- None.
- The relative lack of presentations to audiences that are not "clean/green" might be viewed as a weakness.

Specific recommendations and additions or deletions to the work scope

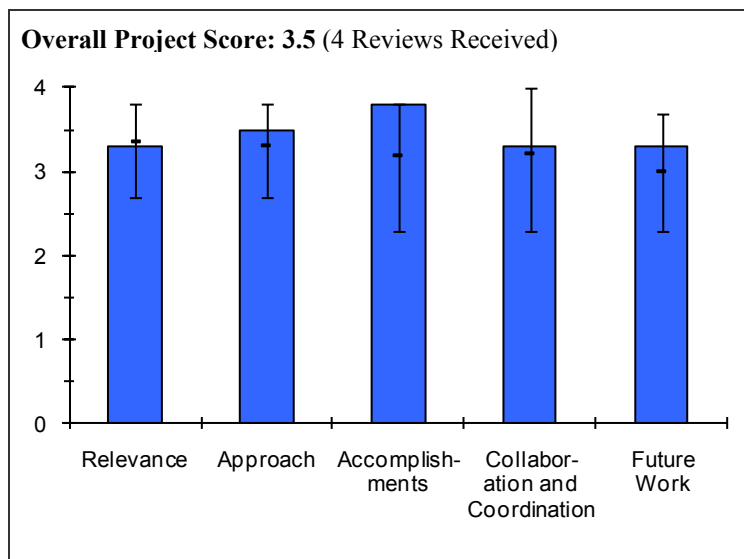
- The project should show how to implement similar programs in other states, such as describing best practices.
- Giving additional presentations to audiences that are not knowledgeable on fuel cell and hydrogen technologies could be helpful.

Project # ED-10: Development of Hydrogen Education Programs for Government Officials

Shannon Baxter-Clemmons; The South Carolina Hydrogen and Fuel Cell Alliance

Brief Summary of Project

The goal of this project is to accelerate the on-going construction of the hydrogen economy in South Carolina and the Southeast by providing accurate and reliable information to state and local decision makers. The objectives are to: 1) identify key messages for decision-makers, 2) develop varying presentation formats based on time available, audience interest and technical level, 3) develop Webinars for state and local government officials, 4) give hydrogen (hydrogen 101) presentations to a variety of stakeholders, 5) give monthly Webinars for interested stakeholders, and 6) collect feedback and improve presentations.



Question 1: Relevance to overall DOE objectives

This project earned a score of **3.3** for its relevance to DOE objectives.

- The project is educating and working with key South Carolina groups, which has resulted in demonstrations, installations, legislation, and permitting.
- The project is relevant to hydrogen education, because it addresses messaging issues. It is working to provide essential information to decision makers in the Southeast.
- This project is critical for reaching state audiences in South Carolina, and it's important for DOE to support these efforts because of their interest in hydrogen and fuel cells. Also, interest from other states helps to show nationwide support that provides validation for continuing the federal program. This is one of the key areas to introduce new technology, so it supports market transformation.
- Persuasive communications with state and local stakeholders, as well as businesses, can result in easier permitting, more state and local government adoption, state and local incentives, adoption of hydrogen and fuel cell technologies by businesses, and decreased risk to hydrogen and fuel cell developers.

Question 2: Approach to performing the work

This project was rated **3.5** on its approach.

- The project is completing more Webinars and presentations than scheduled.
- The project is developing materials to reach key audiences resulting in crucial legislation to help advance commercialization and installations.
- The focus on reaching decision makers is useful. It removes barriers to implementing hydrogen projects. The project is getting to the right people with targeted outreach.
- It brings the DOE message to the audience in a tailored fashion that will help these audiences to better understand the basics of fuel cell and hydrogen technology.
- Responding to evaluation feedback improves the program.
- The project is also doing more advanced education projects.
- The multi-pronged approach in making quality connections through in-person interactions coupled with the utilization of the media is smart and effective.
- The approach is very active and energetic with more meetings and presentations accomplished than originally planned. This is laudable.

EDUCATION

- It may be helpful to state and repeat the essential messages. The central, key message for each target audience should be stated repeatedly during the presentations to improve the focus.

Question 3: Technical accomplishments and progress

This project was rated **3.8** based on accomplishments.

- The project is exceeding targets and conducting more Webinars and meetings than planned. It is reaching key stakeholders and branching out to more interested parties.
- The project includes meetings with political and environmental groups in South Carolina and educating at grassroots and local levels.
- The project has reached more than 1,500 decision makers and many other stakeholders as well, including 60% of the state's government councils.
- The project exceeded expectations for the number of meetings to be conducted.
- The South Carolina Hydrogen Permitting Act pushes permits to the state fire marshal's office, which maintains leadership for the state in hydrogen. This program appears to have had a role in this.
- This project is addressing the social networking aspect as well.
- The project team is taking feedback from its audiences seriously and making changes as best they can.
- There are a lot of other tools and resources. The availability of case studies for businesses will be particularly useful.
- The project team presented great metrics that measure how much outreach is happening. It's wonderful to see this project exceed its goals by so much.
- Having monthly Webinars is an excellent approach. Maintaining a consistent and persistent schedule should provide opportunities to reach out to the maximum number of participants. Keeping up the schedule may be essential to ensuring that all who wish to get the information can access it, and it allows prior participants to encourage others to attend.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.3** for collaboration and coordination with other institutions.

- The project team is working with state and local officials, universities, and organizations. It also works with national groups' universities in other states, as well as fuel cell groups.
- The project has very good partners in South Carolina.
- The coordination is very good. It's mostly focused within South Carolina, which is good for the project. However, other groups would benefit from knowing more about the basic strategies that are being employed. Those strategies can be replicated in other states or even at the national level using tactics such as the combination of in-person and media outreach combined with newsletters and other communications.
- Additional collaborations could be helpful and could include the state's public utilities commission, more utility companies, chambers of commerce, local labor groups, local environmental groups, schools and universities, among others.

Question 5: Proposed future work

This project was rated **3.3** for proposed future work.

- This is a very effective program.
- The project still has one more year to go, but future work was not specifically identified.
- This part may have been left out of the presentation, but if the PI is planning to continue outreach efforts as currently planned, that would make sense.
- The PI should continue the existing schedule while expanding the contacts to complete the project.

Strengths and weaknesses**Strengths**

- There are tangible results with jobs, business attraction, and legislation.
- The project is building on leadership from the state in hydrogen technology, which pushes momentum forward.
- There is a great list of resources.
- The project has focused outreach efforts.
- There is a comprehensive strategy for outreach: in-person interactions, electronic media, and mainstream media like television.
- The project has numerous contacts with interested parties and decision makers.
- The project's handouts are a strength.
- The project's Web site is a strength.
- The broad scope of audiences and of information, case studies, payback evaluations, and similar persuasive materials is a strength.

Weaknesses

- It was unclear whether there is any connection between this hydrogen lift truck education project and the LiftOne education project. There appears to be some overlap in the two audiences. More coordination wouldn't hurt.
- More information on future work is needed in the presentation.
- None noted.
- It could be helpful to add more partners.
- It could also be helpful to focus more on the key messages for the different audiences and repeat them consistently. Since the project has such a broad scope of audiences, this sort of message management might be very helpful.

Specific recommendations and additions or deletions to the work scope

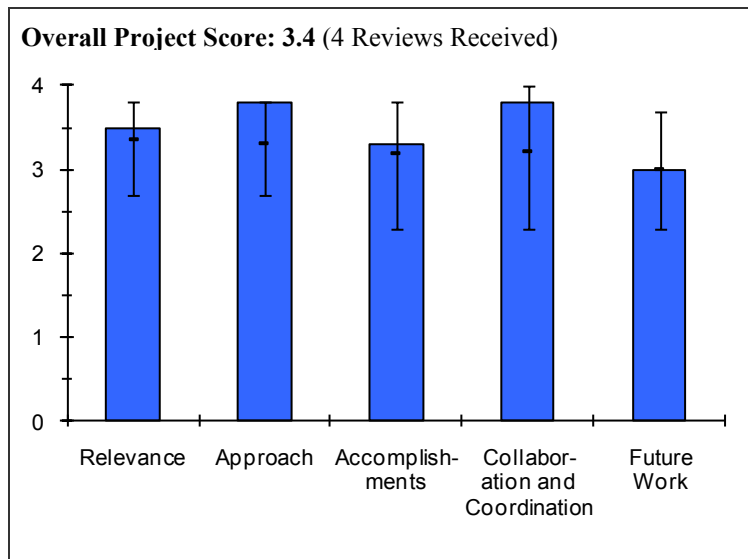
- It would be good if the project worked with other states to show how they succeeded in changing legislation and permitting and to share best practices.
- There is an opportunity to share strategies and messages with other groups doing similar work.
- More partners might be helpful.

Project # ED-11: VA-MD-DC Hydrogen Education for Decision Makers

Chelsea Jenkins; Commonwealth of Virginia

Brief Summary of Project

The goal of the project is to increase a targeted audience’s understanding of hydrogen and fuel cells, including early market applications, and to provide specific examples of actions that the targeted audience (state and local government leaders) can take to support the development and use of hydrogen and fuel cell technology leading to better understanding of the community benefits. Objectives are to: 1) conduct up to a dozen in-person workshops by technical experts and professional educators; 2) produce video resources for public television, seminar use, the DOE, and the general public; 3) use hardware demonstrations when possible and provide real-world examples of the technology; and 4) produce electronic magazine-like articles on hydrogen technology demonstrations and other instructional project deliverables.



Question 1: Relevance to overall DOE objectives

This project earned a score of **3.5** for its relevance to DOE objectives.

- This project's goals and objectives are to educate decision makers who will play a key role in the deployment of hydrogen and fuel cell technologies in their respective geographic region. It is very relevant.
- The project has a good objective and key target area. It is reaching a wide audience through various media avenues.
- The project is very relevant to hydrogen education goals and objectives by reaching a broad audience with consistent messaging.
- It is extremely important for decision makers, especially in this region, to have a reasonable understanding of the technologies and the issues.

Question 2: Approach to performing the work

This project was rated **3.8** on its approach.

- This project is associated with the Virginia Clean Cities program and involves Maryland; Washington, DC; and Virginia. The approach is based on presenting workshops for decision makers that include equipment demonstrations (such as ride-and-drives) and gives the participants an important, hands-on experience.
- The project is using new media to reach younger and more computer-savvy people.
- The videos and Webinars provide great resources.
- The approach is very reasonable and incorporates some unique features. Video products are broadly useful.
- The project team has incorporated new social media efforts as part of its program.
- Ride-and-drives and other demonstrations are a plus. They show the technology working in the real world.
- This group has a plan to put together many worthwhile activities and plenty of relevant educational material.

Question 3: Technical accomplishments and progress

This project was rated **3.3** based on accomplishments.

- The project has made good progress having hosted 12 workshops for regional representatives. The informational videos made with MotorWeek are excellent!
- The video is excellent. It covers all applications and doesn't sugar coat. Lots of real-world applications and footage really make the case.
- The project team has made very good progress working toward all key milestones. Careful resource management will reap benefits to complete additional work.
- The curricula are targeted and well received.
- The project team has made efforts to verify that the audience's understanding improves. It is good to immediately prove the effect of the work.
- The MotorWeek videos will reach audiences well beyond the three states in this project.
- The team's progress has been very good. It is probable that issues beyond its control have restricted some of the progress. The video the team produced was very good, but it seems that distributing a few hard copies of its newsletter would have had value as well. The team didn't hand out any newsletter copies.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.8** for collaboration and coordination with other institutions.

- This project exhibits outstanding collaboration with many appropriate organizations: state, local and private sector.
- The project has good partners within the DC metropolitan area and in Virginia, including the rural areas and other communities besides northern Virginia.
- The project has very good collaborations (GM, universities, others) and a very large number of collaborators (including local governments and Clean Cities).
- The project team is working with the Los Alamos National Laboratory project, which is also funded by DOE.
- The MotorWeek partnership is unique and represents a good crossover to Clean Cities program efforts that will connect to this audience. It will be pushing the information through the Clean Cities network and connecting with other areas (i.e., the Northeast and California) where hydrogen is being used.
- There looks to be some work with the other hydrogen education activities funded by DOE, specifically South Carolina.
- The very nature of this type of project almost insures a great deal of collaboration—and the project team did collaborate.

Question 5: Proposed future work

This project was rated **3.0** for proposed future work.

- Future work plans are to complete the project in September, continuing the activities presently underway.
- There will be more seminars and another video that will be reaching a larger audience.
- The project ran for 12 months. There is some very interesting work to be done, such as trying some more innovative approaches to reach more audiences, addressing some travel issues, and teaming with TV Worldwide to produce do interactive Webinars.
- The student thesis project on scooter build should be a great addition.
- They seem to be putting much of their future plans on more video and a few more seminars. These are certainly worthwhile but, under present economic conditions, a bit more innovation might be helpful.

Strengths and weaknesses**Strengths**

- This is an excellent approach featuring multi-component activities.
- The video is huge asset. It needs to be circulated to key audiences outside the scope of this project.

EDUCATION

- There is a careful marshaling of DOE resources, and extra cost sharing is a plus.
- Video resources are very interesting and can be widely used outside of the project area.
- They have lots of connections outside their project area. Clean Cities can be a good outreach tool.
- There are impressive efforts by this group for relatively small funding.

Weaknesses

- None apparent.
- None significant.
- None worth noting.

Specific recommendations and additions or deletions to the work scope

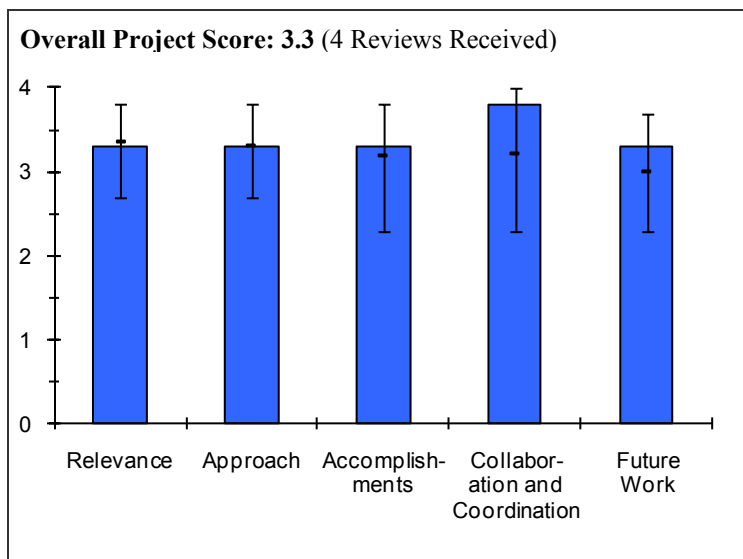
- Keep up the good work!
- The project should partner with other states to share best practices and share video and/or Webinar resources.
- It would be good to see more information on the curriculum development, although time limitations may have prevented this. It may be helpful to bring some samples next year.
- The project team should try to develop a few innovative approaches in addition to the more obvious. Also, it might be of value to have a few hard copies of the newsletter available for selected distribution.

Project # ED-12: State and Local Government Partnership

Joel Rinebold; Connecticut Center for Advanced Technology, Inc.

Brief Summary of Project

The primary objective of this project is to build and strengthen partnerships between the hydrogen community and state and local governments. The partnership building project has five components: 1) identify key stakeholders and expand and strengthen partnerships, 2) develop resources to analyze potential sites for hydrogen and fuel cell deployment, 3) educate state and local decision makers and other key stakeholders, 4) integrate state and local development plans with federal and/or DOE objectives, and 5) identify financial and investment opportunities.

Question 1: Relevance to overall DOE objectives

This project earned a score of **3.3** for its relevance to DOE objectives.

- This project is relevant in its focus on the education of key stakeholders in Connecticut.
- This project is strongly linked to the goals and barriers that needed to be addressed by the education program.
- The project is relevant to addressing the hydrogen education barriers for state and local governments and for communities in Connecticut. It focuses on a state with heightened interest in hydrogen technology.
- With several of the major fuel cell firms in Connecticut, the state is already generally more aware and supportive of fuel cell technologies than most others.

Question 2: Approach to performing the work

This project was rated **3.3** on its approach.

- The approach of providing educational opportunities for key stakeholders who make decisions regarding the deployment of fuel cell technologies in respective areas of responsibility is sound and responsive to the projects goals and objectives.
- The focus on deploying projects that will be successful, and being an honest broker when hydrogen technologies will not work, is critical to the success of early deployment.
- There is a logical five-step approach to address barriers: identifying the audience, developing resources for analysis, educating stakeholders, integrating local plans with national DOE objectives, and locating financial incentives. The approach is thorough and carefully planned.
- Presentation slide 5, Approach and Milestones, looked good, but it is not clear that these efforts can be effective. For example, the issue of potential environmental benefits is extremely complex. It involves things such as how the fuel is produced and transported, whether there is (or will ever be) carbon capture, etc. The same is true for economic issues. They are very complex and not subject to simple models.

Question 3: Technical accomplishments and progress

This project was rated **3.3** based on accomplishments.

- The approach of presenting workshops/seminar tailored to fit the specific audience, whether it be state legislatures or regional or local officials, is sound. An interesting variation in this project is the inclusion of

combined heat and power opportunities (considering both the advantages and disadvantages) and presents a full spectrum of fuel cell deployments to potential users.

- Outstanding progress is being made toward the stated goals. While some may criticize the use of models for fear of misuse, what this project has done in making appropriate tools available to targeted audiences is an excellent approach, particularly the focus on the bottom line of cost and cash flow. If these projects are not successful financially, the entire industry will suffer. The focus on the financial success and the willingness to say no to situations where these technologies will not work is outstanding.
- A unique aspect is the project benefit tool that is used to calculate the benefits of implementing hydrogen fuel cell projects such as return on investment, renewable energy credits, performance, etc.
- There is a wide range of educational efforts at various state and local venues to reach appropriate audiences.
- The project provides a connection of hydrogen and fuel cells with local and state energy plans. For example, they are working with the Connecticut Department of Transportation on a statewide hydrogen fueling and vehicle plan.
- It is good to hear that their analytical tools allow them to analyze possible projects and make the right fit. They can avoid giving organizations the go-ahead for projects that will not be successful.
- Mostly, the project seemed to have developed resources from which to draw information and assistance. How are the messages actually conveyed? How do they present cash flow analyses, and to what groups? What was the result of working with the DOT to develop strategies for vehicle deployment and refueling?

Question 4: Collaboration and coordination with other institutions

This project was rated **3.8** for collaboration and coordination with other institutions.

- The project has many collaborations and interactions with federal, state, regional, and local decision and policy makers. Bringing focus on integrated opportunities is very valuable.
- The numbers and types of collaborations are very appropriate for this project.
- There is focus on state and local partners. They have worked with a great many organizations in Connecticut, and the Connecticut Center for Advanced Technology appears to have very good connections within the state. Utility partners are a good addition.
- There are clearly many contacts with other organizations, although probably most are not true collaborations.

Question 5: Proposed future work

This project was rated **3.3** for proposed future work.

- This project is 85% complete and scheduled to end in August 2010. The project team's plans to complete the project include reinforcing contacts already made and extending the activities to additional contacts, which are reasonable and proper actions.
- This project is scheduled to end this year, and the team is on track for a successful conclusion.
- Closeout work should be useful such as regional briefings and conducting a post-survey for measuring the success of the program.

Strengths and weaknesses

Strengths

- The project has a sound approach.
- This is a really good project. It is unfortunate that it is finishing up without an obvious continuation project.
- There are thorough planning efforts.
- The project has employed advanced online analysis tools to assist with planning hydrogen projects and communicating their benefits to the local communities.
- The project team is being realistic with local communities and only encouraging projects where they make sense.
- This is an area where additional decision-maker education about the issues could be very useful.

Weaknesses

- None apparent.
- None.
- There is no actual project deployment yet.
- The project PI seems to be trying to do too much, which probably contributes to sub-par performance in some areas.

Specific recommendations and additions or deletions to the work scope

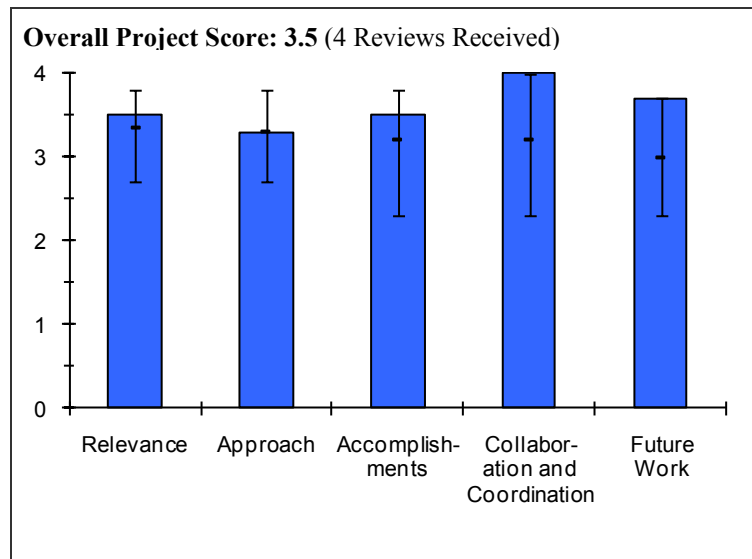
- The project team should continue making models for comparative analysis and municipal energy analyses available to potential early adopters.
- A general comment on the educational sub-program element: Education to all segments of society regarding hydrogen technologies is very important for the acceptance of these technologies, particularly if we want to accelerate the adoption. There is concern that funding for this program element is being sacrificed, which hinders visibility. Granted, the overall budget for hydrogen education needs improvement, but even in tight budget years, an increased focus on education is warranted particularly if we want to accelerate public acceptance of these technologies.

Project # ED-13: Raising H2 and Fuel Cell Awareness in Ohio

Pat Valente; Ohio Fuel Cell Coalition

Brief Summary of Project

The overall objective of the proposed program is to increase the awareness and understanding by state and local government officials in Ohio concerning hydrogen and fuel cell technology. The goal is to accelerate the deployment of clean energy solutions that will better the environment, decrease dependence on foreign energy, and bolster the manufacturing sector. This increase in the awareness and understanding will directly contribute to these Hydrogen Education Sub-program objectives: 1) by 2009, increase the understanding of hydrogen and fuel cell technologies among state and local governments by 10% compared to the 2004 baseline, and 2) by 2012, increase knowledge of hydrogen and fuel cell technologies among key target populations (state and local governments) by 20% compared to 2004 baseline.



Question 1: Relevance to overall DOE objectives

This project earned a score of **3.5** for its relevance to DOE objectives.

- The goals and objectives of this project to increase awareness of hydrogen and fuel cell technologies in Ohio with potential early market segments are very relevant.
- Outreach to the targeted audiences, including elected officials, economic developers, transit operators, utility companies, is critical to the successful deployment of these technologies.
- This project is highly relevant in a state with a need for new industries and technology.
- This seems to be an excellent effort, but naturally, it is confined to the state of Ohio.

Question 2: Approach to performing the work

This project was rated **3.3** on its approach.

- The approach involves serving as part of the Ohio Fuel Cell Trade Association, which is a sound plan with a focus on informing elected officials and promoting economic development.
- The design of specific forums to target the appropriate audiences is exactly what is needed. A one-size-fits-all solution is not appropriate and is not used in this project’s approach.
- The forum approach is good and can reach a large number of interested people.
- While it’s very good plan, it is apparently confined to forums involving targeted audiences. There are many other avenues that could be used to convey better understanding of hydrogen and fuel cells.

Question 3: Technical accomplishments and progress

This project was rated **3.5** based on accomplishments.

- The project team has been making good progress based on a large number of informational meetings that have reached targeted audiences totaling approximately 1000 interested participants. The emphasis on matchmaking

potential funding sources with early users is very good. The project has been very successful in getting state funding for developers and users of fuel cell technology.

- Initial target goals have been exceeded in some areas and are on track to be achieved in other areas. The project team initially planned for nine forums and has to date held 16 forums, which is excellent.
- The project team has exposed a significant number of people through the forum approach.
- Developing databases to integrate interested people with fuel cell capabilities in Ohio is good.
- Relative to the funding involved, the group has accomplished a great deal. The group has held more than the originally planned number of forums and has apparently been very effective in conveying its message to those it has reached.

Question 4: Collaboration and coordination with other institutions

This project was rated **4.0** for collaboration and coordination with other institutions.

- There is much collaboration including state and federal agencies, along with state, regional, and local interested participants, which is impressive. It is noted that the involvement of federal laboratories in Ohio was an excellent idea.
- The collaborations around Ohio are very impressive.
- The project team exhibited very good collaborations with key Ohio organizations.
- The project team has effectively interacted with and collaborated with many diverse and important groups.

Question 5: Proposed future work

This project was rated **3.7** for proposed future work.

- Plans for completion of this project appear to be reasonable and proper, and the project team builds on the sound approach utilized in this project to date.
- The project appears to be on track to finish, having met or exceeded all its proposed goals and targets. It is performing beyond expectations.
- The project activities may continue from other funding sources after the DOE funding ends.

Strengths and weaknesses

Strengths

- This is a sound and innovative approach.
- The project demonstrated expertise in fuel cell and hydrogen technologies.
- The use of focused forums to educate the public is a very powerful, cost effective, and a successful way to increase education and awareness of these technologies. This project has been quite successful in meeting its stated goals. The PI admits that at least one of the initial goals, economic development, may have been a bit too aggressive for the project team to meet. However, the success in other areas of this project far outweigh missing the aggressive target set in one area.
- There is strong commitment from the state of Ohio.
- The project is apparently well organized and has done more than planned, with the exception of the total number of contacts made to date.

Weaknesses

- No weaknesses are apparent.
- None.
- None.
- The project team seems to have relied almost exclusively on forums. The forums seem to have been very effective but other approaches, such as informational videos, could have added to the overall effectiveness and probably would have allowed many more people to have been reached.

Specific recommendations and additions or deletions to the work scope

- It was good to hear that these forums will continue beyond the life of this particular project. DOE needs to continue these successful educational outreach activities, particularly now because hydrogen technologies are just beginning to take hold in the energy and transportation sectors. To lose momentum now will result in a significantly decreased rate of deployment. Indeed, the number of skeptics may increase, which will be devastating. As part of the executive branch, DOE needs to work with the White House to continue these educational outreach activities that are critically needed to accelerate the deployment of hydrogen technologies.

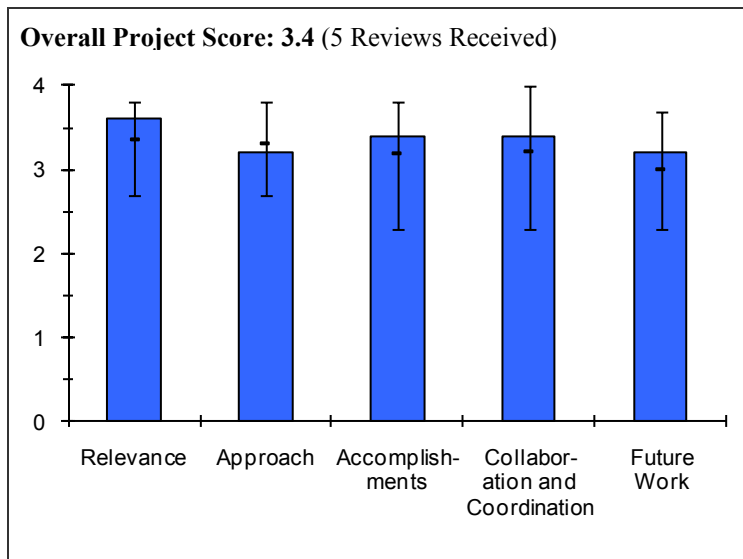
Project # ED-14: H2L3: Hydrogen Learning for Local Leaders

Patrick Serfass; Technology Transition Corporation

Brief Summary of Project

The objectives of this project are to: 1) create presentation materials tailored to effectively communicate with state and local government leaders, relating hydrogen to their interests and spheres of responsibility, 2) establish pathways for working with national associations of state and local officials as a route for disseminating information about hydrogen and setting a pattern for ongoing flow of information, and 3) hold learning sessions through workshops for local and state officials at national gatherings and achieve nationwide reach.

Question 1: Relevance to overall DOE objectives



This project earned a score of **3.6** for its relevance to DOE objectives.

- This project is helping DOE overcome the barrier of disseminating good information on hydrogen technologies to the national, state, and local thought leaders.
- The content of this multi-dimension project plan to educate the public on hydrogen and fuel cells is critical to DOE objectives.
- The project addresses key barriers of information dissemination and education. It addresses the lack of information resources and mixed messages, specifically to local leaders. They work with information dissemination networks. The national focus is very relevant to DOE objectives to build coherent messages.
- The project is a solid provider of key information to decision makers and policy makers.
- Education for local leaders can help encourage hydrogen deployments. The idea is to encourage incentive funding and early adoption of hydrogen technologies by local leaders. This can help to jump start the commercial market.

Question 2: Approach to performing the work

This project was rated **3.2** on its approach.

- The project uses good mechanisms for disseminating information.
- Working and talking with local leaders are good ways and means to reach their goals.
- The project team's use of workshops and Webinars is an effective way to reach target audiences.
- The U.S. Market Report (www.hydrogenassociation.org/marketreport) is an excellent report that has been downloaded 30,000 times.
- Working with the Public Technology Institute (PTI), a national organization, was a good approach. The catch phrase "H2L3: Hydrogen Learning for Local Leaders" is good and allows a train-the-trainer approach for education dissemination. Engaging the National Association of State Energy Officials (NASEO) is also effective. Working with as opposed to "talking at" is a novel and effective approach in communicating with the target audiences. Telling more stories is an effective education approach as well. The Hydrogen Student Design Contest and Business Solutions Forum were both good ideas, too.
- Working with state and local leaders using peer presenters is a good approach using peer presenters. Relating hydrogen information to the audience (peers talking to peers) is important for this audience. The project team is also utilizing national organizations to reach local leaders.

EDUCATION

- The project is outstanding in terms of collecting and reporting industry information and with its relationship with NASEO, which is an important stakeholder. However, the effectiveness of the delivery of services tied to the National Hydrogen Association (NHA) meetings, where attendance at those forums has been low, is questionable.
- The approach appears to involve encouraging networking and collaboration, mostly among those interested in hydrogen technologies.
- The learning sessions seem to occur mostly at hydrogen or energy events, not at events where local officials unfamiliar with hydrogen will be exposed for the first time. It might be better to make presentations at national associations of mayors, council members, city managers, and auditors, for example, rather than high technology venues where the messages won't be new.
- The use of peer presenters is generally effective. This is a strength.
- The organic approach is non-conventional and potentially risky. Typically, outreach opportunities would start with a presentation and move into the organic phase. Skipping the presentation could be confusing to the audience.

Question 3: Technical accomplishments and progress

This project was rated **3.4** based on accomplishments.

- The Hydrogen Student Design Contest was a huge success.
- The Hydrogen Business Solutions Forum at the NHA conference was successful.
- The Hydrogen Student Design Contest winners went to the World Hydrogen Energy Conference.
- The fact that Sandy Thomas supports the U.S. Market Report is significant, since he has provided some excellent analysis for DOE in the past.
- The project team continues to think outside the box and get the public involved.
- Each one of the efforts turned out to be quite effective, with the exception of the Hydrogen and Fuel Cells Business Solutions Forum. The latter project suffered from sending notification to potential attendees too late. The PI blamed that on inability to lock in speakers early enough. While partially true, it is common practice to write "invited" next to a prospective speakers name when to enable prompt publicizing to prospective attendees.
- Telling stories is a good way to reach the audience as opposed to relaying dry technical data. Tailoring the curriculum for specific audiences is important.
- The project developed a fuel cell market report with extensive information on the hydrogen industry, which was endorsed by NHA. It is a good resource that is downloaded frequently and well received.
- Their informal networking activities that develop personal connections to disseminate information is a novel approach.
- Communicating with university students through a student design contest reaches the next generation of hydrogen technology users.
- Their participation in some social networking sites can be particularly successful in disseminating reports and receiving comments.
- Some other educational sub-program projects used Webinars periodically and more frequent meetings to increase the number of interactions with audiences. More presentations and interactions such as Webinars and other ways to communicate could improve this project.

Question 4: Collaboration and coordination with other institutions

This project was rated **3.4** for collaboration and coordination with other institutions.

PTI is a good partner.

- The California Fuel Cell Partnership has been helpful.
- NASEO is an essential partner in this project.
- They continue to ask anyone who is interested to participate, and they are convincing some to join the cause.
- There is great collaboration with a number of activities. The student design contest was particularly effective. Working with as opposed to than talking at the intended audience is also effective outreach. Talking with local leaders helps to get the message out to a broader audience from people the locals know and respect.

- The project is partnering with PTI for strong outreach activities to local organizations. They are also working with NASEO.
- There are good partners in terms of their collaboration with PTI, the Schatz Energy Research Center, and NASEO. It is also beneficial to be able to easily access the Technology Transition Corporation (TTC) organizations.
- The lack of active partners may be holding this project back. Active partnerships with associations comprised of local officials may help and is encouraged.

Question 5: Proposed future work

This project was rated 3.2 for proposed future work.

- It is important to finish their future work. They are halfway through their outreach program.
- It's not certain that lessons learned were discussed for potential future work. Having said that, many of these techniques should be considered in the future.
- Future work builds on the activities by the core of local H2L3 leaders. The activities seem reasonable
- The Webinar-based educational effort is good in reaching a lot of people at a low cost.
- It seems like most of the future work is follow-up to the previous work. It might be helpful to hold more events at a wider range of venues for more exposure to new audiences.

Strengths and weaknesses

Strengths

- The project has good partners, especially PTI and NASEO.
- The project has a good focus for national and local leaders.
- Working with local leaders (H2L3) is a strength.
- The student design contest engages young participants.
- The relationship with PTI improves messaging.
- Having a strong connection with NHA through TTC, the contractor that operates the NHA, is a strength.
- The project employs some novel ways of reaching intended audiences through networking events and social networks.
- The extensive data report is a great asset.
- The ability to collect and present relevant information to both national and local interests is a strength.
- The market study is a good resource.

Weaknesses

- None.
- There was low attendance at the Hydrogen and Fuel Cells Business Solutions Forum.
- The project should ensure that the activities are reaching the right audiences and avoid "preaching to the choir" if possible.
- The NHA workshops have been spotty in terms of the ability to attract a large number of people.
- The project does most of its communication to audiences who are already familiar and probably supportive of the technology. Expanding this to new audiences would be an improvement.

Specific recommendations and additions or deletions to the work scope

- Expanding the university courses in hydrogen and fuel cell technology may be a good step.
- A Hollywood or sports star image supporting hydrogen would be good to encourage.
- An annual drive across America with the DOE Clean Cities Program support would be a good idea, ending with an event at the Capitol steps. Dennis Weaver used to organize this.
- Encourage the project team to continue with the hydrogen market report for 2009 if funding is available.
- It could help the project to expand to new venues and to new audiences who are not as familiar with the technology.

Project # ED-15: Hydrogen Education State Partnership Program

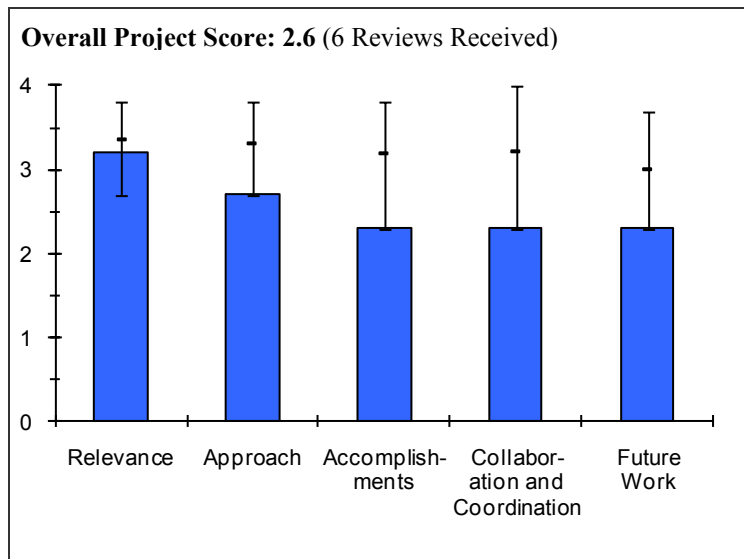
Charles Kubert; Clean Energy States Alliance

Brief Summary of Project

The objectives of this project are to: 1) identify state hydrogen program best practices and policies, 2) provide information and technical assistance to state policy leaders and state renewable energy programs to foster the development of effective fuel cell programs, and 3) promote strategic opportunities for states and DOE to advance fuel cell deployment through partnerships, collaboration, and targeted activities.

Question 1: Relevance to overall DOE objectives

This project earned a score of **3.2** for its relevance to DOE objectives.



- The CleanEnergy States Alliance (CESA) writes reports for dissemination to policy makers.
- It is unclear how the reports are placed into the hands of the policy makers.
- The project is relevant to DOE interests because it proposed to coordinate state and regional efforts on a national scale. Delivery unfortunately was lacking.
- DOE isn't doing this type of work, so it helps promote technology and advancements to key audiences.
- It is strategically important to have a communications dialogue that can reach a number of key states that are well-positioned to be leaders in terms of shaping energy policy.
- The focus is on promoting education at the state institutional level.
- Making presentations to state officials regarding hydrogen technologies can help to persuade other states beyond California, Connecticut, Massachusetts, and New York to adopt incentives and programs in support of fuel cell programs.
- Coordination and collaboration among states with hydrogen programs can also help them to solve problems using resources available within that network. This can improve the efficiency and effectiveness of individual state programs through cooperative efforts.

Question 2: Approach to performing the work

This project was rated **2.7** on its approach.

- Only three states (California, Connecticut, and New York) are funding fuel cells. This is a limiting factor.
- Only three reports have been written so far.
- Targeting policy makers makes sense, but there was little evidence that it was done to any significant degree. The CleanEnergy States Alliance is a sound approach to nationwide education dissemination, but again, they were short on the details and follow through. Engaging with the Department of Homeland Security (DHS) was not well thought out and really out of scope.
- The reports are targeted and needed, but are they reaching the right audience. How are the messages marketed outside of the fuel cell industry?
- While the strategy is sound, the execution and delivery have been spotty at best. The primary weakness is the focus primarily on states with systems benefits charges and primarily on the National Conference of State Legislatures (NCSL). The former is limiting in the project's scope because there are many other state-level programs and policies that can be positioned to advance fuel cells. The latter is limiting because NCSL is not in a position to be a contributing partner, much less a sole partner.

- The project has a multi-pronged approach involving best practices, information and technical assistance, education and outreach, communications, and a focus on critical power.
- The approach of using meetings and venues that are likely to get to new potential early adopters is a strength.
- The publication of brochures is also a strength.

Question 3: Technical accomplishments and progress

This project was rated **2.3** based on accomplishments.

- The project includes development of a list serve and a Web page to link best practices.
- The project team held Webinars.
- The project team wrote three reports.
- The project team identified the best policies at the state level to support hydrogen fuel cells and technologies.
- For the funding provided, even the PI admitted little was delivered beyond three brochures. His response to questions was even more troubling.
- The project seems to be moving slowly. The team devoted two hours of a three-day meeting to tell the state fund managers who aren't investing in fuel cells (all but three) about the benefits of fuel cells. Why were only two hours devoted?
- A fair rating is generous. The summary page highlights the fact that stationary fuel cells continue to be largely unfamiliar to state policy makers.
- The description of accomplishments is not very detailed. There was no discussion of the reports generated or the case studies completed.
- The publication of brochures is excellent and is a strength of the program.
- The concentration on critical loads is viewed as a good approach.
- The flagging of National Electric Code Article 708 is helpful and laudable.

Question 4: Collaboration and coordination with other institutions

This project was rated **2.3** for collaboration and coordination with other institutions.

- The project is partnered with the National Council of State Legislators (NCSL).
- Only California, New York, and Connecticut outreach was done. The PI did not talk beyond the slides to give confidence that a large collaboration effort was undertaken.
- There is a key partnership with the NCSL.
- NCSL is shown as the sole partner. This group could have established stronger relationships with stakeholders who were much better positioned to provide targeted information relevant to fuel cells. The National Hydrogen Association (NHA) and the U.S. Fuel Cell Council (USFCC) are two examples of potential collaborations that would have been much more effective than NCSL.
- There seems to be a reasonable level of collaboration.
- Partnership with the NCSL is viewed as a good partnership that could result in new early adopters.
- Adding other state-level associations as partners might be helpful, such as the National Governors Association and the Council of State Governments.

Question 5: Proposed future work

This project was rated **2.3** for proposed future work.

- Their attempt to get DHS and the Federal Aviation Administration engaged to promote fuel cells is a good idea.
- The project team should encourage state-level policy makers to include hydrogen and fuel cell technologies in their Renewable Portfolio Standard plans.
- The project works with State Energy Program Managers to build awareness and get favorable legislation passed that will support hydrogen fuel cells and technologies.

EDUCATION

- The PI gave little confidence that additional funding would be of any use. This project should not continue beyond its contract and DOE should seriously consider re-scoping this effort to get more impact out of it, if possible.
- Case studies and targeted reports are crucial in letting the public know about fuel cell successes and experiences.
- This project needs to push the policy and legislation up because it doesn't want to miss the boat on a lot of the clean energy legislation moving through the states and federal government. Fuel cells need to be included.
- The future work plan looks reasonable.
- Continuing to reach out to organizations and make the brochures available will finish the project.

Strengths and weaknesses

Strengths

- They have a niche group at the state-level with whom they engage, but the results seem few and far between except for the written documentation.
- None.
- Their access to fund managers and state legislatures could really help to move industry in the states.
- Recognition of key stakeholders at state and local levels is a strength.
- None.
- Hard copy brochures are a strength and an exemplary approach.

Weaknesses

- The project needs more results and tangible goods.
- The project is not working with state organizations in an effective fashion.
- The PI is not doing much beyond the three reports. The remaining two case studies in 2011 will likely have minimal impact.
- The project needs to move faster or prioritize tasks to get the most effective ones, policy changes and legislation, out there.
- The project is very weak in terms of execution. For example, this group was not aware that the ARRA included fuel cells in substantial state block grant programs. Not including this in the message delivery is an egregious error in execution. Better coordination and collaboration with DOE and key stakeholders would have mitigated the risk of this happening.
- This project needs better metrics of success.
- More outreach at more meetings would improve the project.

Specific recommendations and additions or deletions to the work scope

- The project should publish the results of the state-level interest on wastewater.
- The project team should investigate Walmart and other grocery stores that are good sources for using fuel cells.
- Teledyne Energy Systems would be good to develop this area of interest.
- It is recommended that the PI review the 2011 plans and re-scope as necessary to gain a broader impact.
- This group was weak last year, and there is no evidence of improvement. They need better coordination with the DOE and with other message-delivery stakeholders such as the NHA and USFCC.
- The project should provide greater emphasis on some key areas of potential, near-term interest to state institutions. It needs to hone in on the highest potential critical facilities for fuel cell backup power.
- More partnerships with state-level associations such as the National Governors Association and the Council of State Governments would be helpful.