

## 2012 — Education

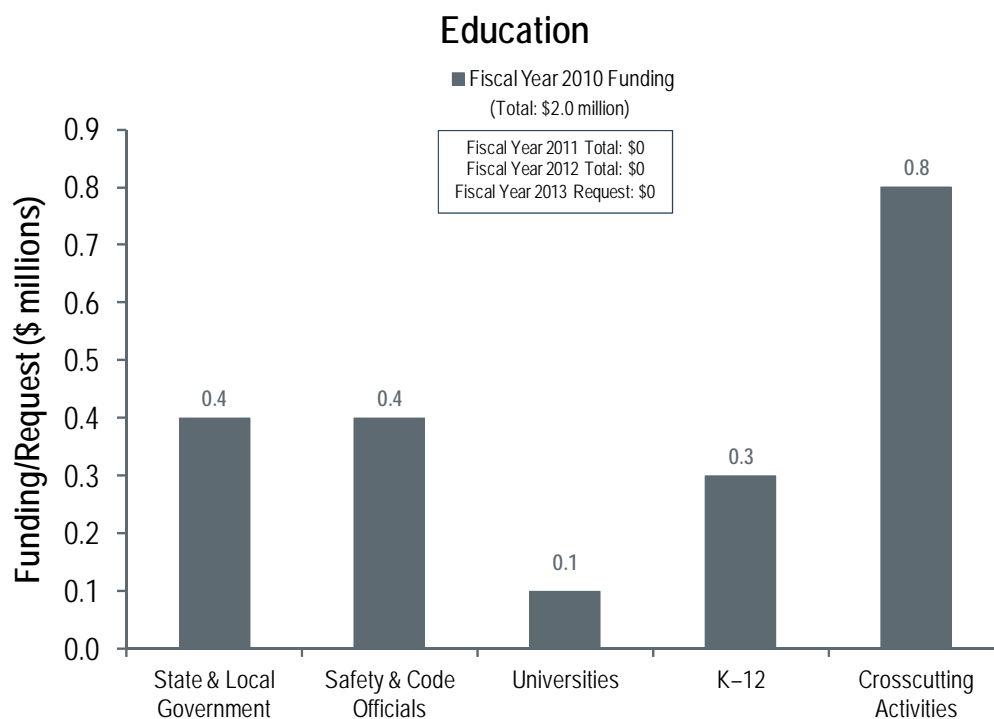
### Summary of Annual Merit Review of the Education Sub-Program

#### Summary of Reviewer Comments on the Education Sub-Program:

Reviewers considered the Education sub-program to be focused, well-managed, and effective. They highlighted that the sub-program has made important impacts on the knowledge and comfort level regarding hydrogen among the general public, education system, decision makers (both state and regional), and first responders. Reviewers emphasized that the sub-program activities are critically important to the successful adoption of fuel cell technologies, particularly in the areas of state and regional education, partnership building, policy formation, and information management. Concerns about the lack of funding for the Education sub-program were expressed repeatedly, and reviewers consistently encouraged continuation of education efforts to support hydrogen and fuel cell deployments.

#### 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 and longer term applications. No funds were appropriated for the Education sub-program in fiscal year (FY) 2011 or FY 2012; projects reviewed were funded with prior year appropriations.



**Majority of Reviewer Comments and Recommendations:**

Two Education sub-program projects were reviewed, and they were rated very highly, receiving scores of 3.6 and 3.4. Scores reflect the progress made over the last year and the plans for future activities.

**State and Local Government Officials:** Both projects reviewed were for educating state and local government officials. Reviewers observed that because state and local leaders are potential technology deployment facilitators, their education is essential to the future success of hydrogen and fuel cells. Reviewers also commented that the locales of the projects were well-chosen, in states with an existing hydrogen and fuel cell presence. Key recommendations were that additional collaboration should be pursued to create programs that can be replicated across multiple states and regions, that the metrics used to track progress should be improved, and that integration with the Clean Cities Program could be a way to continue their efforts.

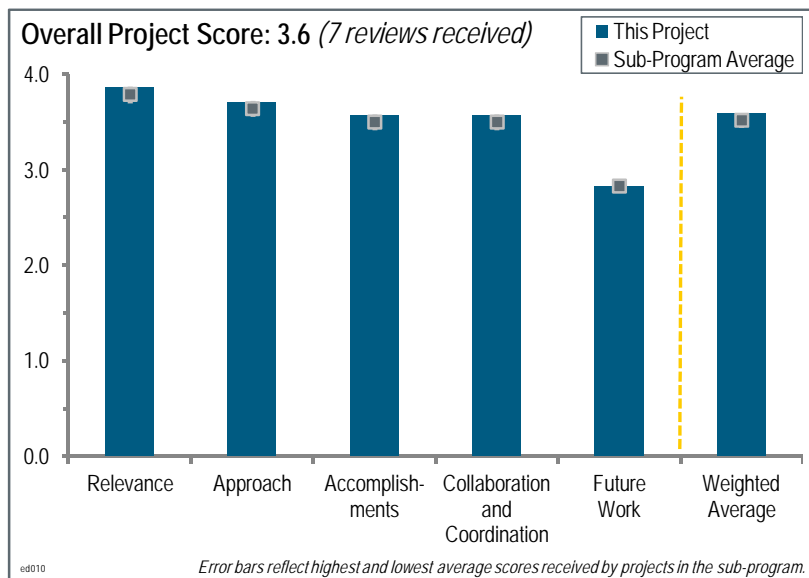
## Project # ED-010: Development of Hydrogen Education Programs for Government Officials

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

### Brief Summary of Project:

The objective of this project is to accelerate the ongoing development of a hydrogen and fuel cell economy in South Carolina and the Southeast by providing accurate and reliable information to state and local decision makers. Information dissemination tools include developing presentation tools and formats such as webinars; educational Internet browsing tools; and live presentations for state and local government officials, industry leaders, and stakeholders.

### Question 1: Relevance to overall U.S. Department of Energy (DOE) objectives



This project was rated **3.9** for its relevance to DOE objectives.

- This project is leading to additional hydrogen and fuel cell projects in the area, which supports DOE's goal of reaching multiple stakeholders. Meetings with legislators help to make a case for continued funding for this project.
- The initiative serves as a focal point for information dissemination from within the state and region. It is poised for growth in research, development, and deployment.
- This project is very relevant to the mission and goals of the DOE Fuel Cell Technologies Program (FCT Program) because it has direct impacts and gets the word out about fuel cells and hydrogen.
- The principal investigator (PI) does a great job identifying influential people and reaching them with messages that resonate with them. The PI encourages support that is at a high level and helps DOE keep the focus on fuel cells and hydrogen.
- The project has addressed the objectives of the Education sub-program and has helped to create an environment where the FCT Program can be more successful. It was great to see that the PI was not only looking out for South Carolina, but was also helping the program through this project's activities.
- This project is right on. The FCT Program needs to continue outreach to political stakeholders, particularly in this critical time of early market deployment. The success of the material handling market and other early markets needs to get attention from influential political people to increase awareness and support. This outreach should not just be in South Carolina, but nationally and internationally as well.
- Education is critical to the emergence of a hydrogen economy, fuel cell electric vehicles, reasonable safety codes and standards, and the awareness of various fuel cell applications and the domestic jobs they create. This effort addresses all of those elements and does so at a strategic level for South Carolina. Incentives are necessary for the emerging hydrogen and fuel cell markets to grow, and this effort targets key decision makers who can help address the need for incentives. The Hydrogen 101 course helps bring the populace to a minimum level of understanding and counters any myths or rumors that may abound regarding hydrogen and safety. Business cases are very important to decision makers, and this effort focuses on a clear, articulate business case for a number of fuel cell applications.

**Question 2: Approach to performing the work**

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

- This project has many activities aimed at reaching out to various audiences.
- The personal, well-focused approach of this project clearly worked. South Carolina is on the fuel cell map largely due to the efforts of the South Carolina Fuel Cell Alliance, and clearly this project contributed to that success.
- The PI has accomplished much with limited funds, limited staffing, and lots of challenges in South Carolina. The PI knows how to stay focused on the tasks that are achievable and part of the program plan.
- Assess, design, develop, deploy, and evaluate is a solid technical approach for delivering educational materials across a wide swath of the South Carolina populace. Greenway Energy is a good partner that produced detailed business cases. The technical approach was to “always focus on hydrogen from an economic point of view.” This is a proven and effective practice.
- The project used written materials, direct materials, press releases, and a newsletter of high value. Of the greatest value were the direct meetings, briefings, and forums. This approach, with an emphasis on economic development and job creation, is appropriate.
- It is great to see that this project was able to employ website work, webinars, in-person work, and relationship building along the way. When lots of approaches such as those are employed and well coordinated, other residual benefits occur. That certainly happened with this project. This project shows the benefit of having a PI who understands more than education, including the industry, politics, and how those elements all go together.
- This is a four-year effort, so it is unclear how the original objectives were written. This organization is very committed to the project, and the mission aligns with the FCT Program. However, there does not seem to be a baseline set of information to judge the impact that this has had on employment and the number of fuel cells sold or companies established in the state. The major measure is the number of people “touched,” which does not really measure much. On the other hand, this is being done for very little money.

**Question 3: Accomplishments and progress towards overall project and DOE goals**

This project was rated **3.6** for its accomplishments and progress.

- This project has made excellent progress that is measurable with numbers.
- The materials are of very high value, including significant meetings with government agency personnel and policymakers.
- This project achieved many objectives and tasks, such as setting up websites and key meetings/presentations. The fuel cell forklift value proposition is a much-needed tool for the industry.
- More than 20,000 stakeholders were reached in 2011. This project reached out to key political decision makers including Senator Lindsey Graham, Congressman Wilson (Aiken and Columbia), and Congressman Clyburn. The project team met with the Advanced Research Projects Agency-Energy on South Carolina’s hydrogen and fuel cell education efforts. The project was unable to focus on combined heat and power (CHP) or fuel cell backup power for telecommunications because the budget ran out.
- Even with a very modest budget, this project was able to reach a very impressive large list of influential South Carolina political interests. This project met or exceeded the project milestones and expectations. A hallmark of this approach was the success in getting the permitting act in place for South Carolina. (The permitting act was an accomplishment in the last reporting period, but it is worthy of mention this time as well.) While this single accomplishment makes this project very worthwhile, it also added to the success of the rest of the activities. South Carolina is on the fuel cell map largely due to the efforts of the Alliance, and clearly this project contributed to that success.
- This project has been able to accomplish a long list of achievements. It is great to see the outreach from the events, the handouts, and the recorded media hits and residual benefits from events such as a visit from the Secretary of Energy, which was a turning point for how DOE’s front office has acted toward hydrogen and fuel cells. The project has been able to accomplish traditional outreach, which is critical, and create tools for the business community on the state of the technology and the value proposition for employing them.
- While the project can count “bodies” that attend events, this does not really measure impact, either on employment, products sold, or companies established. It would seem that this would determine whether a real,

measurable impact was achieved. This may have been the fault of how the request for proposal was written (and the amount of funds available), rather than the performance of this organization. I think it is useful to measure whether a key law or regulation was changed in the state that would impact the ability to use the technology in the state. This was done.

#### Question 4: Collaboration and coordination with other institutions

This project was rated **3.6** for its collaboration and coordination.

- This project is working with fuel cell companies to distribute the forklift brochure, as well as working with many other South Carolina entities.
- This project has been very successful at teaming and collaborating with relevant stakeholders.
- The project has been coordinating well with the state and other states/regions doing similar activities.
- The PI has uniquely pulled together industry, government, academia, and non-governmental organizations. The PI looks for support and ideas in places that many programs ignore.
- The collaboration in South Carolina is very good. Regional collaboration with additional states is growing, with possible high-value rewards if such collaboration were to be funded and continued.
- The PI has collaborated with several organizations to accomplish the goals. The organizations are very diverse, and include universities, companies, and government. However, there appears to be some room for improvement in utilizing the strengths of the other organizations to accomplish even more. Perhaps this was done, but the presentation mostly focused on what the PI did.
- The PI promoted fuel cells and hydrogen in all parts of South Carolina. Every new member of Congress from South Carolina, as well as members of the state legislature, were identified and contacted with offerings of educational information on hydrogen and fuel cells, particularly the economic benefits. The PI is considered one of the most articulate spokespersons on hydrogen and fuel cells, combining a solid engineering understanding with great outreach skills. This combination has helped keep South Carolina in the forefront of states that are favorable to this technology. The Alliance has been very successful in the number of brochures and other handouts it has been able to disseminate across the state and region.

#### Question 5: Proposed future work

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

- The Education sub-program, above all others, needs to be continued and should get more funding.
- The work that was focused on South Carolina activities could be expanded throughout the region and additional states as a regional information center.
- The award is ending, so the project will have limited resources. The project has good plans to expand to other southern states, but it needs more funding to continue the success of this program.
- The work that this project would like to accomplish would be extremely valuable to the industry, and especially to accelerating the industry in South Carolina. It is unfortunate that there is not enough money to be able to do everything on the project's list.
- The PI will continue the effective dialogue with local and statewide officials in order to promote the use and support of hydrogen and fuel cells. There is not enough funding left on this project to go beyond January 2013, so a minimal level of effort will be applied. There will be no fuel cell CHP or telecommunications fuel cell backup power fact sheets or business case/outreach produced. The work the budget supports is laid out in a logical fashion for the remainder of this effort. The PI made a strong case for continued federal co-sponsorship in hydrogen and fuel cell education.
- More aggressive outreach to other states would be good. There is a need to tie together all states that are active in hydrogen technologies and to increase that number. South Carolina has established a very good track record and is recognized as being one of the few states that are successfully supporting and growing the deployment of hydrogen technologies. An activity where states start to work together on building a state-up (ground-up) partnership can clearly benefit from the leadership shown by the Alliance and the state of South Carolina.

**Project strengths:**

- Reaching a wide audience of key stakeholders ripples out to others, making the DOE dollars count.
- The personal outreach from very passionate people in this field was clearly shown to be one of this project's strengths. This project should continue and broaden its focus to include other regional/state interests.
- This is a gregarious approach to facilitating meetings and forums, development of personal alliances, and openness to work with South Carolina partners of very high value.
- The organization and staff are deeply committed and strategic about how to create a relatively large impact on a very small budget. They seem to be very aggressive about contacting key decision makers.
- The strengths of this project revolve around the fact that the traditional outreach was exceptional, but so were the residual benefits. The PI is well connected and was able to leverage the resources of this project to do more than accomplish basic outreach goals.
- This project is pulling together many different partners and collaborators, sticking to the project plan, and not letting the scope creep. The team is reporting realistic results and paying attention to business.
- A wide range of leaders and other stakeholders have been contacted and educated. The focus on impact metrics (quality) rather than just activity metrics (quantity) is quite impressive and not seen in any other state effort. The PI is particularly qualified, articulate, and energized on the topic of hydrogen and fuel cells. A correlation exists between education and market adoption, as evidenced by this program (Fort Sumter, BMW plant, University of South Carolina hydrogen vehicles, South Carolina Hydrogen Fund, and Fort Jackson backup power).

**Project weaknesses:**

- This project's weaknesses are dependent on resources.
- This project needs more funding to do this important work.
- The project's major weakness is that it is coming to a close.
- The time and resources needed for long-term program administration for effective policy development is a weakness of this project. This is a long-term program that must be supported for long-term productivity.
- The one place that seemed relatively weak was the collaboration with other organizations. It was unclear how exactly they were utilized. In a world of constrained resources it would have been good to hear how the PI was resourceful in utilizing the resources of other organizations to enhance the benefits this project was able to provide.
- This project needs to really measure the impact of employment, sales, and start-up companies, even if this is done as a baseline (2008) and ending (2012). It would be a better measure of impact than the number of bodies who have sat through a briefing.
- This project has no weaknesses.

**Recommendations for additions/deletions to project scope:**

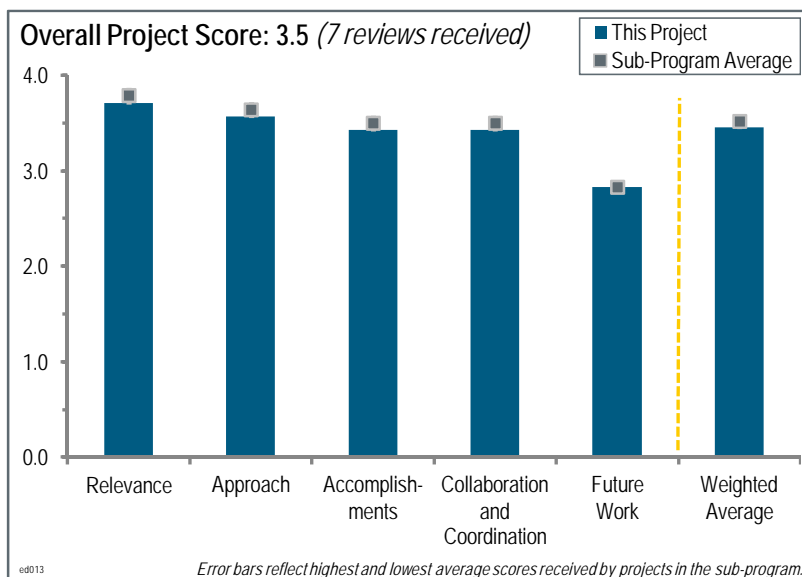
- This is a great project that should continue.
- This project should not spend too much time on the zero emission vehicle (ZEV) credits issue. The original equipment manufacturers are now focused on triggering the Clean Fuels Outlet regulations rather than complying with ZEV.
- It is recommend that education programs such as this receive funding so that they can continue, especially as fuel cells and hydrogen become more mature and prevalent.
- The project should figure out how to replicate this program in other states—highlighting South Carolina's successes as a model to attract business and change policy to assist fuel cells and hydrogen. These successes need to be publicized more.
- This project needs to increase the scope for a regional approach. This project should continue to be funded for a two- or three-year contract and expand technical targets as a portfolio for increased flexibility and choice.
- This is the end of this four-year project. Funds should have been added to ensure a good baseline measure of what existed at the beginning of the project in the state (employees in fuel cell companies, sales, number of companies/suppliers).

## Project # ED-013: Raising H2 and Fuel Cell Awareness in Ohio

Pat Valente; Ohio Fuel Cell Coalition

### Brief Summary of Project:

The overall objective of the project is to educate state and local government officials in Ohio about the potential economic and environmental benefits of current and future hydrogen and fuel cell technology, thereby accelerating the deployment of clean energy solutions. The project's goals include: (1) compiling educational materials, (2) marketing and conducting nine forums around Ohio, (3) publishing a bi-annual newsletter, and (4) measuring the increased awareness using the metrics from the U.S. Department of Energy (DOE) Hydrogen Education Sub-Program 2004 Baseline Study.



### Question 1: Relevance to overall DOE objectives

This project was rated **3.7** for its relevance to DOE objectives.

- This project clearly addresses DOE goals for education and increased deployment.
- This project is focused on the education of local and state officials and decision makers in Ohio, which is a key state because it is home to much of the industry's supply chain and research.
- Outreach programs such as this one are right on. As the deployment of hydrogen technologies accelerate, we need to be more aggressive in educating the class of stakeholders targeted by this project.
- This effort is tied directly to what the DOE Hydrogen and Fuel Cells Program is trying to accomplish: easing the non-technical barriers to ensure that the research and development pays off in the adoption of fuel cell technology.
- This project has very specific and measurable objectives. It is good that the principal investigator (PI) is clear about meeting DOE's objectives of reducing oil and greenhouse gases and increasing jobs in an area of the country where manufacturing is a large part of the economy. Many programs focus on fuel cells as tools for meeting environmental regulations, while this PI focuses on building fuel cells as an economic opportunity.
- The project not only addressed the objectives that were originally planned, but, with the expanded scope of the project, DOE was able to realize additional value. The PI was able to address the traditional objectives related to outreach, mixed messages, etc. The project was also able to support the supply chain, help companies reach new audiences to do business, and also show the role that the Ohio supply chain plays in the national fuel cell business arena.
- Educating key officials as well as the general public is critical to the success of hydrogen and fuel cell adoption, and raising fuel cell awareness is a good means for doing that. The project itself does not attempt to reach out to as many stakeholders as similarly funded programs in other states. The breadth of this effort does not cover a large fraction of the key state personnel that could be educated. Manufacturing represents 17% of the gross output in the state of Ohio, and the state is home to Rolls Royce Fuel Cell Systems, NexTech, Lockheed/Tools & Metals Inc., and a number of other fuel cell and component manufacturers. This makes the case for an education effort that is focused on the importance of fuel cells to the state of Ohio.

**Question 2: Approach to performing the work**

This project was rated **3.6** for its approach.

- This project created a targeted list of selected audiences and used newsletters and forums to reach them.
- The approach (and changing approach) of this project clearly worked. The project met or exceeded its milestones and expectations.
- The follow-up and tracking is a great way to know that the PI is making progress. CleanCities programs need to include the benchmarks that this PI includes, and maybe the PI can share with them how to do this.
- The approach used for in-person events was very interesting, given that there is a significant shift toward webinars. It is good to see that the PI was paying enough attention to which method worked best and was able to modify the approach to utilize the methods that would yield the most results.
- This project seems to be very strategic and tactical in its approach. The team was careful to evaluate what works and what does not, and they modified their plans accordingly (e.g., kept the in-person rural briefings rather than doing ineffective webinars).
- This project has a good, solid technical approach that covers all parts of the state of Ohio. The Ohio Fuel Cell Coalition has many aspects to its education: decision makers, industries, local officials, and a number of other potential stakeholders. The approach does not take advantage of utilizing social media to reach out to the masses. Even webinars were only a small component of the effort. The approach of including matchmaking services for buyers, users, and suppliers can be very effective.
- The collaborative approach to establishing relationships through meetings, conferences, and other activities has been appropriate and of high value. Targeting information to community leaders is an excellent approach, and the numerous forums for community groups have reinforced the message for deployment. Matchmaking events for the supply chain have been of high value to improve manufacturing coordination, which is expected to reduce final original equipment manufacturer product costs. While more time consuming and resource intensive, the forums and symposiums (rather than webinars) appear to be a strategic choice with valuable results.

**Question 3: Accomplishments and progress towards overall project and DOE goals**

This project was rated **3.4** for its accomplishments and progress.

- The forums and conferences are a good way to educate. Following up on matchmaking is key.
- This project exceeded goals and learned from other programs, shared with other programs, and created a follow-up process—all efforts were excellent.
- Having such a large volume of forums, symposiums, and supply chain exchanges is a very valuable accomplishment in regard to disseminating information and integrating industry, supply chain, policymakers, and end users.
- Only 1,200 people were targeted for this evaluation period, and the PI was only able to reach out to 745. Webinars were initially tried but discarded, which severely limits the number of people who can be addressed. Surveys were conducted with the people who received educational services, and the results were favorable. The Ohio Fuel Cell Coalition (OFCC) did 15 forums last year versus the 9 planned forums, but only 15 forums over a 12-month period is not very impressive, given the size of Ohio. Hydrogen 101 seminars were held, along with the creation of a database of state activities related to fuel cells.
- This project was very successful in going beyond expectations, particularly considering the modest funding. The original plan to hold 9 forums was exceeded by 38 (a total of 47 forums over three years). The goal of 1,200 attendees was passed with closer to 2,500 over the course of the last three years. The results of the self-evaluations were very positive, and the project clearly increased the basic awareness and knowledge of hydrogen technologies, as was the original plan for this project.
- The PI has been able to communicate not only the accomplishments originally set out to be achieved by this project, but he was also able to communicate the impact on the supply chain manufacturing industry in Ohio. Those are unique attributes to the state, so it is important to see that the PI was able to note those additional accomplishments as well. It provides a good understanding of the support needed to grow the fuel cell and hydrogen economy in a given state so that knowledge can be used to help grow the economy in other states and nationally.



- This project seemed to meet its goals, but the goals seemed unclear. First, using a 2004 baseline for a project that began in 2008 is problematic (the project was likely done that way because there was a 2004 survey). Next, the idea of measuring a 10% improvement in knowledge is not a very strong measurement. It would have been better to measure what existed in the state as a baseline, such as the number of suppliers (and therefore workforce) involved in fuel cells and the number of fuel cells sold, and then measure the impact of outreach. This is not necessarily the fault of the PI, because this may not have been in the scope (and arguably costs more money than may have been available).

#### Question 4: Collaboration and coordination with other institutions

This project was rated **3.4** for its collaboration and coordination.

- This project team collaborated with many, many companies and organizations in Ohio and elsewhere.
- The strategy to collaborate with the manufacturing supply chain is excellent. A formal expansion to the region would be of value.
- It is great to see the PI utilizing the resources of collaborators to add to what the project was able to accomplish, such as utilizing space to save money when holding events.
- It seems like Ohio is doing a good job. There seems to be good coordination with other states doing similar efforts.
- Several industry and university partners/interactions were listed. There was a good turnout in rural areas, but a poor turnout in urban areas. The PI had fuel cell companies do some of the presentations, which adds another dimension of economic development. The project could not do webinars successfully, which is a key means of collaboration with the public.
- While the collaboration among local Ohio organizations and laboratories was good, it could have been better by reaching out to other organizations beyond just those local ones. Other national laboratories (such as the National Renewable Energy Laboratory, Argonne National Laboratory, Oak Ridge National Laboratory, and Sandia National Laboratories) could have been tapped for expertise and participation in the forums. That would have helped broaden the exposure for both Ohio and the other outside participating organizations.
- In addition to working with Ohio companies and state government, the PI has done the most in integrating with other fuel cell and hydrogen programs. The PI regularly shares ideas, processes, and expertise, and adopts what other programs do. The PI should be the poster child for how to collaborate.

#### Question 5: Proposed future work

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

- A regional approach to address the full regional supply chain would be of value.
- A supply chain exchange is a key part of helping move industry forward, and it is good to hear that the success of the one held will lead to more.
- It would be great to see the PI accomplish more if more funding were available. It would be interesting to see how this work would translate if it were able to continue just outside of Ohio to the nearby region.
- The project's funding is running out. If CleanCities expanded its scope to include clean air technologies (such as stationary and off-road) or vehicles that are not yet commercially available (such as fuel cell electric vehicles and fuel cell buses), the PI could get continued financing, including applying for the new Clean Communities grant.
- Planning for the last six months of this effort includes the OFCC Supply Chain Exchange in May 2012. The PI invited the DOE sub-program manager to this event, which was deemed to be successful. An additional three forums are planned in Akron, Columbus, and Cleveland. A newsletter and compilation of survey results will also be accomplished in the time remaining until the project is over (6/30/2102). There is no goal for outreach numbers for the remaining time of this effort.
- This project should continue to embrace a larger stakeholder base beyond just Ohio, such as supply chain companies that have business in Ohio, but whose boundaries extend beyond the state. Also, providing leadership in a state-state-state-like consortium to help educate others who are potentially interested (or who should be interested) in emerging hydrogen technologies would clearly help accelerate the deployment of these technologies.

### Project strengths:

- There is a good industrial talent pool in Ohio.
- This project has a good focus on the supply chain, which is Ohio's strength, and good knowledge of what works in rural versus urban areas.
- The PI's process for staying in touch with Ohio companies is amazing and should be a model for other programs. The PI's ability to shift and change the program while still staying within the scope and the results is also a strength.
- Strengths include the high volume of forums; the supply chain exchange; and the symposium to educate, justify deployment, and improve manufacturing processes.
- A good cross section of stakeholders was targeted, including local officials, codes and standards officials, industry members, and statewide decision makers. The project held multiple forums across the state, utilizing existing planned conference/exchanges, universities, and other institutions as partners.
- The self benchmarking of this project was very good. It provided information to allow the project to improve its approach as the project evolved (i.e., the project first planned to use webinars as a communication vehicle, but as time evolved and webinars were found to be less successful than anticipated, that activity was stopped in lieu of the more successful personal outreach approach). This was nicely done.
- The knowledge of how outreach accomplished what it did translates to growing the fuel cell economy. Not only was the PI able to create great events to perform outreach, but one could see the economic impact of those efforts and how they had a growing impact on fuel cell businesses.

### Project weaknesses:

- The project is ending; this is a weakness.
- There is a lack of predictable resources for continued work.
- This project needs to take some of the findings on jobs, exports, etc. and make them available to others in the industry to continue to make the case.
- The measurement of impacts by number of people briefed is interesting, but not necessarily meaningful.
- The PI's program would benefit from someone who can get the state legislature to be more supportive.
- A low percentage of the Ohio populace was educated in this effort. Chances are there are still a lot of people that have yet to learn the fundamentals about hydrogen and fuel cells. There is no electronic means of information dissemination; webinars were used only sparingly and later abandoned as an outreach medium.
- There is a lack of information on the feedback gained. The project collected a lot of good feedback, but the results from that feedback were not reported. The project would likely have appeared even more impressive if that information was also included in the presentation.

### Recommendations for additions/deletions to project scope:

- This work should be continued.
- This project should continue as planned—great project.
- The project should figure out how to integrate with the CleanCities scope to get more funding and support.
- This project should increase its formal scope to the whole region. It should be provided with predictable funding for a two-to-three-year term. The project should develop a portfolio of technologies for increased flexibility for deployment.
- It would have been good to have better statistics on the industry in Ohio at the beginning of project, and then measure progress every two years.
- This project should continue supply chain exchange and expand to neighboring states, such as Michigan, to help the industry as a whole, as well as Ohio-based companies. More data on the supply chain would be great to make the case to Congress and the Administration that if the fuel cell industry expands, it will trickle down to help create jobs and opportunities for other companies that could supply fuel cell systems.
- There are no recommendations to be made, because the effort is almost over.