

## Education

### Summary of Annual Merit Review Education Subprogram

#### **Summary of Reviewer Comments on Education Subprogram:**

Reviewers considered the goals of the hydrogen education subprogram to be supportive of the President's Hydrogen Fuel Initiative. They noted that targeting public education in areas where technology validation projects are being developed is not premature and would have been helpful to recent hydrogen fueling station demonstration projects that were not fully supported by the local community. Reviewers praised the program's shift in hydrogen education priorities given zero funding for FY05, which dictated a tightening and refinement of the program focus.

Reviewers noted that education of safety and code officials is an important component of the education program. They judged the Hydrogen 101 project to be effective in educating state and local government officials. It should be noted that the education subprogram will target state and local government officials, safety and code officials, and communities where technology validation projects are located. Reviewers commented that all audiences may not be addressed given the lack of hydrogen education funds and noted that plans for proceeding with hydrogen education activities are unclear if there is no budget in FY06.

#### **Hydrogen Education Funding:**

There were no available funds in FY05. The budget shortfall was addressed by using limited carryover funds from FY04 efforts to sustain projects.

#### **Majority of Reviewer Comments and Recommendations:**

The number of education projects included in the 2005 merit review increased by 50% from the previous year and includes the baseline knowledge assessment, development of general educational materials to multiple target audiences, and activities targeted to middle school, high school, and college teachers and students, some of which are Congressionally-directed projects. Efforts related to state and local government and safety and code official education were included in the Education Subprogram overview presentation.

The reviewer scores for the education projects reviewed varied from as high as 3.7 to as low as 1.8. Some projects are new and had little progress to report, and reviewers commented on the need to focus Congressionally-directed projects more specifically on hydrogen and fuel cell technologies. Also, the Hydrogen Technology Learning Center projects awarded through the 2004 State Technologies Advancement Collaborative experienced significant funding delays that have affected performance. A few projects were commended for their exceptional management given federal financial constraints and the budget shortfall. To the extent possible, DOE will act on reviewer recommendations to support and refine the overall hydrogen education effort.

**Baseline Survey:** Excellent work and useful data. Results should be disseminated to a wider audience, through the DOE website, magazines, educational materials, and fact sheets in order to dispel hydrogen myths. Future surveys should dig deeper to understand about the effectiveness of education program tools. Need a contingency plan if no funding is available for the next round of surveys.

**General Educational Materials:** Projects address education barriers and provided needed tools. Develop metrics to measure effectiveness of educational tools. Ensure coordination with other education projects targeting similar audiences. Work with target audiences to define need, beta-test, and refine final products. Materials should be developed with an outreach plan in mind to disseminate efforts to the widest possible audience.

**College/University Activities:** Strong university collaboration and regional centers are a good idea. Training the next generation workforce is important to the success of hydrogen technologies. Collect and document data for demand of hydrogen education materials. Provide nationwide access to curriculum materials. Benchmark curriculum against previously produced hydrogen university-level curriculum, and collaborate with other universities. Collaborate with other DOE hydrogen education and safety activities. Participate with local industry to develop curriculum to provide knowledge and skills that students can immediately apply. Tighten focus to include more linkages to hydrogen technologies and the overall hydrogen initiative.

**Middle and High School Activities:** Excellent partnerships, inclusion of students and teachers in curriculum development, and actual hands-on teaching. Notable and measurable progress made in spite of lack of budget. Work with schools to obtain financing for hydrogen education materials. Focus more on long-term professional development for teachers.

**Project # ED-01: Hydrogen Education***Cooper, Christy; U.S. Department of Energy***Brief Summary of Sub-Program**

The Education Sub-program Overview presents DOE's hydrogen education strategy and provides context for the projects presented during the Annual Merit Review. The overview presentation describes hydrogen education goals and objectives, the budget, barriers/targets, approach, accomplishments, interactions and collaborations, solicitations and awards, and future directions.

**Degree to which the Sub-Program area was adequately covered and/or summarized**

- Excellent summary of sub-program needs, demonstrated links between this program and others. Also detailed ties between program goals and overall hydrogen initiative.
- Good overview of program efforts and accomplishments.
- Thorough overview of past projects and future.

**Were important problem/issue areas and challenges identified/discussed, including plans for addressing these items in the future?**

- Yes. The budget's zero-balance was addressed with lessons learned from a year of functioning without funds.
- The problem of no 2005 funding was identified. Plans for addressing funding shortfall were mentioned; contractors must make do with FY04 funding. Plans for proceeding with hydrogen education activities are unclear if there is no budget in FY06.
- Yes, including FY05 budget and how FY04 money was carried over to sustain projects; perception remains that not all audiences are being addressed.

**Does the Sub-Program area appear to be focused, managed well, and effective in addressing the Hydrogen Program R&D needs?**

- Focus has been tightened and refined. Budget dictated shift in priorities, which appear to have been well managed.
- Yes. The program area appears to be focused and managed well. The Hydrogen 101 sub-program seems to be effective at educating code officials and policy makers.

**Other comments:**

- Excellent, upbeat presentation in spite of gloomy budget reality. Commendable!
- It's good to see DOE targeting its public education towards folks in areas where technology validation projects are planned. Such efforts would have been useful to alleviate community concerns over recent hydrogen fueling station openings. Targeting the public in areas where technology validation is not premature. Education of code officials is also very good and a very important component of the education program.
- Remarkable management of a program that was not funded.

**Project # ED-02: Hydrogen/Alternative Energy Center**

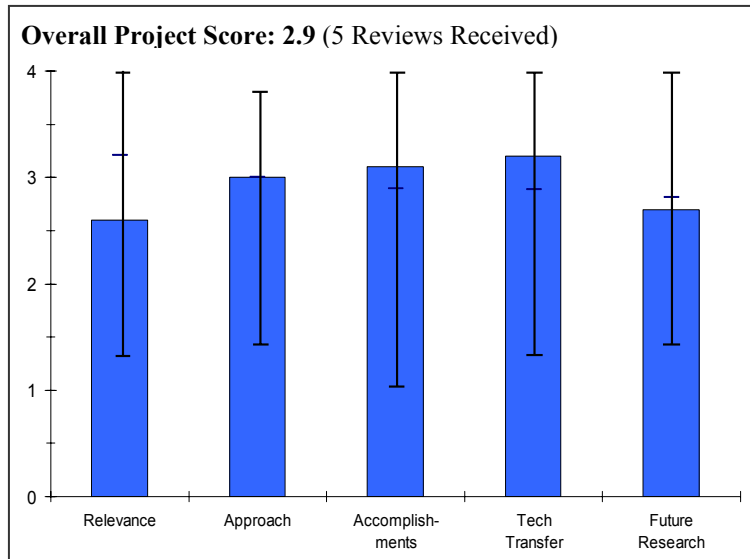
*Borger, Ruth; Lansing Community College*

**Brief Summary of Project**

Lansing Community College (LCC) is focused on increasing the number of technicians available to service and maintain hydrogen equipment by providing an open and accessible lab in which students can learn about hydrogen fuel cells and alternative energy. LCC will also build links between businesses and industry and educational institutions. Its goal is to become a resource center for educators, innovators, and policy makers.

**Question 1: Relevance to overall DOE objectives**

This project earned a score of **2.6** for its relevance to DOE objectives.



- Good identification of barriers. Needs stronger connection to hydrogen – understands education/curriculum well, but the bridge to hydrogen needs development.
- The project supports the goals and objectives of the HFCIT MYRD&D Plan.
- Developing a 2-year degree program for community college students.
- Cross-cutting curriculum with HVAC and automotive.
- Includes transfer curriculum for 4-year degree.
- Development of hydrogen curriculum should increase number of informed students and faculty on hydrogen issues.
- If you are looking at this as a way to realize the President's Hydrogen Fuel Initiative with regards to vehicles, utilizing hydrogen ICE vehicles does seem to be a bit off course. However, attention to stationary fuel cells is very worthy, as these will likely be commercially available long before vehicles. I believe, that despite the attention to hydrogen ICE vehicles, the overall outcome of the project will align very closely to the objectives of the President's Hydrogen Fuel Initiative.

**Question 2: Approach to performing the research and development**

This project was rated **3.0** on its approach.

- Looks like a standard education program. How will they address problems specific to hydrogen? Could be a great opportunity to work on areas of interest to the hydrogen community.
- The “Developing A Curriculum” or DACUM curriculum development model appears to provide a focused methodology to identify the appropriate curriculum needs and content.
- Curriculum development with faculty and students.
- Aware of the need for relating hydrogen curriculum to CURRENT jobs available in the area.
- Cross-cutting curriculum helps tie hydrogen to other areas such as HVAC and automotive.
- Overall approach is sound. Possibly spread too thinly over every area and track of studies within school.
- The approach seems to have been well thought out. Training of faculty is certainly the most logical first step, running concurrently with the development of the curriculum in collaboration with industry. Transfer of curriculum to other universities as it is completed is a good way to get accomplishments and successes spread as soon as possible.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **3.1** based on accomplishments.

- Good progress since last year.
- It appears that components of the curriculum development are being completed. Are there descriptions of the classes available? Fuel cell classes were mentioned several times.
- Curriculum for a 2-year degree has been developed.
- Continuing to work with community outreach and further develop curriculum for the 2-year degree.
- Focus on hydrogen ICE rather than just fuel cells.
- On-track progress is evident.
- Project seems to be moving at a good pace. Considering how much coordination has to be done with industry and other universities, Lansing seems to have implemented several pieces of its curriculum already and appears ready to launch another in the fall.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **3.2** for technology transfer and collaboration.

- Good sharing of data with other universities.
- The sharing of curriculum is a strong component of this project. More information on how this will be implemented would provide more value.
- Lansing Community College is working with General Motors and the American Association of Community Colleges to make this curriculum available to a larger audience – potentially to community colleges throughout the United States.
- Partnered with 4-year schools and industry – excellent leverage of resources.
- Collaborating with the University of Michigan sounds good and may raise awareness of “Learn Hydrogen Day” on the capitol lawn. Tech transfer partnership with colleges and universities seems to be working well. Bringing industry into curriculum development also sounds like a good idea.

**Question 5: Approach to and relevance of proposed future research**

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

- More ties with hydrogen technologies.
- It appears that significant work has been accomplished in the DACUM process. Future work in taking the DACUM process to the next step, actual curriculum development, does not appear to be identified in the future plans.
- Lansing Community College plans to continue to develop its curriculum and refine it based on student input, faculty input, and industry input.
- Plans for building include optimization of all available renewables.
- Not sure how the hydrogen storage project replacing the hydrogen fueling station project will work. The plans to address hydrogen safety seem to be in the works. However, it is unclear how they will be able to address these issues within the next year in order to accomplish what they want. Having a network of hydrogen storage demonstrations seems to be of much less value than a network of fueling stations for learning purposes.

**Strengths and weaknesses****Strengths**

- Good partnerships with state.
- Strong university collaboration within the state.
- Well-funded project; DOE’s \$981K cost shared with LCC’s \$1M.
- Curriculum development includes contributions from experts from industry, government, and academia.
- Dissemination to a wide audience, with potential to make a hydrogen technician curriculum available across the country.

- Curriculum is crosscutting with courses in HVAC and automotive technology.
- This is a very important area to be focused on. Training the future technicians who will repair fuel cell and hydrogen technology is most definitely a valid goal. The collaborations with industry in developing the curriculum, and the collaborations with other universities and colleges in the transfer of the curriculum, seem to be very solidly in place. The project approach seems to have been well thought out.

#### Weaknesses

- Could use stronger linkage to hydrogen technologies. Appears to be focused on education in general; hydrogen not emphasized? Any participation by local auto industry?
- Implementation of the curriculum developed, and the collaboration within the community college and university system, should begin to be demonstrated.
- Not clear that an emphasis on hydrogen internal combustion engines will be as useful as fuel cells.
- At this point, it is not clear that there is a big demand for students who complete this degree program.
- As the field is still growing and standards are still being established and worked out, it isn't clear that the program is strong enough that graduates will be able to immediately use their knowledge and skills in working with the auto companies or fuel cell manufacturers.
- Possible dilution of HYDROGEN dollars as they are spread across all energy/science/environment/math areas.
- There were concerns expressed in the Q&A about the hydrogen ICE vehicle. I was not as concerned about the focus on hydrogen ICE vehicles and demonstrating to students hydrogen safety by using the hydrogen in an ICE. A larger concern is the focus on hydrogen in teaching students about the HVAC Hydrogen & Electrical Energy curriculum coming up in August 2005. The program needs to include other fuels that will be used in stationary fuel cell applications. Stationary fuel cells will most likely be dealing with issues surrounding natural gas and propane reforming. I believe there will be very little "stored" hydrogen.

#### Specific recommendations and additions or deletions to the work scope

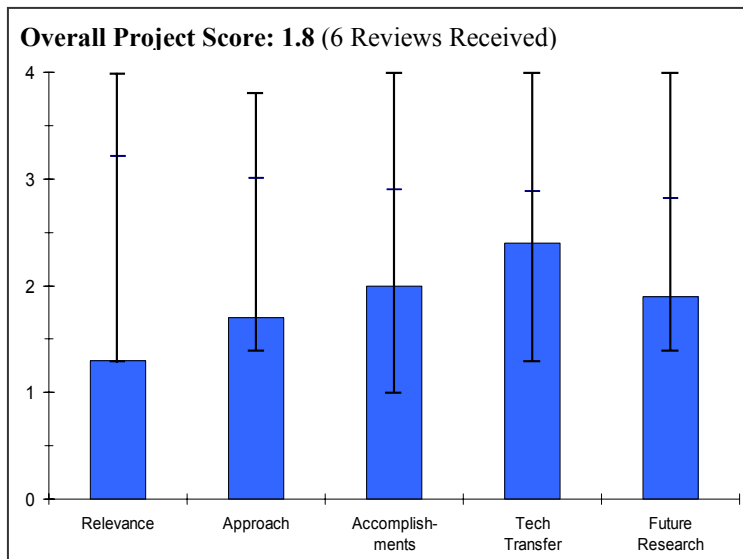
- Training involves hydrogen ICE vehicles – any thought/direction to FCVs etc.?
- Recommend pursuing collaboration with the state's transportation industry.
- For the duration of the project, until 2006, the overall project scope is fine. If they are going to extend the program, recommend not pursuing hydrogen storage ideas if they cannot have hydrogen fueling stations. Training students in technology that will actually be in place when they graduate (i.e. small stationary fuel cells, backup/cheap fuel cells) would be more important for students who will be seeking jobs when they graduate.

### Project # ED-03: Shared Technology Transfer Project

Griffin, John; Nicholls State University

#### Brief Summary of Project

The overarching goal of the Nicholls State University project is to establish a collaborative process with domestic industries for the purpose of sharing Navy-developed technology. The purpose is to educate private sector businesses and increase their awareness of available technologies, with an initial focus on technology applications that are related to the DOE Hydrogen Program. NAVSEA-Carderock and the Houston Advanced Research Center are teaming with Nicholls State University to catalog NAVSEA-Carderock unclassified technologies, rate the level of technology readiness, and establish a web-based catalog of the technologies. The catalog contains technology descriptions, including testing summaries and overviews of related presentations, and an evaluation of the technology readiness.



#### Question 1: Relevance to overall DOE objectives

This project earned a score of **1.3** for its relevance to DOE objectives.

- Hard to follow relevance to hydrogen program. No strong linkage. Slides do not follow DOE template.
- There appears to be no relevance to the DOE objectives.
- Presentation related to research on rudder design and hull design is great for the Navy but not unique or valuable for the DOE.
- This project is not applicable to overcoming the barriers or achieving the objectives of DOE's Hydrogen Program.
- Some patents fit with HFCIT and some are beyond the scope.
- This program is not applicable to the education sub-program. It is unclear in its application to the MYRD&D Plan.

#### Question 2: Approach to performing the research and development

This project was rated **1.7** on its approach.

- Hard to follow – why is approach so unique?
- An interesting approach to evaluate a technology portfolio. Perhaps as the hydrogen technology portfolio is developed, this analysis process could be reviewed to determine applicability to use in the hydrogen program.
- Approach is very general – and would be very interesting for naval architects and navy designers. Not clear that this is useful information for the DOE Hydrogen Program.
- Although this project could yield some useful information, it is unclear if the team has the technical expertise to draw the relationships between the various patents and their potential relevance to hydrogen technologies.
- Good plans for tracking inquiries and web hits so that relevancy and lessons learned can be captured.
- Catalog categories should tie directly to hydrogen, fuel cell, infrastructure categories and sub categories.
- Not R&D. Couldn't the Navy provide a database of Navy technologies?

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **2.0** based on accomplishments.

- Some progress made – but no relevance to hydrogen.
- The evaluation and portfolio analysis have advanced in the past year. What are the metrics? How many technologies have been reviewed and are they in the portfolio? How many technologies have actually been reviewed for adoption?
- Group has established a website and a ranking of technical level for recently unclassified NAVSEA material. Not clear if the materials will be relevant or useful to the hydrogen economy. Or, how much of the catalog of materials on the website will be helpful to DOE.
- The cost of this project is very high relative to the scope.
- The database architecture, including the catalog categories and technology maturation codes, should make the database useful. The TRL structure is good.
- Presenter stated that there were no barriers.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **2.4** for technology transfer and collaboration.

- Transfer with HARC/NAVSEA.
- The marketing activities were reported, but no information was provided on the metrics of the transfer of technologies.
- This project does have a high degree of coordination with NAVSEA and the ability to share information with the Navy, industry groups, universities, and other government projects.
- Good effort is being made to ensure that the database will be visible and to alert the technical community of its availability.
- Description of technology database – not certain why an RD&D program or education program are related to hydrogen. Not a hydrogen specific project.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **1.9** for proposed future work.

- Not good linkage with the DOE Hydrogen Program. Too close to DOD program. Does not promote hydrogen.
- Not clear what the benefit was for the HARC facility industry member tour.
- It is clear that this proposal has the potential to reach a large number of people. It is not clear that the data that is being used to establish this database and website is unique to the President's effort to establish a hydrogen economy or unique to hydrogen education.
- Although the planned efforts for tracking the relevancy of the database and for measuring inquiries is good, it is unclear whether the technical expertise exists to proactively identify opportunities for applying the technologies.
- Plans to continue with same?

**Strengths and weaknesses****Strengths**

- Interesting portfolio analysis process.
- Project has the potential to reach a wide audience.
- Project has a wide potential for technology transfer.
- As far as database development and understanding of the naval patents in their intended application, the team seems well qualified.



Weaknesses

- Couldn't see linkages with HARC, NAVSEA. Slide showing linkages would have been useful. Not a lot of new information or novel concepts.
- This project is not relevant to the DOE Hydrogen Program.
- Not clear that project is in the best interest of the DOE.
- Not clear that the data obtained from NAVSEA is applicable to hydrogen economy or hydrogen education.
- Little to no ties in advancing the goals of the DOE Hydrogen Program.
- Recommend tighter targeting.

Specific recommendations and additions or deletions to the work scope

- Get closer to hydrogen education goals.
- Upon completion of the project, review portfolio analysis and classification process to determine if the evaluation process might be applicable to the hydrogen technology portfolio.

**Project # ED-04: Montana Hydrogen Futures Project**

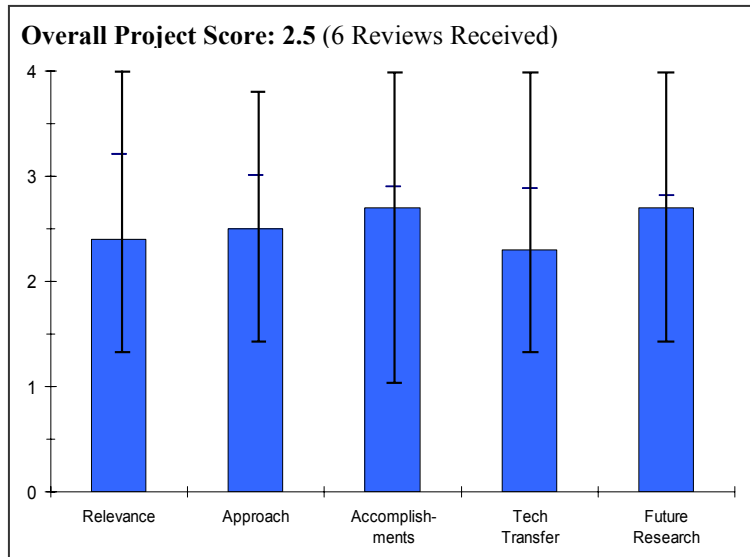
*Williamson, Paul; University of Montana*

**Brief Summary of Project**

The Montana Hydrogen Futures Project includes a new web-based curriculum for hydrogen and alternative energy technician, a hydrogen education website for students and teachers of all ages, a hydrogen safety training center to provide safety training and certification, and Hydrogen Futures Park to provide a comprehensive, integrated learning environment in which to demonstrate, educate, and exhibit sustainable energy in Montana.

**Question 1: Relevance to overall DOE objectives**

This project earned a score of **2.4** for its relevance to DOE objectives.



- Good identification of barriers needs to continue in identifying better connections with hydrogen than education.
- Project description does have objectives related to goals in the MYRD&D Plan.
- Project is very narrowly focused, i.e. the state of Montana, and may have limited impact on the overall goals and objectives of the program.
- Clear understanding that there are a large number of U.S. citizens who need to learn about and become aware of issues related to hydrogen, fuel cells, and infrastructure to support the hydrogen economy initiative.
- Training the next generation workforce is important to the success of hydrogen technologies.
- Crosscuts multiple technologies.
- This seems to be primarily focused on Montana, with little relevance to DOE's national scope. The training programs are a good idea, as is the hydrogen safety center, but only if there are plans to provide nationwide access to developed curriculum.
- There's mention of generating hydrogen, but doesn't seem to be much thought into what the hydrogen would be used for.

**Question 2: Approach to performing the research and development**

This project was rated **2.5** on its approach.

- Good use of leveraging universities, 2-year colleges, and high schools.
- Technical barriers identified are very high-level barriers. It is not clear how the identified objectives will be accomplished.
- Objective 1: Develop a college curriculum for energy technicians. It is unclear what technologies the energy technicians will be trained to support. How will the curriculum content be identified?
- Objective 2: Establish a hydrogen safety training center at the University of Montana College of Technology. It is unclear as to who will be trained and what aspects of safety they will be trained on? Would coordination with the PNNL HAMMER Facility be more effective?
- Work with K-12 students and teachers, industry, and undergraduate students and faculty.
- Web-based curriculum to share information with a wide audience.
- Link with resources at federal, state, and local government agencies.
- Big ideas (such as making Montana a state that is based on hydrogen economy) linked with practical, simpler ideas (such as the informational web site) that can be implemented quickly and easily.

- Seems to be well planned, but this is a very complicated undertaking. Are the resources being stretched too thin?
- Need to benchmark against what has already been done with similar curriculum development (examples: College of the Desert, Humboldt State, and University of Victoria).
- Energy Technical Program sounds strong. Web-based curriculum access is good for allowing other universities to use curriculum.
- Hydrogen education web site sounds like a good idea. But not sure how it will differ from all the other hydrogen education web sites out there.
- Lots of attention to marketing and PR. That is important once the projects are completed and the results are worth promoting.
- The web based approach to curriculum is good.

### **Question 3: Technical accomplishments and progress toward project and DOE goals**

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

- Good progress and good leveraging of funding for future activities.
- The accomplishments are limited as this is a new project.
- Accomplishments are difficult to review but it was reported that the project is 30% completed. It would seem there should be more definitive accomplishments identified with 30% of the project completed than were presented.
- Information being made available now.
- Establishing curriculum for a hydrogen /energy technician program.
- Business plans established and state and university approval.
- There is some concern that as the program grows, it clearly ties into available standards for safety in working with fuel cells and hydrogen as a fuel.
- Good progress has been made in the upfront planning and stakeholder development.
- Sounds like the web site portion of the project is progressing nicely.
- Doesn't sound like any parts of the course curriculum are completed yet, but perhaps they are waiting until the entire curriculum is complete before releasing portions.
- Hydrogen Safety Center seems to be least developed portion of this project. Why?
- Focus on coordination with DOE hydrogen safety program – a “must do” item.

### **Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **2.3** for technology transfer and collaboration.

- Progress slide - did not mention who partners were.
- The development of the web site appears to be a prominent technology transfer strategy. This would be an effective strategy for the state of Montana.
- Working with a wide range of university, K-12, and industry resources to acquire information share with others.
- It seems to me that the majority of resources are being used in Montana. It would be nice if the scope was broadened to support more of a national program.
- Although some thought has gone in to replicating the curriculum at other sites, stronger partnerships with other universities doing similar demonstrations and training development would improve the likelihood of success.
- Doesn't really sound like they are doing much in the way of collaborating with other universities or industry. At least it was not mentioned. Seems all focused on Montana's hydrogen economy and not dispersal throughout the U.S. University interest he mentions is all "intra" university.
- It is troubling that most of the "industry" participants on the curriculum development advisory board are non-hydrogen, non-fuel cell related. I would think those are the most important people to have on an advisory board for development of hydrogen related curriculum.
- Needs more coordination beyond MT.

**Question 5: Approach to and relevance of proposed future research**

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

- Good list of future work in renewables, which the state can showcase.
- Future work identified appears to be focused primarily on renewable energy. Recommend developing stronger ties to hydrogen.
- Construct/coordinate a hydrogen sustainable campus among the University of Montana system.
- Business plans for future sustainability of hydrogen education
- Advisory board input.
- Leverages current efforts to expand capabilities.
- It sounds like a lot of proposed future work, once current projects are completed, is non-hydrogen, non-fuel cell related. There was some mention of wind-powered hydrogen generation. Lots of plans. Very ambitious project scope. Perhaps too broad? Funding from DOE may need to be more focused.
- Are hydrogen/fuel cells getting lost among all the other plans they have?
- Lots of vision, but needs more work fuel cell side.

**Strengths and weaknesses**Strengths

- Good use of visuals and supplemental information on the board. Seems to have great potential for tech transfer to other applications. Good financial leverage. Good leverage with EPA on refueling station.
- PI is enthusiastic.
- Interest in a broad spectrum of hydrogen education issues and collaboration with many institutions in Montana.
- We need to start now to educate and train the individuals who will ultimately be responsible for realizing the hydrogen economy.
- Sounds like they are doing a great job of going to schools and to the public and talking about hydrogen and fuel cells. Is this part of their original project scope? They seem to do a very good job of public education, albeit only in their state.
- PR/marketing seems to be a big part of their project plans. This is definitely important. Make sure it is a nationwide promotion.

Weaknesses

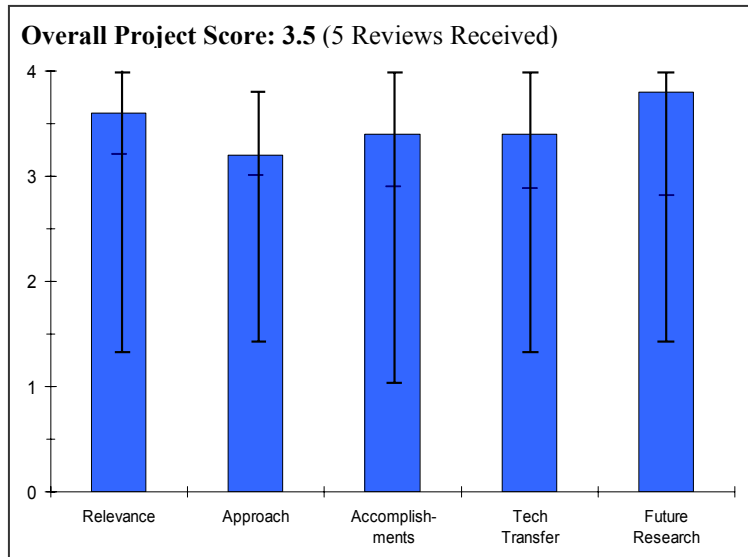
- This project scope is very broad but targeted to a much focused audience. (Montana)
- Resources are too largely focused on one state (Montana). Would like to see resources and initiatives planned for reaching more of a national audience, both in terms of developing the materials and training students and educators (other than just making materials available online).
- Quite a bit planned for the limited resources available.
- The hydrogen education they do sounds primarily focused on Montana. Needs to be a more nationwide outreach. Not sure why the web site isn't being created specifically on the DOE's web site. There are so many hydrogen education web sites now. Why do we need another one?
- Lots of talk about hydrogen generation, little talk about demonstrating use of hydrogen. Perhaps that's not part of their scope. What will be done with the hydrogen?
- Little hydrogen/fuel cell industry involvement. Vague plans for disseminating resulting curriculum outside of the state.
- Hydrogen Safety Center does not seem to be progressing very quickly. Does not seem to be a "vision" for what they really want to do with this part of the project. Vague talk of working with NREL/Ohio on hydrogen safety issues. Is this misplaced in the Education Program?
- Need better safety coordination -visit the PNNL HAMMER facility. Need stronger hydrogen/ fuel cell partnerships.

**Specific recommendations and additions or deletions to the work scope**

- This project could be strengthened with strong collaboration with the current activities ongoing in the HFCIT Education and Safety programs, i.e., other curriculum development projects and other safety training projects.
- More hydrogen/fuel cell industry involvement in curriculum development.
- Broader geographic focus.
- Perhaps they are trying to do too many things with their DOE funding and are unable to really focus on the hydrogen safety center, which seems to be the least advanced portion of their program.
- Rather than funding specific hydrogen education projects for K-12, perhaps Montana should focus on the more university level projects.

**Project # ED-05: Hydrogen Technology and Energy Curriculum (HyTEC)***Nagle, Barbara; University of California, Berkeley***Brief Summary of Project**

The Hydrogen Technology and Energy Curriculum (HyTEC) project, led by the Lawrence Hall of Science at the University of California at Berkeley, will develop, test, and disseminate hydrogen and fuel cell curricula for high school students. The project will create new materials, including student handouts, teachers' guides, kits for students' investigations and experiments, and professional development for teachers. The project will also incorporate hydrogen and fuel cell information into existing Lawrence Hall materials, which are used in more than one million classrooms nationwide. Project partners include Schatz Energy Research Center, AC Transit, and Lab Aids, Inc.

**Question 1: Relevance to overall DOE objectives**

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

- Emphasis on providing educational materials for teachers and students in grades 9-12.
- Emphasis is on curriculum and kit development rather than long-term sustainable professional development and evaluation of outcomes.
- Program as described should result in many new teachers exposing students to hydrogen basics.
- Directly addresses the goals and objectives outlined in the Multi-Year RD&D plan.
- Geared towards a wide impact approach to education.
- Excellent project that will reach target audience.

**Question 2: Approach to performing the research and development**

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

- Bring at least 8 fuel cells to each classroom for student use.
- Have a larger "demo" fuel cell that can be disassembled for classes to look at and re-assemble.
- Kits can end up being relatively expensive (\$200 to \$500 per classroom), which makes the kits only available to school districts that are well funded.
- Making excellent use of previously developed expertise and relationships.
- Clearly a strong team knowledgeable in the area of education.
- Good benchmarking approach with strong stakeholder involvement.
- Hands-on training aids are a good approach to stimulating interest in the students.
- Ability of schools or others to finance the purchase of kits will be key to determining the impact of this effort.
- National approach is a strength.
- Outstanding sequential approach that addresses all target audiences. Impressive tools and training materials to prepare teachers and educate and motivate students.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

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

- Completed outline of lessons.
- Prototype kits developed.
- Try outs after AP exams.
- Related to National Science Education Standards and California state science standards.
- Prototype of fuel cell with electrolyzer and multimeter to allow students to lift weights using the fuel cell.
- Excellent leveraging of resources.
- The team is commended for making strong progress given the funding constraints.
- Wish this were further along.
- Leveraging by also including hydrogen in existing science modules is a bonus.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **3.4** for technology transfer and collaboration.

- Lawrence Hall of Science has an established, large network for dissemination of curriculum materials to high-school teachers throughout the United States.
- Project is working to use existing kit material rather than go through an expensive development program for getting new materials to high school students and teachers.
- Significant involvement with range of appropriate groups. Should strengthen final product.
- Well-connected with teacher/education networks.
- Good approach.
- Could use more emphasis on working with schools to obtain financing for kits.
- Excellent partnerships.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **3.8** for proposed future work.

- Classroom testing of the curriculum.
- Online field trip to a hydrogen fueling station.
- Would like to extend to 3 modules and national field testing if funding is available.
- Working to collaborate with local science centers.
- Use with teacher workshops.
- On track to reach stated objectives.
- Strong plan for validating usefulness of kits and expanding into multiple science areas.
- Nice long-term sustainable financial basis.
- Planning revamped due to lack of DOE funding.

**Strengths and weaknesses****Strengths**

- Excellent collaboration with teachers and scientists to develop a grade 9-12 curriculum on hydrogen and fuel cells that is cross-curriculum (with physical science, chemistry, physics, and environmental science) and aligned with the National Science Education Standards and state science standards.
- Excellent presentation.
- Clearly a strong team with a clear understanding of educational needs and opportunities for inserting new curriculum into the school.
- Nice fit to broader high school science module series.

Weaknesses

- Too much focus on curriculum and not enough on teacher professional development that is long term and working to establish lasting ties between teachers and the research community. Not clear that DOE should be funding curriculum projects that do not use the unique resources of the DOE labs and DOE community of researchers and experts.
- Although getting hydrogen-related activities into schools is important and necessary, how much impact will a 2 to 3 day module make on accelerating the acceptance of hydrogen technologies? Modules that contain things that can be put into practice now, or that kids can associate with everyday, will be important.

**Specific recommendations and additions or deletions to the work scope**

- None.

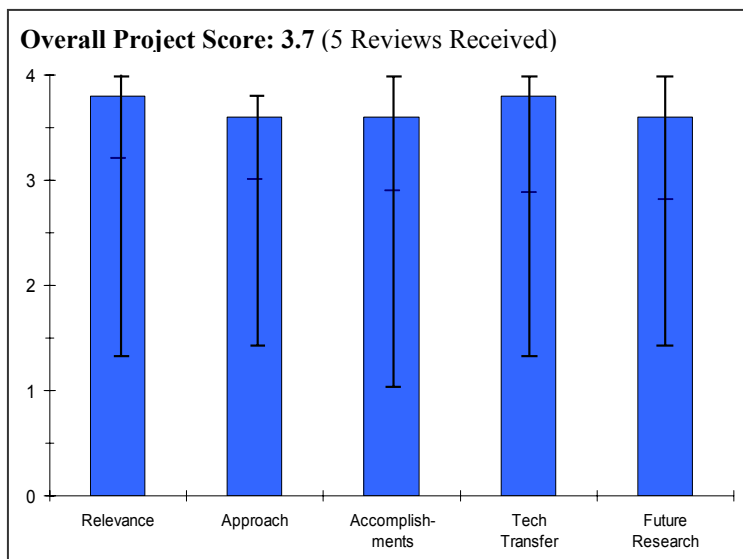


**Project # ED-06: H2 Educate!**

*Spruill, Mary; National Energy Education Development Project*

**Brief Summary of Project**

H2 Educate!, led by the National Energy Education Development (NEED) Project, will provide hands-on kits, classroom curriculum, and teacher training on hydrogen and fuel cells. The project, which targets middle schools, will reach a network of 45,000 classrooms with one-day workshops, week-long conferences, and strategic partnerships around the country. The program and materials were designed by teachers, with technical support from SENTECH, Inc., the National Hydrogen Association (NHA), Los Alamos National Laboratory (LANL), and the U.S. Fuel Cell Council (USFCC).

**Question 1: Relevance to overall DOE objectives**

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

- Developing curriculum units teachers and students in grades 6-8, with input from industry and LANL.
- Materials are provided free of charge in most cases to the middle school classroom.
- Excellent implementation plan for expanding exposure of large groups of teachers and students to hydrogen basics.
- Directly addresses the goals and objectives outlined in the Multi-Year RD&D Plan.
- Geared towards a wide impact approach to education.
- Meeting critical to educate teachers and students and elementary years.

**Question 2: Approach to performing the research and development**

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

- Resource materials for reading and learning about hydrogen and energy.
- Emphasis for teachers to use energy education as a theme or strand throughout the school year.
- Allows middle school teachers to work together to implement learning about hydrogen and energy across the curriculum.
- Addresses low levels of knowledge in population on hydrogen issues. Builds confidence for teachers new to technology.
- Demonstrates an exceptional understanding of identifying the need, establishing the stakeholders, and implementing the tools.
- Good tie to middle school teachers.
- Materials update annually - excellent. Ability to raise funds to cover cost of materials will help to reach larger audience - outstanding. Comprehensive planning.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **3.6** based on accomplishments.

- Curriculum pilot programs are completed.
- Training programs are completed.
- Starting professional development for teachers in New York.
- Making notable, measurable progress in spite of lack of budget.
- Project is ahead of schedule; the team should be commended for stepping up and moving the project forward given the federal financial constraints.
- Impressive, given the funding- bravo!
- 50% ahead of schedule in preparing module.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **3.8** for technology transfer and collaboration.

- Good focus on providing technically accurate hydrogen information to teachers.
- Excellent utilization of links to industry and other educational institutions.
- Strong collaborations. Great fundraising.
- Excellent partnerships and inclusion of students and teachers in curriculum development and actual hands-on teaching.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **3.6** for proposed future work.

- Pilot workshops with teachers leading to larger scale of professional development for middle school teachers.
- Work to assess how well students and teachers are learning about hydrogen and energy.
- Use of 8th grade students to teach 6th grade students about hydrogen and energy.
- Materials for teachers are updated annually -- keep material current and accurate.
- Program design allows expansion to meet other identified needs.
- Good strong plans for measuring progress and impact.
- Clear understanding of future challenges.
- Like the update approach.
- Continuing regardless of funding issues.

**Strengths and weaknesses**

Strengths

- Program is national in scope and NEED has an excellent way of providing middle school science curriculum related to energy and the hydrogen economy to a wide audience of middle school teachers and students nationally.
- Program has good input from teachers in the development of what they need for education resources and has worked to reduce the cost of curriculum to schools and school systems so that material will be widely available and not just to school systems that can afford it.
- Builds on expertise of organization. Able to deal with budget shortfall more easily than other organizations.
- Takes fundraising in stride. Excellent presentation skills provided clear information on project.
- Exceptional team with a long history of developing educational tools.
- Strong partnership development.
- Strong fit to broaden middle school effort.

Weaknesses

- Not clear that DOE should be in the business of funding science curriculum development, which can compete with funding from Education and National Science Foundation. DOE may be better off funding professional development and research experiences for students and teachers that use the unique resources of the DOE labs and community of researchers.
- None noted.

Specific recommendations and additions or deletions to the work scope

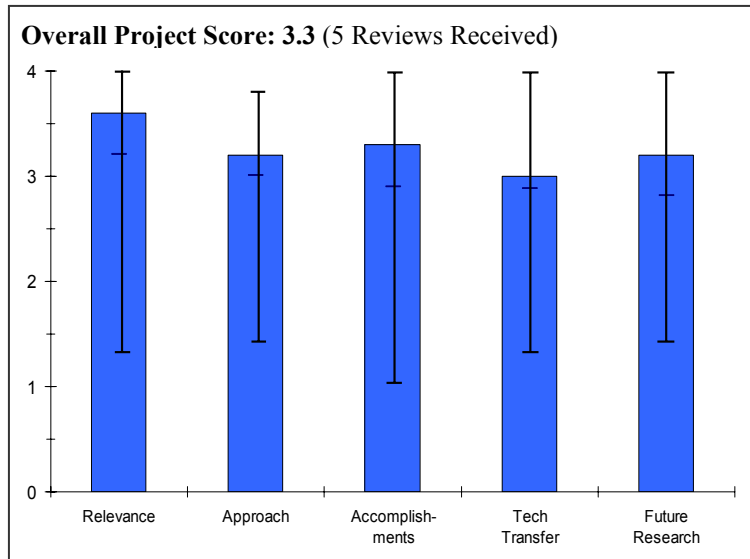
- None.

**Project # EDP-01: Baseline Knowledge Assessment**

*Armstrong, Tim; Oak Ridge National Laboratory*

**Brief Summary of Project**

The Baseline Knowledge Assessment, led by Oak Ridge National Laboratory (ORNL), with support from Opinion Research Corporation, measures the current level of knowledge and understanding of hydrogen and fuel cell technologies and the hydrogen economy in four target populations – the general public, students, state and local government agencies, and potential large-scale end users. It establishes a baseline for comparison of future evaluations of knowledge and awareness among these same four key populations. The surveys were completed in 2004 and an updated survey report will be available in 2005.



**Question 1: Relevance to overall DOE objectives**

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

- Great project – very relevant to assessing public knowledge.
- Project performed surveys of general public, students, government officials, and potential end users regarding their knowledge and fears about hydrogen and fuel cells.
- Data provides a baseline for DOE’s hydrogen education program
- A major goal is to improve the knowledge and acceptance of hydrogen and fuel cell technology in order to facilitate the commercialization decision; establishing a baseline is a key first step.
- If you are going to measure the effectiveness of any educational program, having a survey of baseline knowledge to measure from is extremely important.
- Glad this work got done!

**Question 2: Approach to performing the research and development**

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

- Good approach. Well thought out – good data generated. Good analysis.
- Project seems to be statistically robust (n=1000).
- Actual survey questions were not available to reviewers.
- Need to ensure that population sampling – number of surveys, types of questions, and interpretation of answers – will lead to a statistically significant result.
- Should benchmark knowledge and acceptance of hydrogen against knowledge and acceptance of related and/or unrelated topics.
- Assuming acceptance improves, how will you gauge what tools have been the most effective?
- Very well thought out approach. Very methodical. Very relevant to other parts of DOE program.
- Mature and solid work.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

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

- Survey provides very good information – where to focus activities and additional research (i.e., students and general public). When the public goes to the government for information, the government needs to have the right information.
- Project has completed surveys in 2004.
- Project has plans to conduct surveys again in 2007.
- Report is about to be published and available on website. Great progress. Efficient work by ORNL in getting this accomplished.
- Needs to be on website.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **3.0** for technology transfer and collaboration.

- Data needs to be disseminated to more audiences – very good insights on hydrogen myths.
- Good coordination with getting industry input on questions. Transfer of information to other DOE hydrogen education program projects will be important.
- Gives good guidance to education effort.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **3.2** for proposed future work.

- Continue work in out-years to assess knowledge of information.
- Surveys will be redone in 2007 and compared to baseline data from the 2004 survey.
- Activities seem to focus solely on repeating surveys. Why not dig deeper into the results of the first set of surveys to try and understand more?
- Plans in place for future surveys to measure effectiveness of education programs.
- Long term planning from the beginning.

**Strengths and weaknesses****Strengths**

- Excellent work – tells us at many levels what is going on. Great baseline work.
- Very useful data for EERE administration and policy decisions regarding hydrogen education programs.
- Important part of hydrogen education program. Timely completion. Will be effective tool to measure program efficiency.
- Best of the education posters.

**Weaknesses**

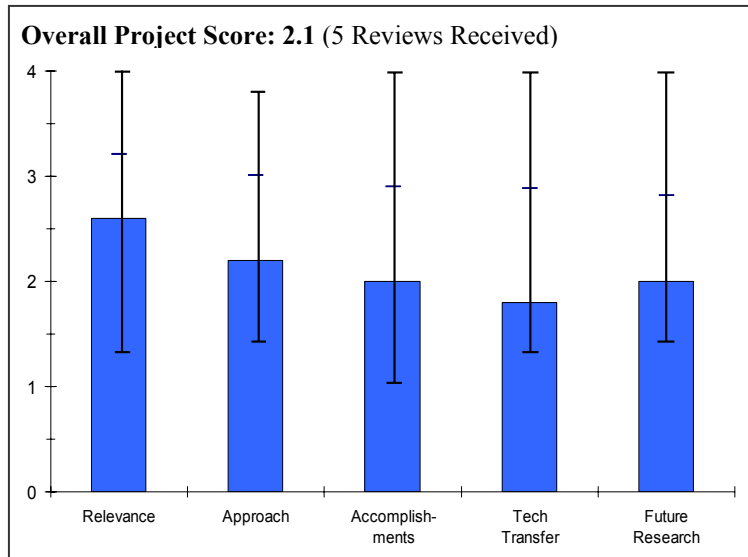
- Scope is limited. It would be nice to get information about more than just general knowledge but also to test knowledge about more specific areas such as how hydrogen will be produced, stored, and transported.
- Can't think of any weaknesses except to ask what contingency plans are there if no funding is available for next rounds of survey?

**Specific recommendations and additions or deletions to the work scope**

- This data really needs to get published to a wider audience – magazines, educational materials, fact sheets, etc.

**Project # EDP-02: Hydrogen Technology Overview Publication and Program Information Kit***Andersen, Cindi; Andersen Creative***Brief Summary of Project**

This project will develop hydrogen educational materials for multiple target audiences. Initial efforts focus on producing an information kit that contains fact sheets, a poster, a PowerPoint presentation, a CD containing current related documents published by DOE, and an interactive CD. Information will include an explanation of the President's Hydrogen Initiative and DOE Hydrogen Program; how hydrogen is produced, stored, distributed, and used; and the technical challenges to achieving a hydrogen economy. Pending future funding, this project will also include the development of a hydrogen technology overview brochure.

**Question 1: Relevance to overall DOE objectives**

This project earned a score of **2.6** for its relevance to DOE objectives.

- Project is collecting data, quotes, and video relating to the hydrogen economy and fuel cells.
- Project is also producing animations.
- Collection of media will be made available to multiple audiences.
- This data is already available online and through trade organizations.
- Difficult to review without drafts.
- Very needed.
- Audience changed from secondary schools to general public. Project scope doesn't include dissemination. How can a product be developed without knowing how it will be disseminated?

**Question 2: Approach to performing the research and development**

This project was rated **2.2** on its approach.

- Project is producing fact sheets, CDs, and other media for distributing information to multiple audiences.
- Descriptions of materials, target audiences, and barriers are general and vague.
- Need to develop metrics to measure effectiveness of tools.
- General low-level information may not have sufficient impact.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **2.0** based on accomplishments.

- About 15% of work has been accomplished. Project seems to be basically on-hold pending additional funding.
- Difficult to evaluate progress without drafts of product. No evident plans for distribution.
- Changing the target audience seems to have slowed progress, but does changing the target audience really require a totally different approach?
- Not fair to rate accomplishments – funding problem hit squarely.
- Unclear since target audience changed.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **1.8** for technology transfer and collaboration.

- Project is collaborating with Argonne National Lab.
- Some of the delays have occurred due to a change in target audience focus.
- Appears to be work of one person/company with only DOE review.
- Need to develop a stronger collaboration with others doing similar work and targeting these same audiences.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **2.0** for proposed future work.

- Plan to complete an overview booklet.
- Development of a color brochure is also planned.
- Need to clearly identify the added value over other tools currently available.
- Are these the correct tools for the target audience?

**Strengths and weaknesses**Strengths

- This is clearly a qualified firm to develop materials that can engage the audiences.

Weaknesses

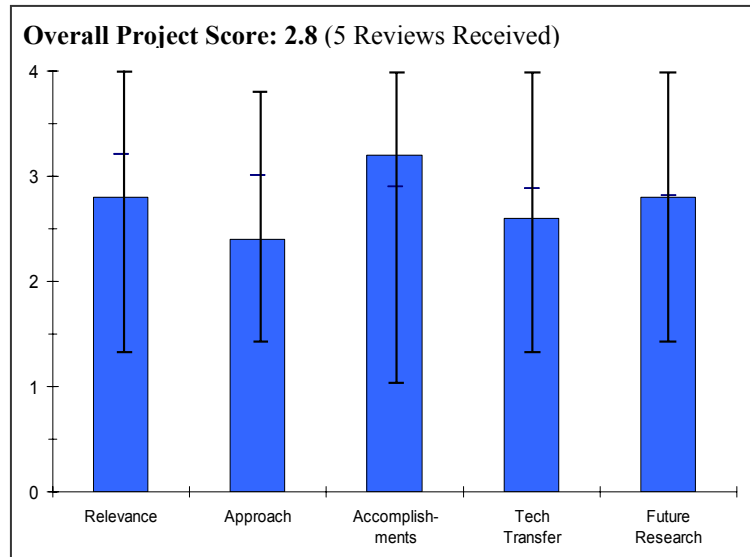
- Limited scope; repeat of data and information that is already available in other forms and from other sources.
- Lack of defined distribution plan for finished products.
- Need to ensure that the materials being developed are the right tools to educate the target audiences. Short, visible material that catches one's attention, but does not require substantial investment of time is more likely to have an impact than long brochures or CDs of programmatic documents.
- Need to ensure good coordination with other efforts.
- This product is not the best format to reach the general public. A power point presentation is included as well as a CD.

**Specific recommendations and additions or deletions to the work scope**

- Distribution or outreach plan needed.
- Hope this gets funding.

**Project # EDP-03: Understanding the Hydrogen Economy***Tidball, Rick; Energy & Environmental Analysis***Brief Summary of Project**

This project will produce hydrogen education materials that will help multiple target audiences understand the concept of a hydrogen economy and how it may affect them. Initial efforts include the development of a hydrogen technology overview brochure; pending the availability of funding, future efforts will include creating a hydrogen information kit. Materials will be developed in a graphics-rich format and will describe the status, challenges, technologies, and anticipated timeline to achieve a hydrogen economy.

**Question 1: Relevance to overall DOE objectives**

This project earned a score of **2.8** for its relevance to DOE objectives.

- This project is the production of a ~40 page booklet on the hydrogen economy and hydrogen as a fuel.
- Booklet audience is public, policy makers, and industry leaders.
- Covers the basics. Individual sections of the booklet are being reviewed by appropriate DOE officials to verify alignment.
- We need this material.
- Very small target audience; people who are already interested in hydrogen. Only individuals who are very interested in hydrogen will read a 40-page document.

**Question 2: Approach to performing the research and development**

This project was rated **2.4** on its approach.

- Approach is to produce a booklet.
- Booklet may be out-of-date before it gets off the press.
- Booklet will be available as a PDF but not regularly updated.
- Approach is appropriate for identified audience.
- Need to develop metrics to measure the effectiveness of the tools developed.
- Seem to be relying heavily on DOE for content review and distribution of tools.
- Working with target audiences to better define need and for beta testing tools would result in a more useful product.
- Lack of access to audience not addressed well – targeting 20,000 subscribers to H2Nation magazine and web.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **3.2** based on accomplishments.

- Working on third draft currently.
- Graphics selection and publication are awaiting final DOE review and potential for additional funding.
- Progress is significant and commendable given the budget shortfall.
- Have made good progress towards accomplishing objective.



- Third draft round is nice progress on booklet.
- Two drafts provided to DOE in timely manner.

#### **Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **2.6** for technology transfer and collaboration.

- Great opportunity for reaching a large audience.
- Some information already available from other sources and trade groups.
- Would be nice if information could be regularly updated as this field is still developing and changing often.
- Close coordination with DOE.
- Although H2Nation may not be the best mechanism for reaching the target audience, this is the correct approach for reaching broader audiences.
- Need to also target periodicals frequented by the less hydrogen familiar audience.

#### **Question 5: Approach to and relevance of proposed future research**

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

- Work is still ongoing and will go to print.
- Still awaiting DOE reviews and funding for FY06.
- Reasonable goals stated, dependent on future funding.
- Need to ensure that efforts are not repetitive of similar activities.
- Project would benefit from an outreach/marketing plan; initial draft should be beta tested with target audiences and refined as needed.
- Fact sheets to be developed if FY06 funds available. Other education projects are also developing fact sheets.

#### **Strengths and weaknesses**

##### Strengths

- This project should provide a useful tool for those that already have a basic understanding of hydrogen and are interested in further information.

##### Weaknesses

- Perhaps need to strengthen ties to universities.
- Need to ensure that the content and scope of the tool is appropriate for the target audience. Booklet may be too long and detailed to sufficiently hold the audience's attention. Metrics should be established for measuring its effectiveness.
- Will need to coordinate with others doing similar work.
- Focused on a limited target audience. If this audience were already interested in hydrogen, a 40-page document compiled from other DOE hydrogen documents, which this audience would be aware of, would not be highly valued.

#### **Specific recommendations and additions or deletions to the work scope**

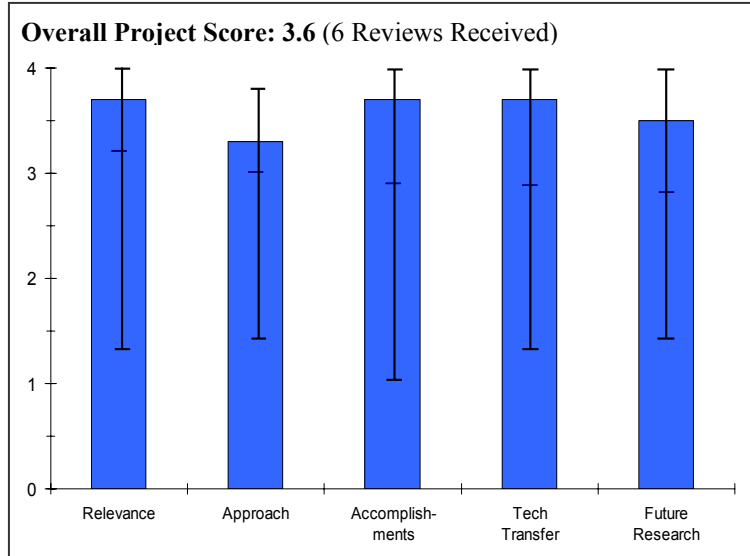
- Products need to be coordinated with those being developed in other education projects. Perhaps use this group to fill in other needed fact sheets rather than duplicate the same fact sheet topics being covered by others.

**Project # EDP-04: Hydrogen Education and Outreach**

*Serfass, Patrick; National Hydrogen Association*

**Brief Summary of Project**

The National Hydrogen Association (NHA) project will assess the information needs of fleet operators and managers, develop a series of hydrogen fact sheets on a variety of topics, and disseminate the fact sheets and other educational collateral using the media most requested to heighten knowledge regarding hydrogen energy systems. The tasks in this project will focus on key target audiences, such as early hydrogen adopters, and address three of the four main education barriers identified by DOE.



**Question 1: Relevance to overall DOE objectives**

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

- The project supports the goals and objectives of the HFCIT MYRD&D Plan.
- Project has large-scale objectives – education for fleet operators and fact sheets on various hydrogen topics.
- Fact sheets are well-reviewed and targeted for different audiences.
- Providing needed documents for outreach to variety of audiences.
- Increasing awareness and providing understandable information to end-users and approving officials will be important for the success of hydrogen technologies.
- Well targeted.
- Target audiences align with DOE targets.

**Question 2: Approach to performing the research and development**

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

- Project activities are well defined and well aligned with addressing the barriers in the MYRD&D Plan.
- Project works with large group of users to collaborate on the education information provided and making that material available to a wide audience.
- Fact sheets can be downloaded from the web.
- Statistics are kept to see how often fact sheets are downloaded.
- Addresses needs of fleets, general public, and officials – all needed areas to raise level of understanding.
- Well-g geared toward first users and approving officials.
- Could leverage more industry involvement in activities.
- Timeline to start required adjustment. Glad adjustment done.
- The products presented are professional and relevant.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

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

- The fact sheets are a significant accomplishment and value to the program.
- Much has already been accomplished – fact sheets available online and under review for updates and new information.

- Excellent progress given low level of funding.
- Project appears on track to achieving its goals and objectives.
- Good progress. Waiting for next batch of fact sheets to go on web.
- Accomplishments are significant.

#### **Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **3.7** for technology transfer and collaboration.

- The technology transfer is very effective through the use of the web sites and NHA.
- Educational programs and fact sheets available to a wide audience.
- Working with wide range of organizations in addition to appropriate DOE staff.
- Need to develop an outreach plan to ensure information is disseminated to the widest possible audience.
- Again, leveraging industrial, state, and federal partnerships more could increase the impact.
- Survey and broad review of materials.

#### **Question 5: Approach to and relevance of proposed future research**

This project was rated **3.5** for proposed future work.

- The hydrogen fleet target will be an important accomplishment as they will be key to the transition and adoption of the hydrogen economy.
- Future work includes continued updates to fact sheets and workshops for fleet managers.
- On track to meet identified needs. Responsive to changing focus as dictated by DOE and market.
- Will current budget be sufficient for implementing future plans?
- How will effectiveness of outreach efforts be monitored?

#### **Strengths and weaknesses**

##### Strengths

- Strong knowledge in the hydrogen area.
- Excellent presentation. Drafts provided for review.
- Good focus on working with the target audience to baseline understanding and define need.
- Good useful materials. Nice to see the multi-year plan validated.
- Covers wide range of defined target audiences; design products relevant for each audience rather than a shotgun general public approach. Successful project.

##### Weaknesses

- None noted.

#### **Specific recommendations and additions or deletions to the work scope**

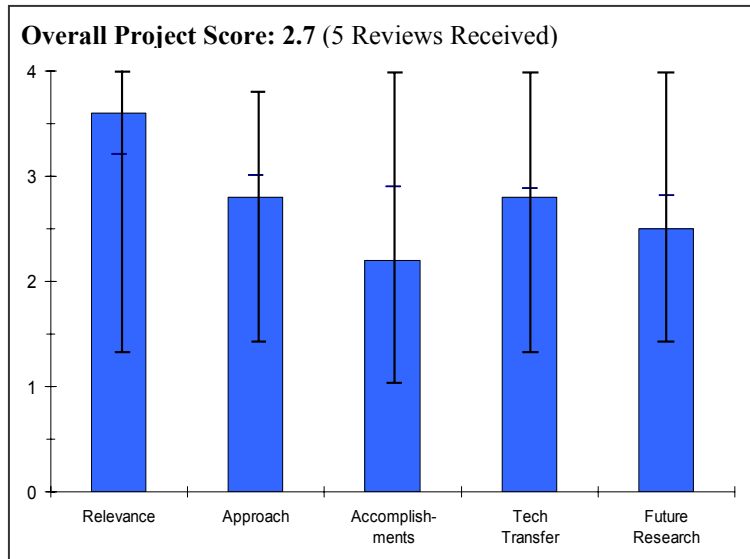
- Recommend pursuing DOE publications numbers for the fact sheets.
- Metrics should be established for measuring impact and effectiveness of tools.
- Develop a "waste hydrogen from industrial processes" fact sheet.

**Project # EDP-05: Hydrogen Technology Learning Centers**

*Kripowicz, Bob; State Technologies Advancement Collaborative (STAC)*

**Brief Summary of Project**

Under the State Technologies Advancement Collaborative – supported by the U.S. Department of Energy, National Association of State Energy Officials, and the Association of State Energy Research and Technology Transfer Institutions – three hydrogen technology learning centers are in development through partnerships among universities in FL, CA, and NY; MD and VA; and NC, SC, GA, and FL. Each center seeks to educate university students; potential end-users, such as fleets or building developers; local officials; and the public about the vision of a hydrogen economy, hydrogen technologies and applications, the safe use of hydrogen as an energy carrier, and the challenges to achieving a hydrogen economy.



**Question 1: Relevance to overall DOE objectives**

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

- The project supports the goals and objectives of the HFCIT MYRD&D Plan.
- Project is seeking to work with federal and state agencies in multiple states and includes collaboration with state energy offices.
- Three projects are currently underway in (1) CA, FL, and NY; (2) VA and MD; (3) NC, SC, FL and GA.
- Regional centers very good idea.
- Opportunity to reach all audiences.

**Question 2: Approach to performing the research and development**

This project was rated **2.8** on its approach.

- Two of the three sub-projects have similar approaches and, although the projects have just begun and are not fully funded, they have sound approaches defined.
- The third sub-project has just begun and is as well defined.
- Project includes cooperation to develop curriculum for undergraduates, graduates, and some younger students
- Expectation of high demand for this educational material, but no data to show that demand has been high.
- Project sees funding as “seed money” to establish curriculum materials that will be eventually funded by other agencies as the curriculum matures.
- Approaches to funding three different projects around the country gives good education coverage. Each individual sub-program within this project seems to have a well-thought out approach.

**Question 3: Technical accomplishments and progress toward project and DOE goals**

This project was rated **2.2** based on accomplishments.

- It is too early to evaluate this project's accomplishments.
- Work has started, but been delayed until future funding becomes clearer.
- Two of the centers seem to be progressing nicely despite lack of funding. The third seems to have waited until funding was in hand to start but is progressing well with curriculum development.
- A bit slow getting going.
- Too soon to tell. STAC process started late.

**Question 4: Technology transfer/collaborations with industry, universities and other laboratories**

This project was rated **2.8** for technology transfer and collaboration.

- It is too early to evaluate technology transfer, but the centers demonstrate strong collaboration efforts.
- High possibility that the information generated will be shared with many universities and colleges throughout the country.
- It is good that each center's information is online so that each can see and share the others ideas.
- Focus on working with rest of DOE's hydrogen education efforts.

**Question 5: Approach to and relevance of proposed future research**

This project was rated **2.5** for proposed future work.

- The continued work proposed for the rest of this year is appropriate.
- Future work seems to be largely "on hold" until future funding potential/availability is understood.
- Not really any contingency for what to do in absence of funding. Not focused on what comes afterward because they are concerned with getting money to actually do work on the project at hand.
- Not clear.

**Strengths and weaknesses**Strengths

- Strong university collaboration.
- Important regional focus. Good progress despite lack of funding.
- Potential to be outstanding.

Weaknesses

- Funding levels – is there any cost share for these sub-projects?
- Lack of funding has inhibited progress, but that could not be blamed on PI or centers themselves.
- Loss of FY05 funding will impact. Did not see coping strategy.

**Specific recommendations and additions or deletions to the work scope**

- Recommend pursuing collaboration with other activities within DOE's hydrogen education program.
- Perhaps a meeting between the groups to discuss common issues would be useful – i.e. getting around funding problems or material development issues.

