

X.10 STAC Hydrogen Learning Centers

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Subcontractors

Three subcontracts and their partners participate through STAC – a cooperative program of DOE, the National Association of State Energy Officials, and the Association of State Energy Research and Technology Transfer Institutions – and contracts are administered by the National Association of State Energy Officials.

University of Central Florida, Orlando, FL

Partners:

*California Energy Commission
NY State Energy Research & Development Authority
University of California-Davis
San Diego-Miramar College
Rochester Institute of Technology*

Virginia Polytechnic Institute & State University, Blacksburg, VA

Partners:

*University of Maryland (UMCP)
Breakthrough Technologies Institute
Hampton Roads Clean Cities Coalition*

North Carolina A&T State University, Greensboro, NC

Partners:

*University of South Carolina
University of Florida
University of Georgia*

Start Date: January 2005

Projected End Date: 2008

Objectives

Three multi-state projects will develop hydrogen technology learning centers at universities within the State Technologies Advancement Collaborative (STAC) hydrogen project area. The objectives of the projects are:

Hydrogen Technology Learning Centers for California, Florida, and New York (H2USA)

- Create a multi-state “H2USA” Center with hubs at four academic institutions.

- Educate undergraduate and graduate students, as well as key audiences in the community, including government officials, industry members, the general public, and others on the hydrogen economy, technology, and applications.

Virginia-Maryland Hydrogen Technology Education Center (H2TEC)

- Provide learning opportunities in the area of hydrogen technology for undergraduate and graduate students.
- Create short courses targeted to energy professionals.
- Develop a seminar series to encourage information exchange.
- Offer a variety of activities for outreach to the public and the local community

Regional Hydrogen Technology Education Consortium (HyTEC)

- Establish a regional Hydrogen Technology Education Consortium (HyTEC) for the south.
- Share technologies, facilities, personnel, and other resources among the four participating institutions for the purpose of providing interactive technology transfer through education and training in hydrogen technologies for university students, as well as professionals and the public.

Technical Barriers

This project addresses the following technical barriers from the Education section of the Hydrogen, Fuel Cells and Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan:

- A. Lack of Awareness
- B. Lack of Demonstrations or Examples of Real World Use
- C. Institutional Barriers and Access to Audiences
- D. Regional Differences

Technical Targets

- *Facilitate Development of Hydrogen Technology Programs at Universities*

All three projects focus on university courses involving technologies, production and storage, energy conversion, and fuel cells. Courses range from general undergraduate level to graduate level for science, engineering, and technology students. H2USA will include an assessment of community college and university hydrogen courses and degree programs now offered in the United States.

- *Facilitate Partnerships and Information Exchange Among Local, State, and Regional Education Efforts, and National Partners*

Each project is a multi-state effort. The exchange of information will take place between states, regionally and nationally. Information and presentations provided to government and industry associations will allow for information exchange to these target audiences as well.

- *Disseminate Hydrogen and Fuel Cell Educational Materials*

Through a quarterly newsletter, fact sheets, public forums, and education programs, all three centers will educate the public on hydrogen production, storage, transportation, and energy conversion. H2USA is also planning the creation of a website operated with input by all four of its participating institutions. The site will provide a virtual center online and will include educational materials, general interest publications, technical documents, and other information updated on an ongoing basis. The website will serve as a clearinghouse for educators.

- *Educate Key Target Audience Groups in the Local Community*

Seminar series and one-day courses for state and local officials will offer an educational means, as well as a way for officials to communicate on these issues. Seminars will focus on the research, as well as policy options to increase knowledge in the concept and the affects on government and policy. H2USA will offer continuing education courses for industry, utilities, and specialized audiences. HyTEC will create a multi-media presentation on safe production, storage, and transportation of hydrogen, as well as safety codes

and standards. The presentation will include information on fuel cells and could be used for a variety of audiences – continuing education of engineers and other professionals, civic clubs, adult education classes, and non-technical college classes. Availability of these lectures will be publicized on the HyTEC website with links to all four participating universities and state energy offices. Education means may include presentations at civic clubs, and holding adult education classes and non-technical college classes. Each of the Hydrogen Technology Learning Centers also has a component focused on safety and codes through educational courses at the centers or multi-media presentations.

Approach

- Analyze the educational needs of the audience.
- Develop the courses for each target audience.
- Create materials based on the audience needs.
- Distribute materials and information through centers, websites, workshops, and forums, and utilize national groups for dissemination and notification.
- Analyze the materials and courses and make appropriate adjustments for future programs.
- Build demonstrations.

Accomplishments

Hydrogen Technology Learning Centers for California, Florida, and New York (H2USA)

- The team has begun to develop a draft curriculum for the Hydrogen Pathways Graduate Course. This task involved a detailed review of relevant literature and available resources to establish important topic areas and themes.
- Continued planning efforts on a Fuel Cell Fundamentals and FuelCell Systems Laboratory Course for university students.

Virginia-Maryland Hydrogen Technology Education Center (H2TEC)

- Developed a three credit hour undergraduate course in hydrogen technology.
- Virginia Tech Future Truck, a display illustrating a hydrogen fuel storage system and a hydrogen internal combustion engine was presented at the Roanoke Civic Center as part of the Association of Energy Conservation Professionals (AECOP) Energy Fair.
- The proposal for a Virginia Hydrogen Network (of which the H2TEC is an element) was developed and presented at the following events:
 - September 8, 2004: DOE Hydrogen Learning Workshop, Annapolis, MD;
 - September 20, 2004: MidAtlantic Hydrogen Coalition Inaugural Meeting, Baltimore MD.
- Industry reviews of the Virginia Hydrogen Network were held with General Motors and Air Products in October 2004.

Development of a Regional Hydrogen Technology Education Consortium (HyTEC)

- A preliminary course outline was developed for a course on fuel cells and portions of the proposed course material were used in an existing undergraduate energy conversion course for student feedback.

Future Directions

Hydrogen Technology Learning Centers for California, Florida, and New York (H2USA)

- Develop content for the various lectures and topic areas of the hydrogen economy graduate course. These will include: lectures; background reading materials; practice problem and homework sets; and a detailed description (and example) of the final hydrogen system design project.

Virginia-Maryland Hydrogen Technology Education Center (H2TEC)

- Complete teaching of graduate and undergraduate courses in hydrogen and fuel cell systems.
- Renovate Virginia Tech research and teaching labs for hydrogen and fuel cells.

- Begin construction of hydrogen refueling demonstration project at Virginia Tech.
- Develop working SOFC system level model for presentation in short courses.
- Have two seminars in the DC area for professionals including government employees.
- Develop educational materials for a one-day short course on hydrogen technology.

Development of a Regional Hydrogen Technology Education Consortium (HyTEC)

- Prepare detailed fuel cell course.
- Prepare a newsletter for the general public with input from all the partners.
- Perform additional tours and demonstrations.
- Finalize course materials for Summer Institute designed for students and science teachers.

Introduction

Hydrogen Technology Learning Centers educate 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. Courses for college and university students, end-user continuing education, website clearinghouses, public forums, publications, interactive displays, workshops for state and local government officials, and newsletters are the means to disseminate the information. The centers will work collaboratively on a state, regional, and national basis to access multi-level audiences through awareness by education and hands-on experiences.

Projects were only recently funded. Work began late in the fourth quarter of 2004. No funds were available for hydrogen education in FY 2005; STAC is working with the project managers and DOE to determine how best to proceed given the lack of complete funding.

Approach

The approach of this project is to create multiple hydrogen technology learning centers throughout the country to enhance the education and information dissemination on hydrogen technologies, trends, and issues. Through various educational means— courses, training, workshops, demonstrations, websites—the centers will reach several target audiences.

Results

During year 1, the technology centers worked to complete course outlines, draft curricula, design modules, create demonstrations, and present lectures. Some of the work began later than hoped due to funding delays, thus only two quarters of work have actually been completed. Beyond that, each of the centers progressed with initial tasks.

The collaborative efforts of the multi-state projects lend themselves to a major DOE target of facilitating national, state, and local partnerships and exchanging information. The Virginia Hydrogen Network (of which the H2TEC is an element) speaks to this key element as well.

The major target audience reached this year was the college and university level. This audience was reached through a one-credit course on scientific challenges behind hydrogen technologies for graduate students at both UMCP and Virginia Tech, and a large seminar to incoming freshman on fuel cell technology and issues for transition to a hydrogen-based energy infrastructure at the UMCP College of Engineering. These accomplishments meet the target need to facilitate hydrogen programs in universities. Feedback from participants will allow for enhanced programs in the future.

The H2TEC project reached other target audiences in the first year, including the public, government officials, and industry through presentations on the centers and demonstrations. The information

dissemination to those audiences answers to several of the targets in the education area. The Virginia Tech Future Truck, a display illustrating a hydrogen fuel storage system and a hydrogen internal combustion engine, was presented at the Roanoke Civic Center as part of the AECF Energy Fair in Roanoke, VA. Attendance was approximately 1,000 people.

Conclusions

- Awareness among target audiences is increasing as a result of the dissemination of hydrogen information and increased education.

FY 2005 Publications/Presentations

1. H2USA - *Hydrogen Pathways Graduate Course*
2. H2TEC - *Virginia Tech Future Truck*