

# **DOE Hydrogen, Fuel Cells & Infrastructure Technologies Program Review**

## **Shared Technology Transfer Project (STTP)**

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Project ID#  
EDP 2

This presentation does not contain any proprietary or confidential information

# Overview

## Timeline

- Project start: 2/15/2005
- Project end: 9/30/2006
- Percent complete: 85%

## Budget

- Total project funding  
\$981,077
- Funding received in FY05:  
\$981,077
- Funding for FY06:  
no cost extension

## Barriers/Technical Targets

Table 3.8.1 Key Objectives by Target Audience

Target Audience	Key Objectives
Educators and Students (e.g., primary and secondary schools, colleges, universities, and other post-secondary institutions)	<ul style="list-style-type: none"><li>• Improve the level and breadth of hydrogen and fuel cell education, using established resources wherever possible and appropriate.</li><li>• Increase the number of schools teaching hydrogen and fuel cell courses.</li><li>• <u>Support and promote internships, academic research, and hands-on product demonstrations in these areas.</u></li></ul>
State and Local Government Representatives (e.g., city, county, state, and regional governments, agencies, and associations)	<ul style="list-style-type: none"><li>• Provide objective, accurate information that government representatives can rely on as part of their research to make informed decisions.</li></ul>
Large-Scale End Users (e.g., transit agencies, fleets, building associations and subdivisions, hospitals)	<ul style="list-style-type: none"><li>• Provide objective, accurate information that potential end users can <u>use as part of their research</u> to make informed decisions.</li><li>• Support training for potential end users.</li></ul>
Code Writing Organizations	<ul style="list-style-type: none"><li>• Provide objective scientific and technical information to facilitate and expedite the implementation of codes and standards.</li></ul>
National Regulatory Agencies	<ul style="list-style-type: none"><li>• Provide objective scientific and technical information to support the timely development of hydrogen and fuel cell policies and regulations.</li></ul>
Professional, Labor, and Trade Organizations	<ul style="list-style-type: none"><li>• <u>Support training for potential end-users and the labor force for a hydrogen infrastructure.</u></li></ul>
Financial Institutions (lenders, investors, and insurers)	<ul style="list-style-type: none"><li>• Provide objective, accurate information that these groups can use as part of their research to make informed decisions.</li></ul>
General Public	<ul style="list-style-type: none"><li>• Provide timely, objective, consumer-oriented information to support the transition to a hydrogen economy.</li></ul>

## Partners

- Houston Advanced Research Center
- South Louisiana Economic Council
- NAVSEA-Carderock

# Objectives

The overarching goal of STTP is to establish a collaborative process with domestic industries for the purpose of sharing Navy-developed technology.

The purpose is to educate private business sectors to increase the awareness of these businesses to the vast amount of technologies that are available, with an initial focus on technology applications that are related to the Hydrogen, Fuel Cells and Infrastructure Technologies (Hydrogen) Program of the U.S. Department of Energy (DOE).

# Objectives

The STTP target audience will embrace southern domestic industries and university educators.

The key objectives include:

- Catalog NAVSEA-Carderock Unclassified Technologies with a focus on identifying those technologies that relate to the DOE's Hydrogen Program
- Rate the level of readiness for each hydrogen program-related technology
- Develop and implement an Educational Outreach program to increase awareness within hydrogen-related industries
- Identify & match hydrogen-related businesses that might benefit from the technologies
- Launch an Educational Technology Showcase and website, featuring the initial set of technologies identified as being hydrogen related.

# Technical Barriers and Targets Addressed

## From the Education section of the Multi-year Program Plan:

- A. Lack of Awareness.** Interest in hydrogen and fuel cell technology is increasing, but there remains a general lack of awareness of hydrogen as an energy alternative. Moreover, although world events have drawn new attention to national energy security issues, there is little consensus about the severity of today's environmental problems or linkages to fuel choice. With little awareness, understanding, or recognition of these issues, there is little impetus for change, and target audiences are less inclined to embrace new technology.
- B. Lack of Demonstrations or Examples of Real World Use.** Hands-on and personal experience greatly enhances understanding and comfort with using any new technology. Although the number of hydrogen and fuel cell demonstration projects is slowly growing, currently there are only a few real-world examples to which educators can point. The absence of installations and demonstrations also results in a lack of success stories and case studies to supplement educational materials and encourage early adopters.
- C. Institutional Barriers and Access to Audiences.** Audience information needs can be well researched and educational materials or training workshops can be well developed, but they must reach their intended audiences to be effective. Institutional barriers can complicate or inhibit access to target audiences. Moreover, identifying the right organizations, as well as a champion within each organization to embrace hydrogen and fuel cell technologies, can be challenging.
- D. Regional Differences.** Educational needs will vary by audience, but they may also vary regionally. What applies to one state, county, city, or district, may not apply to another. Serving the education needs of a single target audience may therefore require multiple approaches tailored to serve the needs of various regions. This strains resources and can complicate activities developed at the national level.

***Key Barriers  
Addressed***

# Technical Barriers and Targets Addressed

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*Key targets*

# Approach

- Catalog NAVSEA-Carderock Unclassified Technologies with a focus on identifying those technologies that relate to the DOE's Hydrogen Program
  - Maintain liaison with NAVSEA-Carderock
  - Review and catalog NAVSEA-Carderock Unclassified Technologies – prepare briefings of technologies using catalog template
- Rate the level of readiness for each hydrogen program-related technology
  - Review briefings and rate level of technology readiness
  - Decide on applicability to hydrogen program
- Develop and implement an Educational Outreach program to increase awareness within hydrogen-related industries
  - Maintain liaison and coordinate potential industry sponsors
  - Develop and implement plan to inform industry

# Approach – Continued

- Identify & match hydrogen-related businesses that might benefit from the technologies
  - Identify and match companies that might benefit – meet with companies
  - Recruit industry sponsors
  - Assist industry with transfer of technologies
  - Prepare plans to develop case studies w/industry for evaluation of transfer
  - Perform case study
- Launch an Educational Technology Showcase and website, featuring the initial set of technologies identified as being hydrogen related.
  - Plan and hold technology showcase at NAVSEA-Carderock facility
  - Complete and maintain webpage for STTP



# Example Technology - Non-Fossil Electrical Power Generation



**NAVSEA-Carderock and FHPL will test and refine the FHPL innovative open center turbine unit and mooring assembly.**

**Carderock brings technical experts and unique facilities for efficient testing and refinement of the new design.**

**Carderock will use expertise in propeller design and moored systems as well as its unique hydrodynamic test facilities.**

**Expertise was provided in using the unit's output as a source of hydrogen, in which electrical energy is routed through water, which breaks water into its component parts, hydrogen and oxygen.**

**The advantage of using the turbines to produce liquid hydrogen is that they would not be limited to areas that are close to shore, as with electricity, and they could take advantage of tides.**

**This system is also expected to produce hydrogen at a cost below the Department of Energy goal of \$2.00/kilogram.**

# Accomplishments/Progress

- Catalog Template Developed
- Technology Readiness Methodology Identified
- Over 600 technologies have been cataloged and are available at: <http://www.nicholls.edu/sttp/>
- Various meetings held with industries to discuss potential projects. Projects will be funded by the industries.
- Organized student presentations/showcase and projects that demonstrate industry uses of the available technologies.

# Future Work

- Hold Technology Showcase for students to make presentations to industries.
- Hold individual follow-up meetings with industries to discuss potential projects. Projects will be funded by the industries.
- Revise web based catalog based on feedback from showcase and meetings.

# Project Summary

**Relevance:** Program increased the awareness of complementary technologies needed as the U.S. continues to pursue a Hydrogen economy, encouraging early adopters to perform demonstration projects, identifying organizations, as well as champions within the organizations, to promote the effort.

**Approach:** Catalog technologies, rate the level of readiness for each, hold various meetings with industries to promote catalog and technologies, have students pull together a technology showcase and make presentations, organize demonstration projects.

**Technical Accomplishments and Progress:** Technologies cataloged and rated. Various meetings with industries held. Students to hold showcase by end of May 2006. Demonstration projects being identified.

**Technology Transfer/Collaborations:** Collaborations being identified with other programs and with various industry partners.

**Proposed Future Research:** Various meetings and promotion of technologies for remainder of FY06. Future efforts beyond FY06 will be funded by other sources.

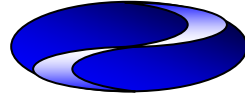
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# Technology Readiness Levels (TRLs)

Generate Knowledge (Research)		
Basic Technology Research	Level 1	Basic principles observed and reported
Research to Prove Feasibility	Level 2	Technology concept and/or application formulated
Technology Development	Level 3	Analytical and experimental critical functions and/or characteristic proof-of-concept
Technology Demonstration	Level 4	Component and/or bench configured subsystem validation in laboratory environment
System/Subsystem Development	Level 5	Component and/or bench configured subsystem validation in relevant environment
System Test and Operation	Level 6	System/subsystem model or prototype demonstration in a relevant environment
	Level 7	System prototype or system demonstration in an operational environment
	Level 8	Actual system completed and qualified through test and demonstration
	Level 9	Actual system proven through successful operations
Produce Products and Capabilities (Development)		

# Relationship of Programs



## BLUE WATER TECHNOLOGY PROGRAM

NETL  
National Petroleum Technology Office

HARC  
NAVSEA  
CARDEROCK  
Surface Warfare Center Division

### Seed Project

Tech. Readiness Level Methodology  
Catalog Template

ConocoPhillips  
Schlumberger  
Maurer Technology  
Southwest Research  
Energy Valley  
Stolt Offshore  
GRANT PRIDECO  
UNOCAL  
KBR-AMDEC CORPORATION  
GLOBAL SANTA FE  
Transocean  
BAKER HUGHES  
MOHR  
ENGINEERING + TESTING  
NAVSEA  
CARDEROCK  
Surface Warfare Center Division  
NICHOLLS STATE UNIVERSITY  
HARC

### Advisory Board

Pilot Web Site Entries

## Shared Technology Transfer Project (STTP)

U.S. Department of Energy  
Energy Efficiency and Renewable Energy

NICHOLLS STATE UNIVERSITY

HARC SLEC  
South Louisiana Economic Council  
Assumption + Lafayette + St. Mary + Terrebonne

CARDEROCK DIVISION  
NAVSEA  
WARFARE CENTERS

### Key Objectives

Develop Catalog  
Identify Technologies  
Promote Tech Transfer