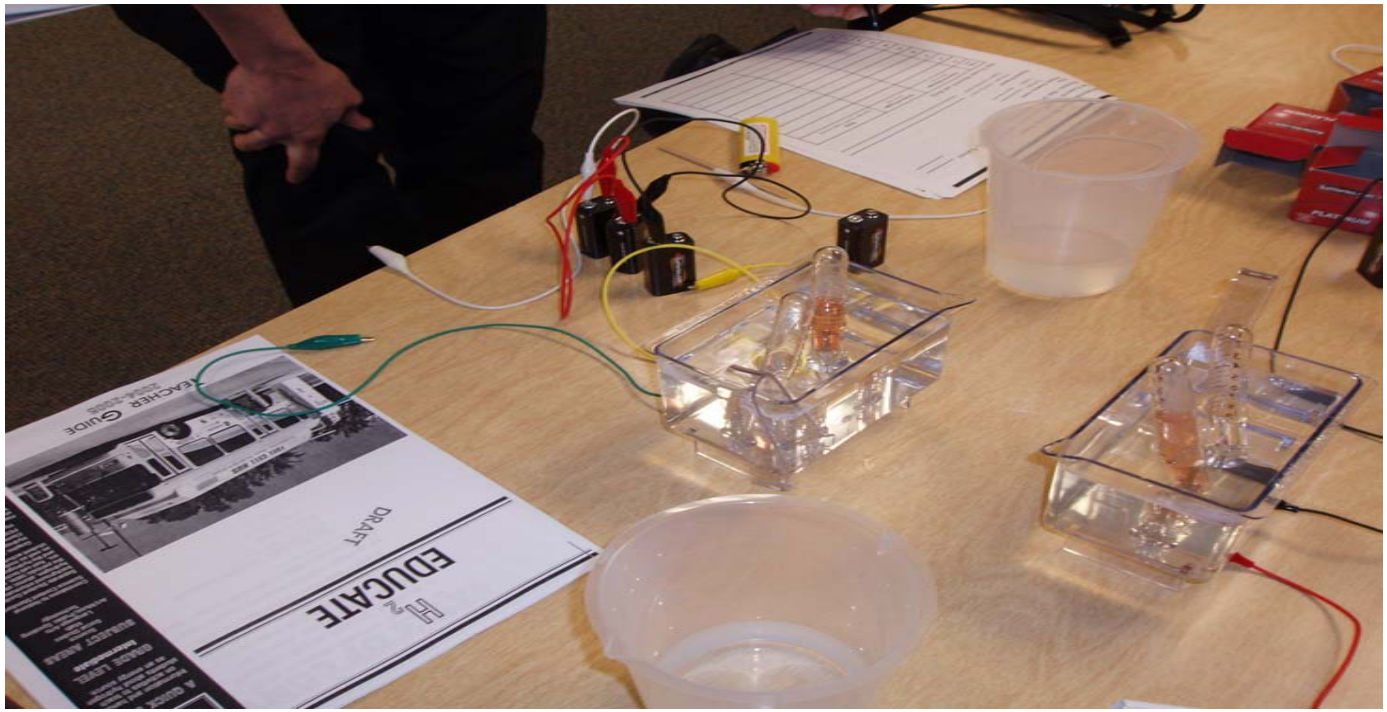
# 2006 DOE Hydrogen Program

## $H_2$ Educate!

### Hydrogen Education for Middle Schools




**National Energy Education Development**

**Mary Spruill, Program Director, May 17, 2006**

Project ID #ED2

This presentation does not contain any proprietary or confidential information

# $H_2$ Educate Overview

## Middle School Training and Materials

## Timeline and Budget

- Project Started:  April 2004
- Project Completion:  April 2009
- 90% complete with revised scope (2800 teachers trained)
- Total project funding
  - **$900,000 (Program Zeroed)**
  - **$600,000 (Matching Funds)**
- FY04 $300,000
- FY05  - 0 –
- FY06 – 0 -

# Special Thanks to our Partners

- U.S. Department of Energy
  Hydrogen, Fuel Cells, Infrastructure and Technologies Program
- Sentech, Inc., U.S. Fuel Cell Council
- National Hydrogen Association
- Los Alamos National Laboratory
- NYSERDA
- Fuel Cell Store
- State Energy Offices

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# $H_2$ Educate Objectives

- 1st year - Collaborate to develop, design, and deliver a first-class, comprehensive middle school hydrogen education program including:  Training, Classroom Materials, technical and best-practices exchange, and evaluation.
- 1st year - Design a program to link hydrogen science and technology and the concept of a hydrogen economy to the classroom.

- 2nd year – Deploy materials via teacher training and other professional development outreach opportunities.
- 2nd year – Provide technical support for schools that entered the program in year one.  Collect data and evaluate for year two revisions.
- 2nd year – Work to expand the reach of the program with new partners able to support training workshops at the local level.

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# Implementation

- In Year One we:
  - Asked and Evaluated: “What do you want to know about hydrogen, and what would your students want to know?”
  - Surveyed:  Consider the national and state education standards and develop the program to meet classroom needs.
  - Created: Have educators create the program and secure technical support to assist and trouble-shoot.
- In Year Two we:
  - Deployed:  Move beyond the pilot project to one-day teacher training workshops hosted throughout the country as resources allow.

# Ask and Evaluate

•In a "hydrogen economy," hydrogen is used to power our cars, homes, and businesses.

• Hydrogen can be made from abundant and diverse resources found right here in the United States.

• Fuel cells use hydrogen to create electricity -- the only byproducts are water and heat (no pollutants or other emissions).

• Fuel cells can power almost anything, from laptops to cars to homes.

• Just like gasoline and other fuels, hydrogen can be used safely.

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# Survey - National and State Standards

e. Electrical circuits provide a means of transferring electrical energy.

f. In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.

g. The sun is the major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths.

INTERMEDIATE STANDARD–E: SCIENCE AND TECHNOLOGY

2. Understandings about Science and Technology

a. Scientific inquiry and technological design have similarities and differences. Scientists propose explanations about the natural world, and engineers propose solutions relating to human problems, needs, and aspirations.

c. Technological solutions are temporary and have side effects. Technologies cost, carry risks, and have benefits.

f. Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Risk is part of living in a highly technological world. Reducing risk often results in new technology.




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# Progress/Results

- In 50% of the time estimated, the team created the middle school $H_2$ Educate learning module, designed one-day workshops and began delivery of teacher training.
- All partners have the same end goal:  Provide as many modules as possible to the middle school community.  To date, demand exceeds supply due to available resources.  NEED is working with other DOE hydrogen grant recipients to maximize impact of funding.
- In the NY pilot program, higher level fact sheets were created for the general public.

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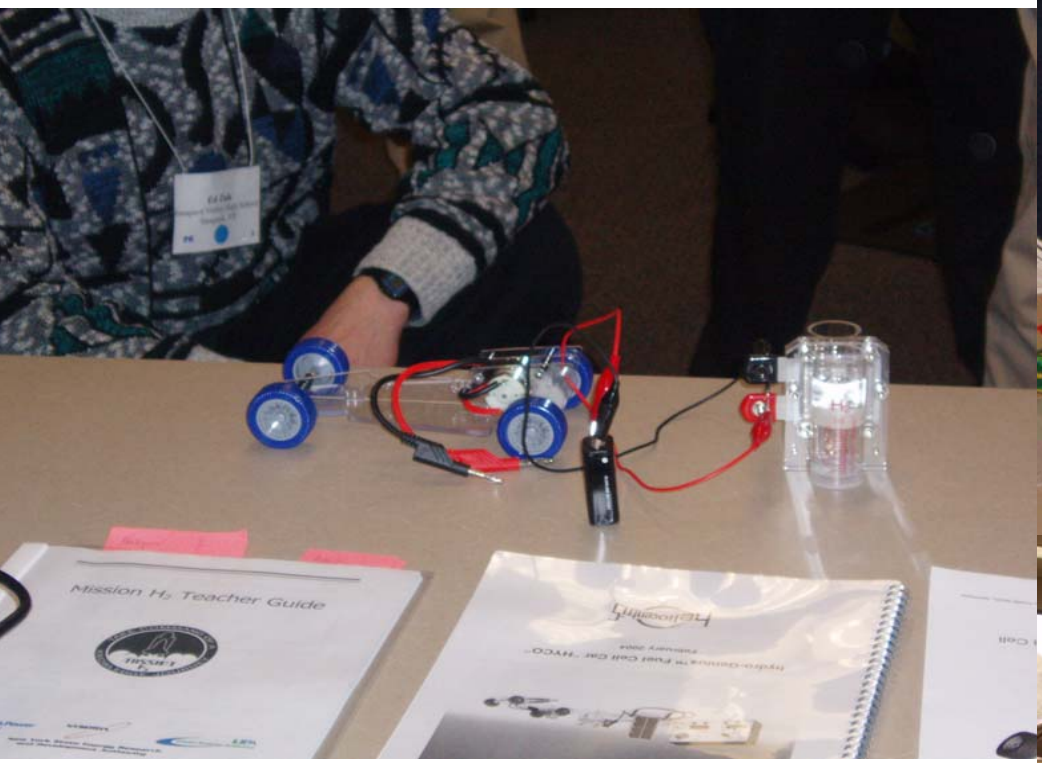
# $H_2$ Educate





## At work….

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# Measure Success

| CATEGORY | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| **Scientific Concepts** | Written explanation illustrates an accurate and thorough understanding of scientific concepts underlying the simulation. | Written explanation illustrates an accurate understanding of most scientific concepts underlying the simulation. | Written explanation illustrates a limited understanding of scientific concepts underlying the simulation. | Written explanation illustrates inaccurate understanding of scientific concepts underlying the simulation. |
| **Drawings/Diagrams** | Clear, accurate diagrams are included and make the simulation easier to understand. Diagrams are labeled neatly and accurately. | Diagrams are included and are labeled neatly and accurately. | Diagrams are included and are labeled. | Needed diagrams are missing OR are missing important labels. |
| **Summary** | Summary describes the skills learned, the information learned and some future applications to real life situations. | Summary describes the information learned and a possible application to a real life situation. | Summary describes the information learned. | No summary is written. |
| **Procedures** | Procedures are listed in clear steps. Each step is numbered and is a complete sentence. | Procedures are listed in a logical order, but steps are not numbered and/or are not in complete sentences. | Procedures are listed but are not in a logical order or are difficult to follow. | Procedures do not accurately list the steps of the experiment. |

- Gather data on school usage
- Collect quantitative and qualitative data to improve, re-assess, and expand programs
- Provide educators the assessment tools needed to review student performance
- Report reach of project
- Report anecdotal student responses to programs

# Challenges and Opportunities

- Demand too great for available resources
- Moving ahead in spite of zero budget for future programming
- A great deal of hydrogen “chatter” keeps educators from finding valuable resources

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# Forward Progress

## Since DOE approval, we have:

- Worked with other hydrogen partners to maximize reach of programs and materials – i.e. working with infrastructure grantees to provide educational resources.
- Continued incorporation of materials and programming into NEED's existing training initiatives.
- Annually updated materials with new data and provide major changes to educational community.
- Delivered maximum number of hands-on resources to classrooms leveraging resources to do so.
- Reached over 2,800 teachers.

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# Innovative Outreach

- Addition of hydrogen information and activities to the EIA Kid's Page www.eia.doe.gov/kids (350,000 users per month)
- $H_2$ Educate Teacher and Student Guides loaded to several web sites
- 6 workshops in New York State supported by NYSERDA
- Workshops at the National Science Teachers Association Conferences – Chicago, Nashville and Dallas (2005) and Anaheim 2006. Over 300 teachers trained.
- DOE/EIA Take Your Kid to Work Day – April 2005
- $150,000 of hydrogen education grant money given to California teachers as part of NEED's partnership with BP in the A+ for Energy Program.
- 1,200 teachers trained in July 2005 and expected 900 in July 2006.
- Workshops to be hosted in cooperation with Orange County Office of Education (CA) June 1 and with Lansing Community College (MI) (Sept. 06) – others scheduled for fall

# Have a Question or Want to Participate?

- Contact Mary Spruill at NEED at mspruill@need.org or 800-875-5029.

- Materials are available at www.need.org.