



U.S. DEPARTMENT OF  
**ENERGY**

# **Nuclear Hydrogen Initiative**

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## **2007 DOE Hydrogen Program Merit Review and Peer Evaluation Meeting**

**May 15, 2007**





# Outline

- Goal and Objectives
- Budget
- Challenges
- Progress
  - Accomplishments/Status
- Future Plans



# Goals and Objectives

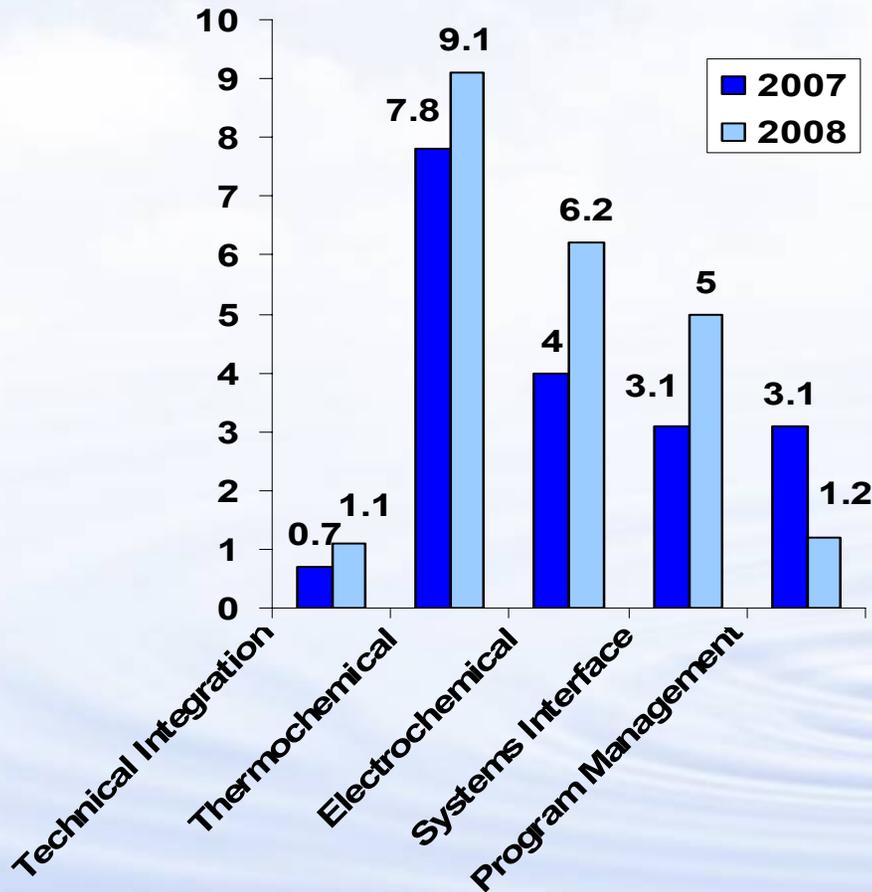
**Nuclear Hydrogen Initiative:** Develop hydrogen production technologies that are compatible with advanced nuclear energy systems and do not produce greenhouse gases.

- Operate laboratory-scale and pilot-scale experiments of thermochemical and high temperature electrolysis production technologies to demonstrate feasibility and scale-up
- Select hydrogen production technology to be coupled with the Next Generation Nuclear Plant (EPACT requirement)
- By 2019, demonstrate commercial-scale hydrogen production system for use with advanced nuclear reactors



# Budget

FY2007 Appropriation = \$18.7M  
FY2008 Budget Request = \$22.6M



- **Emphasis:** Research and development of high-temperature hydrogen production technologies for use with nuclear energy – Thermochemical Cycles and High-Temperature Electrolysis.

- **Budget Obligations:**

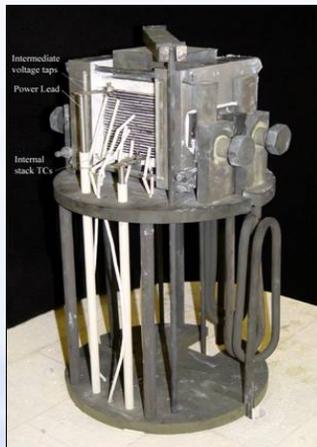
Fulfill current contracts	\$5.7M
R&D at National labs	\$16.2M
New starts	\$0.7M
Total	\$22.6M



# Challenges



- Need for high temperature resistant, corrosion resistant materials
- Need for advanced catalysts and membrane materials
- Water management
- Durable electrode materials and seals for electrolysis cells
- Selection of intermediate loop heat transport fluid





# Progress

## Thermochemical Cycles

Bayonet Design, Si-C,  
 $\text{H}_2\text{SO}_4$  Decomposer for  
Sulfur-Iodine Cycle,  
FY 2006 (SNL)



$\text{SO}_2$ -depolarized  
Electrolyzer for Hybrid  
Sulfur Cycle; 100-hr test  
scheduled for June 2007  
(SRNL)



$\text{H}_2\text{SO}_4$  Decomposition  
Skid for Sulfur-Iodine  
Integrated Lab-Scale  
Experiment  
(SNL, GA, French CEA)

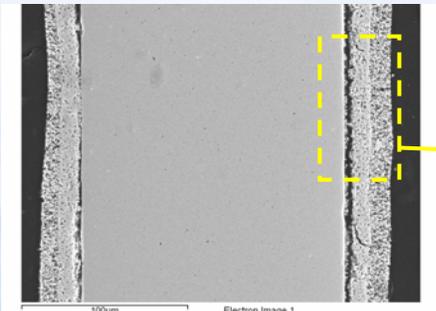


# Progress

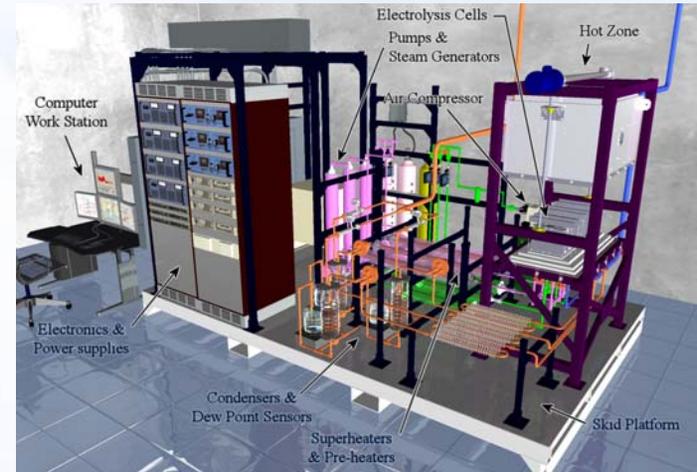
## High Temperature Electrolysis



2,000-hr test of 120-cell “half-module”  
September 2006 (INL / Ceramatec)



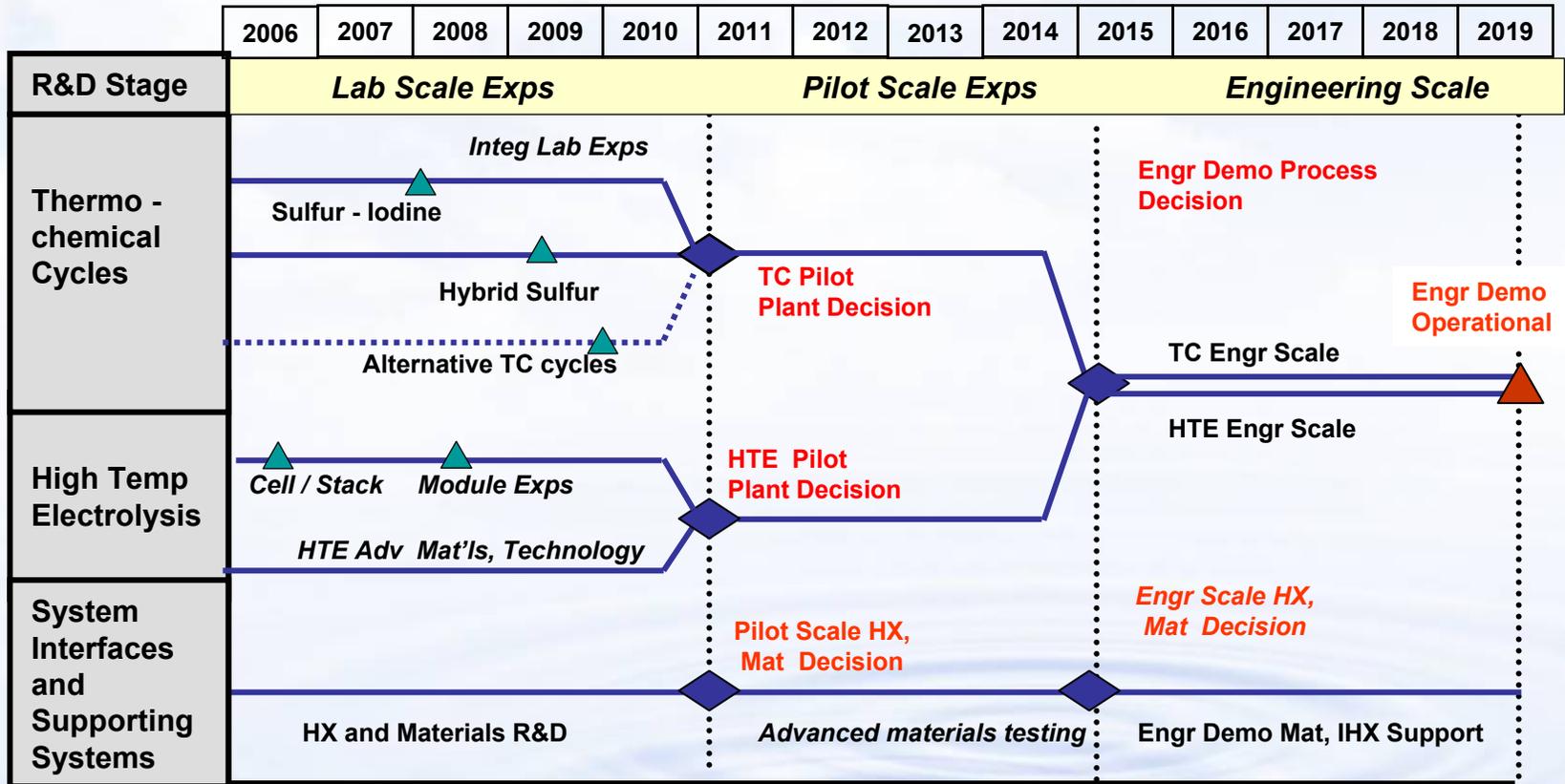
Post-test evaluation of electrodes (ANL)



Integrated Laboratory-Scale Experiment  
to start operation September 2007 (INL)



# Future Plans





# For More Information

## Nuclear Hydrogen Initiative

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The screenshot shows the homepage of the DOE Hydrogen Program website. The header includes the U.S. Department of Energy logo and the text "hydrogen.energy.gov". A navigation menu lists: Home, About, DOE Participants, International, Library, and News/Events. A search bar is located in the top right. The main content area is divided into several sections:

- Left Sidebar:** A list of categories with expandable arrows: Hydrogen Production, Hydrogen Delivery, Hydrogen Storage, Hydrogen Manufacturing, Conversion/Fuel Cells, Applications/Technology Validation, Safety, Codes & Standards, Education, Basic Research, Systems Analysis, and Systems Integration.
- Top Center:** "INCREASE YOUR H<sub>2</sub>IQ" and "Announcement Peer Evaluation Report Focuses on Merit of DOE Hydrogen and Fuel Cell Projects".
- Right Side:** "DOE Hydrogen Program" logo, "Features" section, "President's Hydrogen Fuel Initiative" with a photo of a man, "ADVANCED ENERGY INITIATIVE" logo, "Hydrogen.gov" logo, and "FreedomCAR Fuel Partnership" logo.
- Bottom Center:** "DOE Announces Hydrogen Funding Opportunity for Small Businesses" (dated September 27, 2006) and "DOE Loan Guarantee Program Promotes Innovative Technologies" (dated August 23, 2006).

Look under "Hydrogen Production" at:

[www.hydrogen.energy.gov](http://www.hydrogen.energy.gov)

