DEVELOPING IMPROVED MATERIALS TO SUPPORT THE HYDROGEN ECONOMY

Edison Materials Technology Center

May 23-26, 2005

Project ID# PDP57

This presentation does not contain any proprietary or confidential information

Objectives

Edison Materials Technology Center (**EMTEC**) will use, “Hydrogen, Fuel Cells & Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan” goals to find and fund projects with near term manufacturing based commercialization potential

Feasibility projects with job creation potential

Cross cutting breakthrough materials technology

Will use EMTEC Core Technology (CT) model

Target Technologies

- Hydrogen Generation
  - Renewable liquid feedstock
  - Natural gas, water electrolysis
  - Photoelectrochemical
  - Separation Materials
  - Biomass, Coal et.al.
- Hydrogen Storage
  - Cross cutting novel approaches
- Hydrogen Processing
  - Sensors, delivery, purification

EMTEC

- EMTEC is one of 7 State of Ohio Edison Centers
  - Established in 1987 by Ohio Gov. Celeste
  - 501c(3) Not for Profit
- Membership Based with Over 100 Industry, plus University, and Government Members
- Virtual – We Own no Major Capital Equipment
- Access to Over $2B in State-Of-The-Art Facilities
- Significant Experience in Ceramics, Metals, Polymers, and many Material Processes

Budget

- Total Funding: $12 Million +
  - DoE share ~ $ 6 Million
  - Contractor cost share > $5 million
  - State of Ohio: > $1 Million cost share
- FY04: $2.945 Million
- FY05: $2.961 Million

Approach

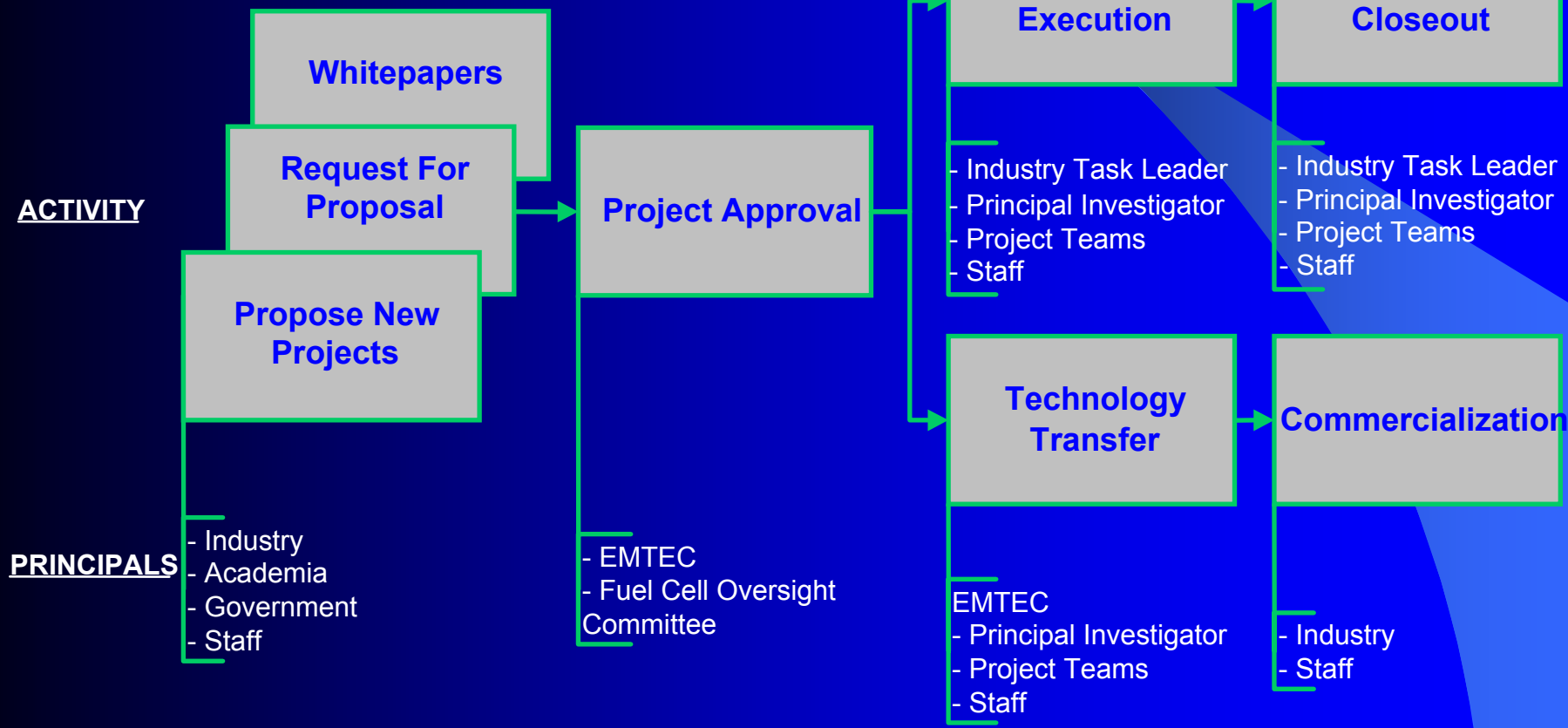
EMTEC will solicit and evaluate projects:

- Clear Project Definition
- Industry Relevance
- Appropriate Resource Level
- EERE Hydrogen Goal Alignment
- Commercialization Viability

EMTEC has extensive experience managing technology projects

EMTEC has developed a business model for selection and management of core technology

EMTEC Proposal Flow Chart



FY04 Project Timeline

Stage 1 – FY04
Solicit & Select projects with EMTEC RFP
Complete FY04 DOE project application

Stage 2 – FY04
Award phase I projects & solicit additional projects AR
Monitor projects and Go/NoGo milestones

Stage 3 – FY04
Down select projects based on phase I performance
Select phase II projects based on commercialization potential

Stage 4 – FY05
Initiate FY05 with new project solicitation & selection

Interactions and Collaborations

- State of Ohio – Department of Development – Technology Division
- State of Ohio – Department of Development – Third Frontier
- USAF – AFRL Technology Transfer program
- Procurement Technical Assistance Center (PTAC)
- Manufacturing Small Business Development Center (MSBDC)
- Material Technology Liaison at AFRL
- Technical Steering Committee (TSC)

Accomplishments/Progress

- Two rounds of proposal requests (2 RFP's)
- > 50 Proposals reviewed
- > 20 Site visits performed
- 13 Projects negotiated
- 7 Projects funded

Nanocatalyst Development Employing Electrically Mediated Processing for Hydrogen Generation - FARADAY

- Total program award value of $360,287
- A low-cost, mass production fabrication technology for catalyzation of membrane electrode assemblies (MEA) for PEM (Proton Exchange Membrane) electrolyzers and regenerative fuel cells
- Program will enable high cost electrode catalysts to be used more efficiently, reducing cost of MEAs

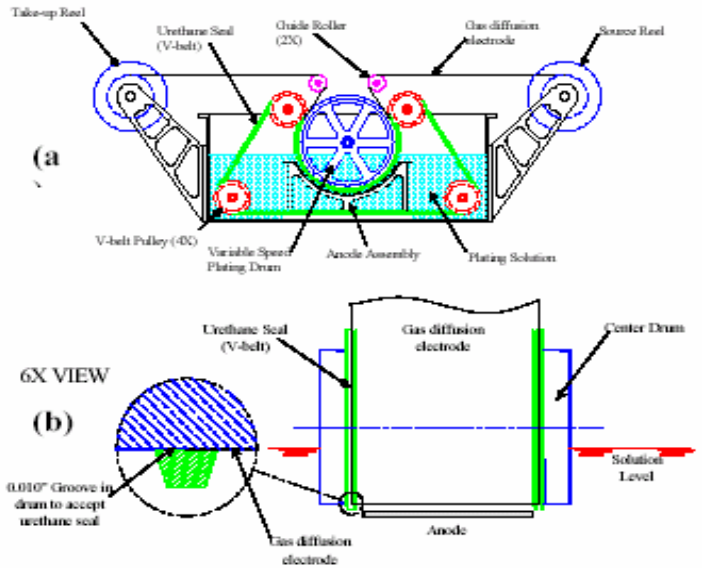


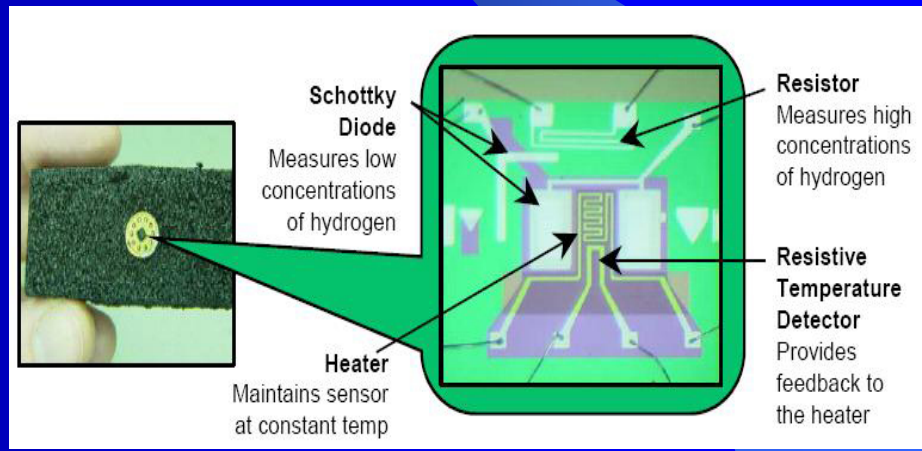
Figure 1: (a) cross-sectional view of the entire reel-to-reel apparatus for electrodeposition of platinum onto a gas diffusion electrode; (b) close up of the gas diffusion electrode on the drum, and urethane seal.

Novel Spiral Stackable Reactor (SSR) for Low-cost Hydrogen Production - CATACEL

- Total program award value of $234,352
- Novel Spiral Stackable Reactor (SSR) for low-cost stationary hydrogen production
- Intended to be a drop-in replacement for the loose ceramic catalyst media in the stationary steam reforming process

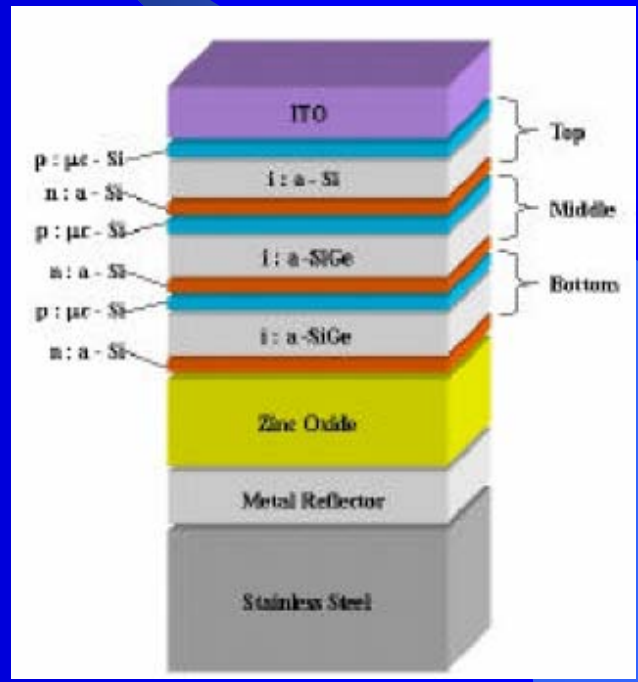
Low Cost MEMS Hydrogen Sensor for Transportation Safety - MAKEL

- Total program award value of $260,727
- Advanced hydrogen sensor system for hydrogen powered transportation applications
- Provides the means for low cost, compact, low power consumption, and miniaturized systems suitable for mass production



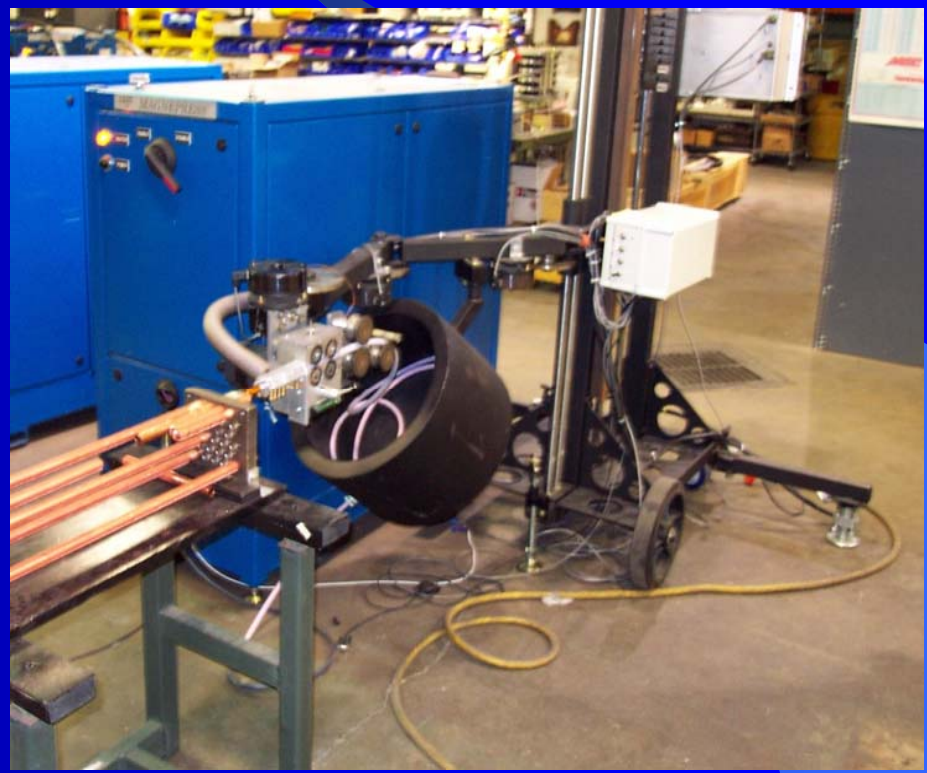
Development of Improved Materials for Integrated Photovoltaic - Electrolysis Hydrogen Generation Systems - MWOE

- Total program award value of $674,875
- Small scale manufacturing process for its integrated photovoltaic electrolysis (IPE) panel
  - This technology produces hydrogen from water using sunlight
- Collaborators on project include the University of Toledo, Energy Photovoltaic, Inc, and National Renewable Energy Laboratory



Commercialization of EM Solid State Welding for High Pressure Hydrogen Storage - IAP

- Total program award value of $324,769
- Electromagnetic (EM) solid state welding process
- Process will meet the requirements for future hydrogen storage applications



Future Work

- Continue to monitor, manage and complete as scheduled and budgeted FY04 initiated projects
- Solicit additional projects with near term manufacturing based commercialization potential with an updated RFP
- WATCH for RFP: ~ August, 2005

Conclusion

EMTEC will have an ongoing award winning program with active DOE Hydrogen, Fuel Cells & Infrastructure Technologies Program advocacy

Project Safety

EMTEC will require that project proposals for hydrogen-related technology include a preliminary safety plan.

All funded projects must complete a safety plan and report as part of the project.