

# Metal Hydride Center of Excellence



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**Project ID# STP 11**

This presentation does not contain any proprietary information



# New MHCoe Project Structure

**DOE**

## **Coordinating Council (2006)**

**Greg Olson (HRL), Craig Jensen (UH), Lennie Klebanoff (SNL), Jay Keller (SNL)  
Jim Wegrzyn (BNL), Ian Robertson (UIUC), Bruce Clemens (Stanford)**

### **Project Groups**

**A**

#### **Destabilized Hydrides**

- **HRL(POC)**
- Caltech
- JPL
- Stanford
- U. Hawaii
- U. Pitt/CMU
- UIUC
- U. Utah
- Intematix
- NIST

**B**

#### **Complex Anionic Materials**

- **SNL(POC)**
- GE
- U. Hawaii
- UIUC
- JPL
- ORNL
- NIST
- Intematix
- UNR

**C**

#### **Amides/ Imides (M-N-H)**

- **SNL(POC)**
- GE
- U. Utah
- UNR
- ORNL
- U. Hawaii
- JPL

**D**

#### **Alanes (AlH<sub>3</sub>)**

- **BNL(POC)**
- SRNL
- JPL
- U. Hawaii
- SNL

**E**

#### **Engineering Analysis & Design**

- **SRNL(POC)**
- SNL
- NIST
- JPL
- GE

# Project A – Destabilized Hydrides

Develop strategies for reducing H<sub>2</sub> storage thermal requirements, improve kinetics

Technical Approaches:

## ***Alter Thermodynamics by Hydride Destabilization:***

- Reduce energy needed to liberate H<sub>2</sub> by forming dehydrogenated alloy, thereby reducing desorption temperature.

## ***Enhance Kinetics by Nanoengineering:***

- Minimize required H diffusion distance by using scaffolds, decreasing particle size

See talk by: Greg Olson, HRL

# Project B - Complex Anionic Materials

Predict, synthesize and evaluate promising new complex hydride materials

## Technical Approach:

- **Develop efficient Monte Carlo method to assess energetics of starting compounds, intermediate species, and end products.**
- **Guided by theory, discover candidate metal hydrides by high-hydrogen pressure sintering, measure hydrogen sorption properties**
- **Work initially with a known compound to develop strategy ( $K_2LiAlH_6$ )**

# Project C - Amides/Imides

Objective: Assess viability of amides, imides for on-board H<sub>2</sub> storage.

## Technical Approach:

- Reduce thermal requirements of amides by alloying
- Examine chemical pathways, side reactions, new synthetic routes
- Determine initial engineering issues (thermal cycling, expansion)

# Project D - Alane (AlH<sub>3</sub>)

Objective: Understand desorption and regeneration properties of alane for H<sub>2</sub> storage



Technical Approach:

- Examine prospects for regeneration from Al + H<sub>2</sub>
- Synthesize AlH<sub>3</sub> polymorphs
- Evaluate thermodynamic/kinetic properties of different alane phases
- Measure crystallographic structure of different phases

See talk by: Jason Graetz, BNL

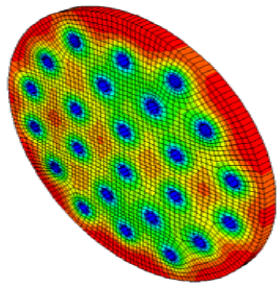
# Project E - Engineering Analysis, Design & Test

Objective: Provide engineering, analysis and design supporting DOE system performance goals

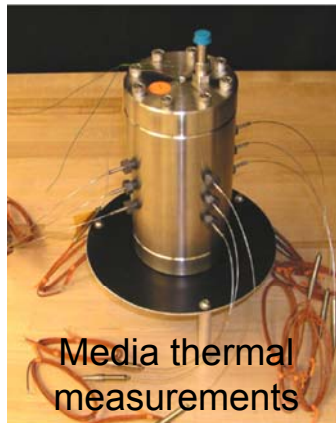
## Technical Approach:

- **Develop engineering system-level storage models**
- **Use engineering models to provide targeted materials properties**
- **Perform thermal modeling of candidate hydride materials**
- **Conduct expansion, stress measurements of promising materials**
- **Determine heat transfer properties of new hydrides**

See poster by: SRNL

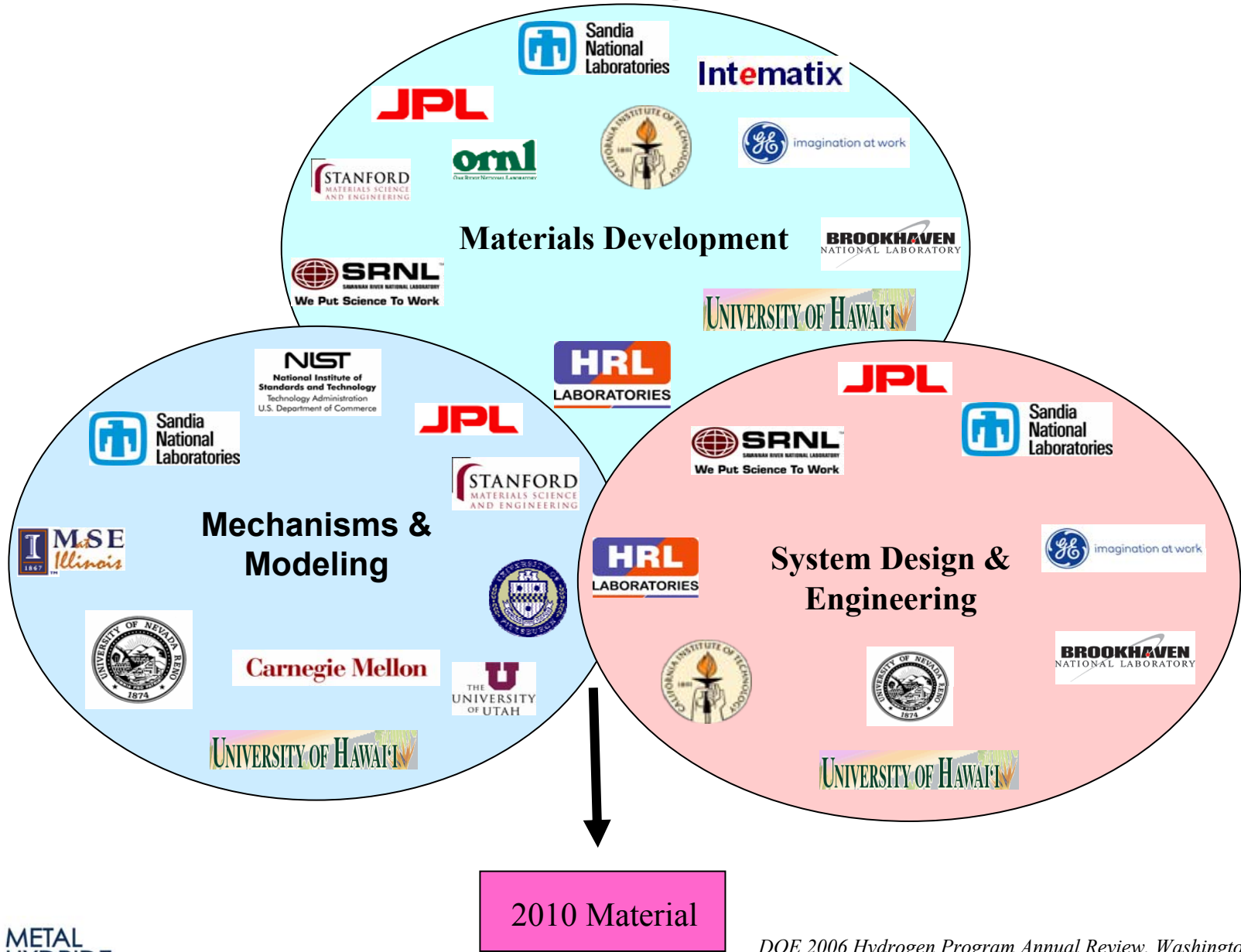


Thermal Modeling



Media thermal measurements

# Collaboration is Key to MHCoe

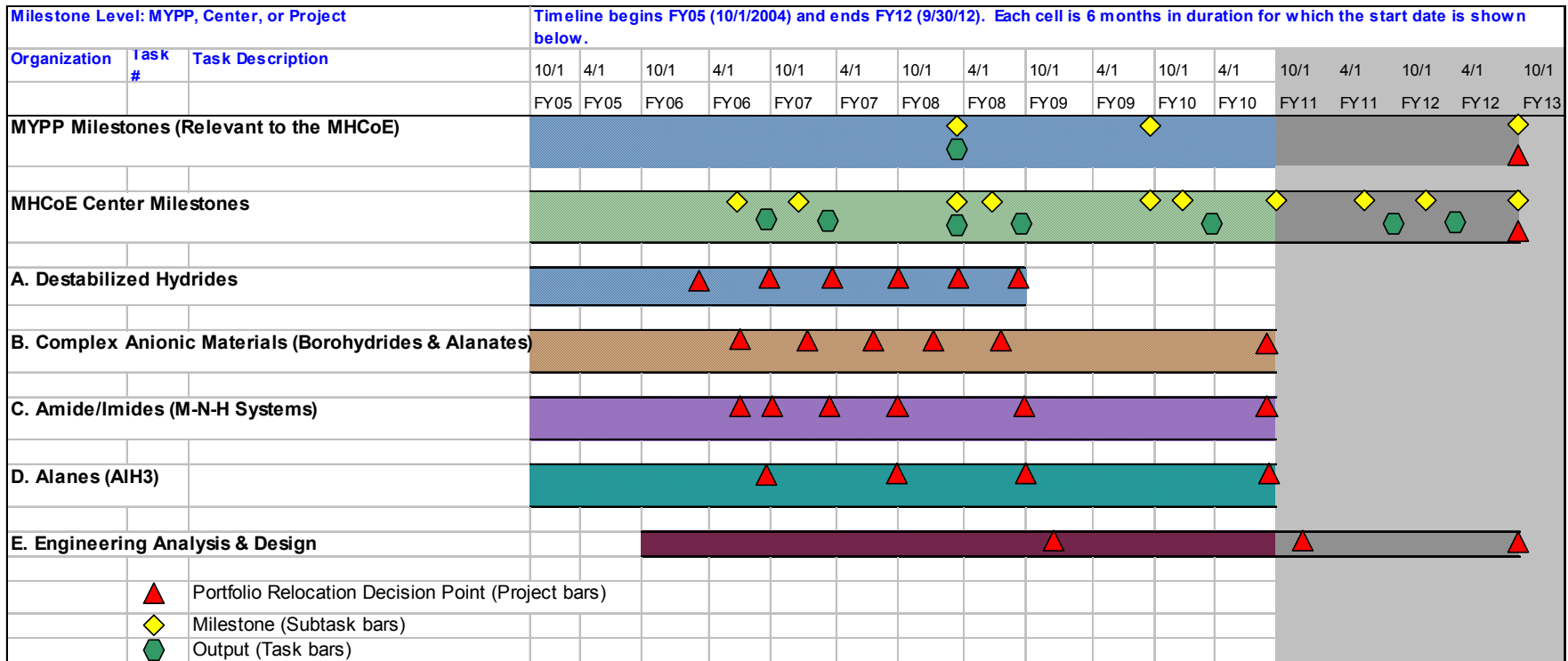




# Project Groups Milestone Chart

**Milestone Chart has been implemented Center-wide:**

- Progress checked against milestones quarterly
- Chart aids planning, tracks technical risk
- Rolls up to MYRDDP Milestones



# Greater Detail Available for Projects A-E

