Metal Hydride Center of Excellence

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Project ID# STP 11

This presentation does not contain any proprietary information

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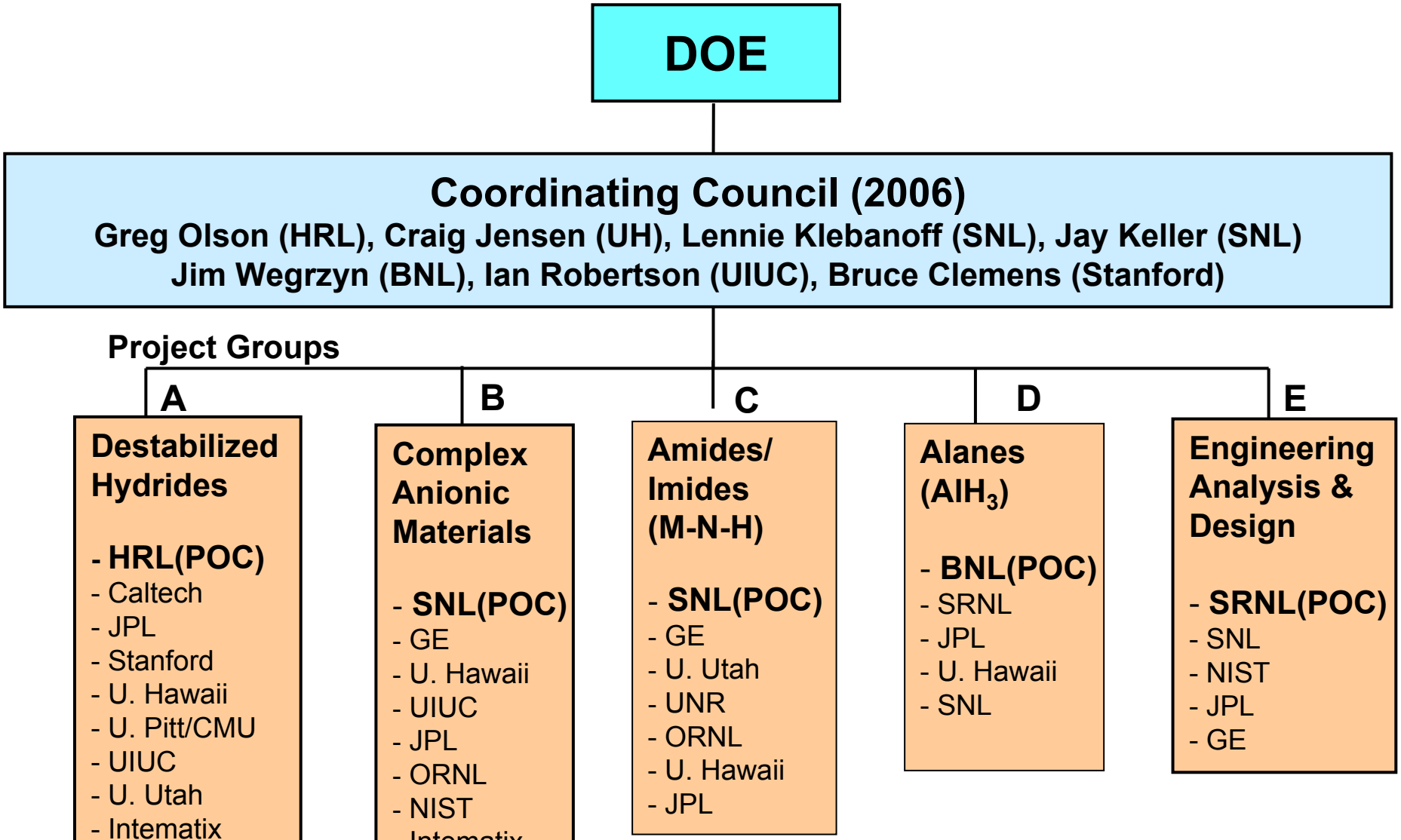
New MHCoE Project Structure



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Project A – Destabilized Hydrides

Develop strategies for
reducing H_2 storage thermal requirements,
improve kinetics

Technical Approaches:

Alter Thermodynamics by Hydride Destabilization:

- **Reduce energy needed to liberate H_2 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

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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_2 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_3)

Objective: Understand desorption and regeneration properties of alane for H_2 storage

α-$AlH_3 \longrightarrow Al + 3/2\ H_2$ **H-capacity (g) = 10.1 wt%**

Technical Approach:

- **Examine prospects for regeneration from Al + H_2**
- **Synthesize AlH_3 polymorphs**
- **Evaluate thermodynamic/kinetic properties of different alane phases**
- **Measure crystallographic structure of different phases**

See talk by: Jason Graetz, BNL

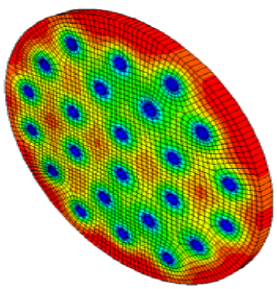
Project E - Engineering Analysis, Design & Test

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

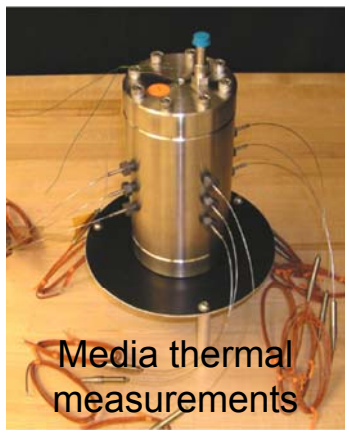
Technical Approach:

- **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

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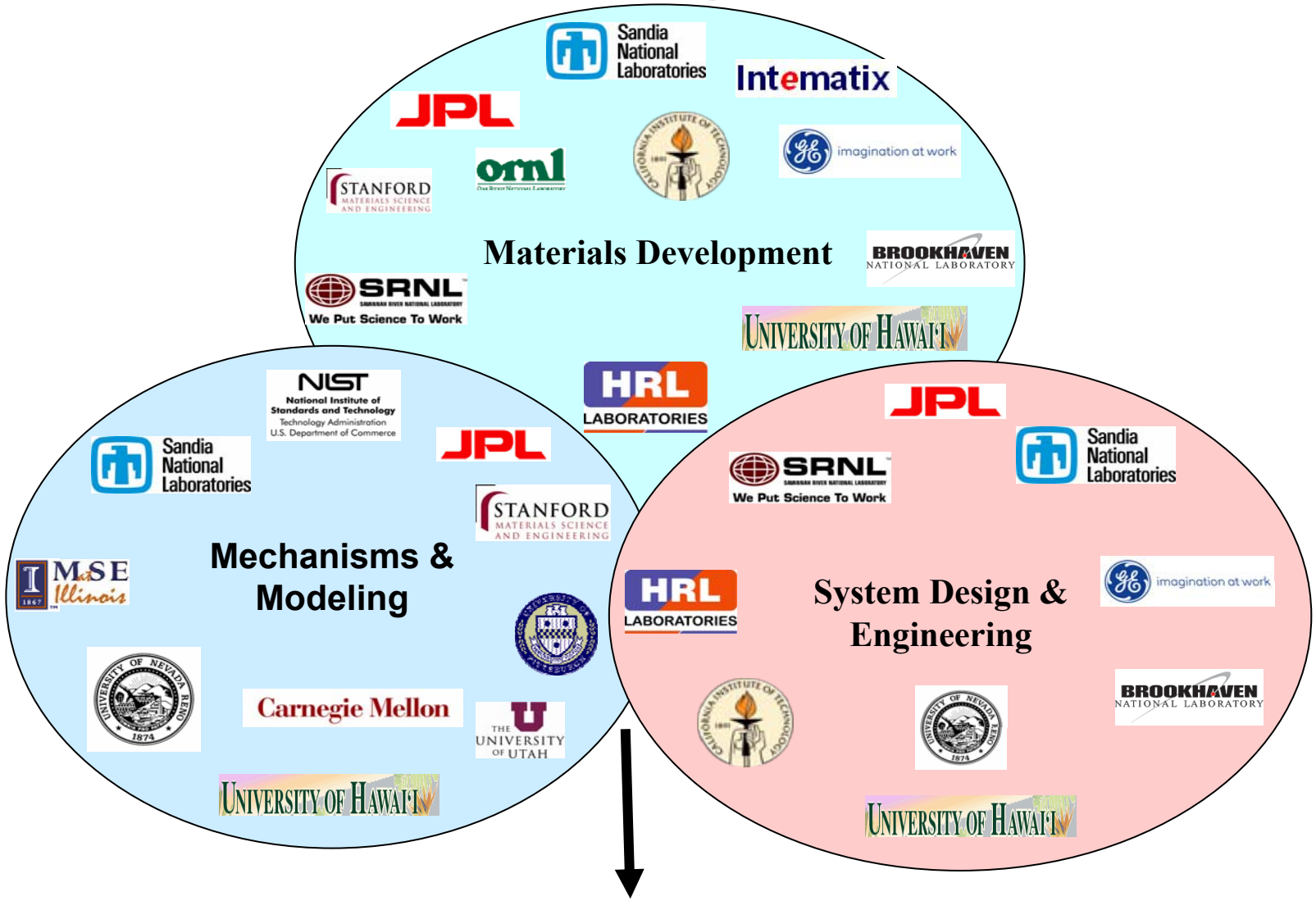
Collaboration is Key to MHCoE



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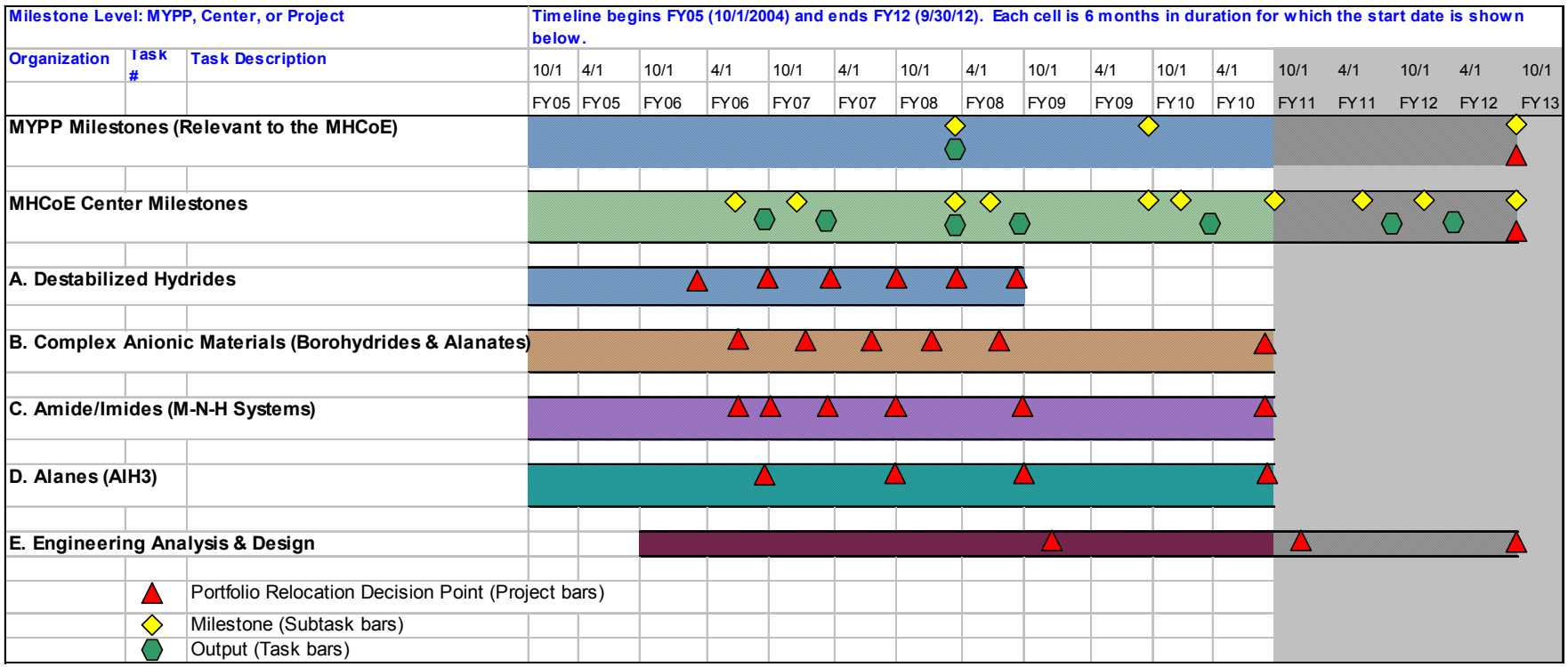
Project Groups Milestone Chart

Milestone Chart has been implemented Center-wide:

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



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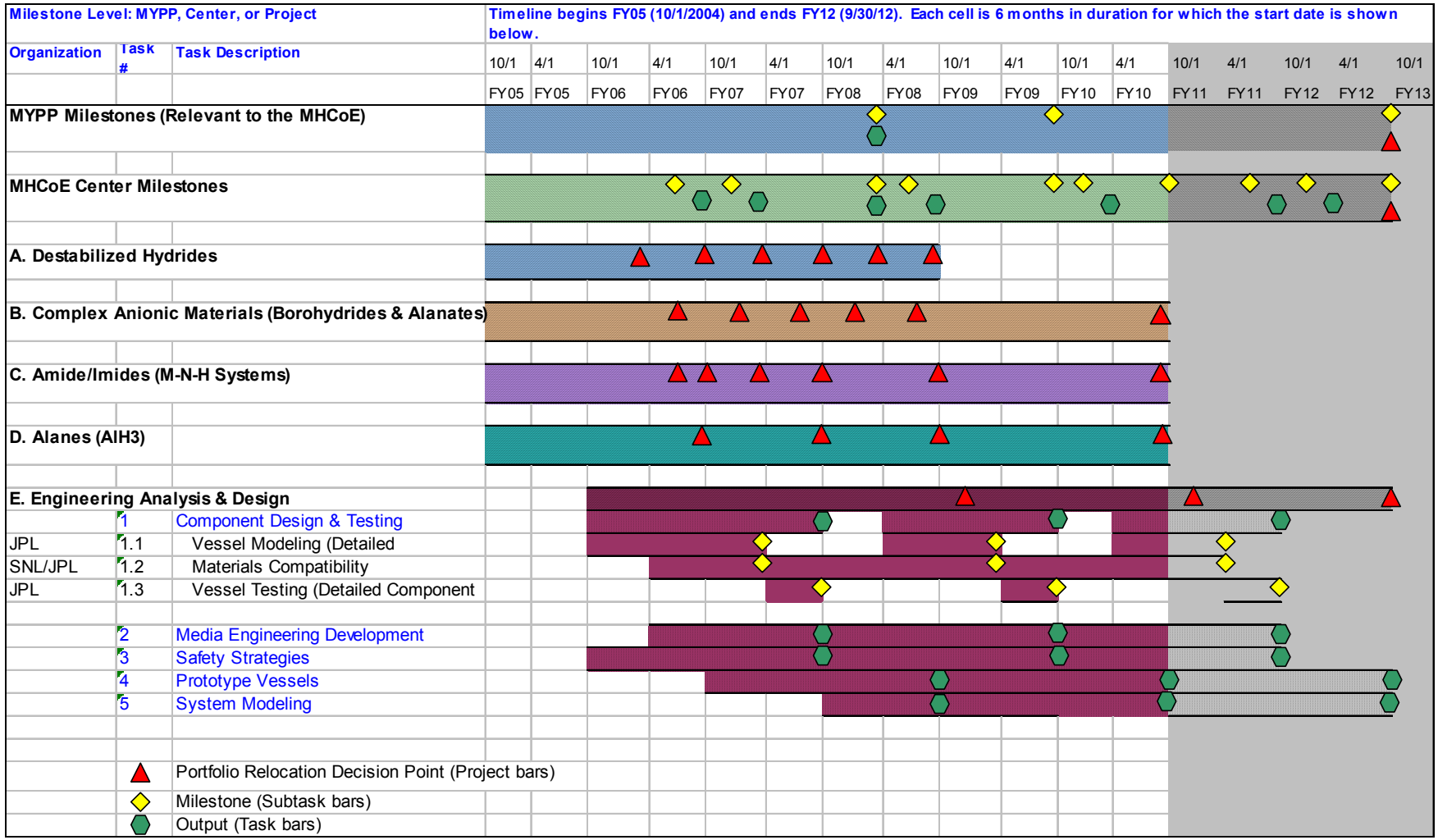
Greater Detail Available for Projects A-E



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