extremEmat

NETL-Led National Laboratory Consortium to Accelerate the Development of Extreme Environment Materials

NATIONAL ENERGY TECHNOLOGY LABORATORY

OAK RIDGE National Laboratory · Lawrence Livermore National Laboratory · The Ames Laboratory · Pacific Northwest National Laboratory · Los Alamos National Laboratory · INL Idaho National Laboratory

OBJECTIVE

Develop the next generation of toolsets needed to accelerate the development of materials to improve the existing fleet and enable next generation fossil energy systems.

CONSORTIUM APPROACH

- Integrate the extensive computational materials modeling, data analytics, manufacturing, testing, and materials characterization capabilities resident within the National Laboratory complex in order to **develop** and **demonstrate** a framework to accelerate materials development.

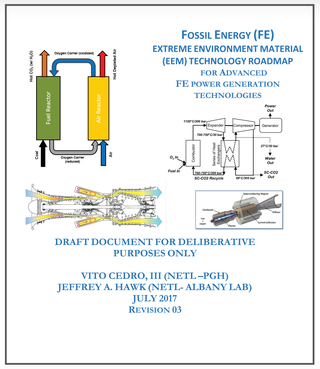
PROJECT SPECIFIC OBJECTIVES

- Create the next generation of **cross-cutting computational and experimental toolsets** focused on **accelerating discovery and scale-up** for reliably **manufacturing materials** at scale.
- Demonstrate application of toolset by **developing a new alloy** with either 50°F or 25% **increase in strength.**

ACCOMPLISHMENTS

EXTREME ENVIRONMENT ROADMAP DEVELOPED

NETL completed the Extreme Environment Materials (EEM) Technology Roadmap for Fossil Energy Application. The Consortium began to address research needs identified in the EEM Roadmap in the last quarter of 2017.

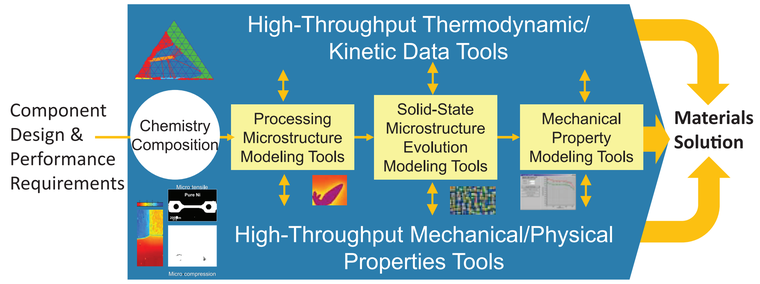


IMPORTANCE

AFFORDABLE AND DURABLE MATERIALS ARE A KEY ENABLING TECHNOLOGY THAT CROSS-CUTS FOSSIL ENERGY PLATFORMS AND SYSTEMS.

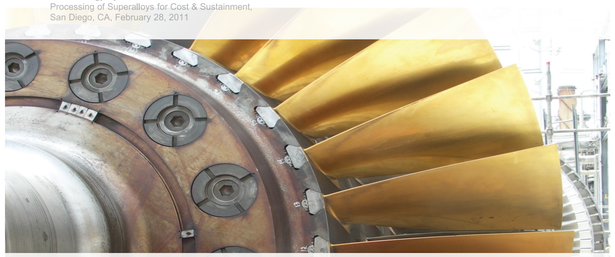
Reducing the Materials Design Cycle

Physics-based modeling tools
High-throughput screening tools
+ Data Analytics → Materials Solution



- Achieve Cost/Time Reduction
- Predict Materials Service Performance & Manage Part Life
- ***Goal: 2x to 4x Reduction in Time to Insert a New Material***

Image afer: Hawk & Jiang, Modeling & Simulation in Fossil Energy Systems, Advances In Science-Based Processing of Superalloys for Cost & Sustainment, San Diego, CA. February 28, 2011



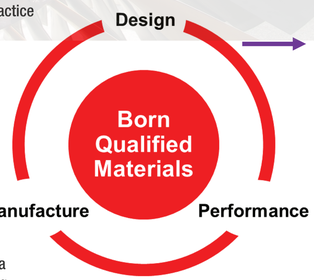
DOE-FE/NETL Vision

"Born Qualified" EEMs

Atoms to Metals
ICME multi-scale computational approaches incorporating best practice manufacturing and focused performance evaluation and characterization

Targeted Validation Experiments
Conducted in industrial relevant environments and scales

Data Informatics and Analytics
- Analyze the large volume of data generated from materials testing
- Incorporate learning to improve predictive capability of simulations and reduce uncertainty



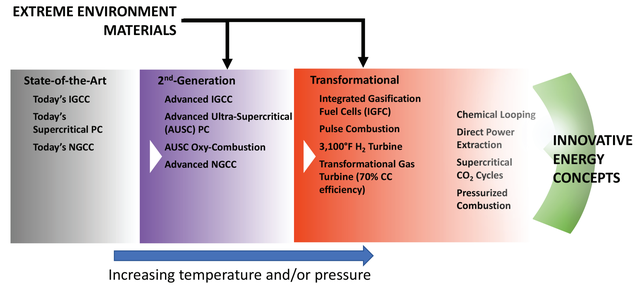
Validated simulations linking structure, processing, and performance

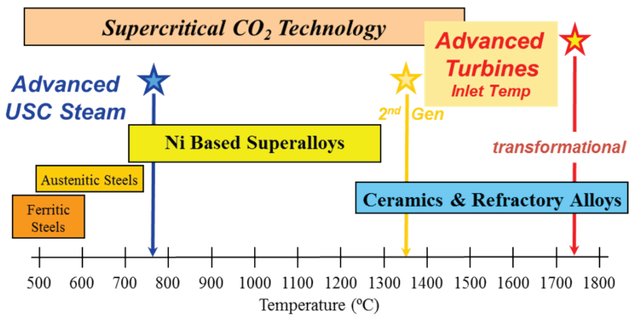
Accelerate the identification and deployment of **cost-effective materials** by 2x for extreme environment applications

FY 2017 BUDGET – ALL PARTNERS

$764,000

CONTACT INFORMATION
Technology Manager – Briggs White
Principal Investigator – Jeff Hawk
HQ Program Manager – Regis Conrad





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