

# PROGRAM facts

U.S. DEPARTMENT OF ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY

Power Systems  
Advanced Research

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## ALBANY RESEARCH CENTER

### Advanced Metallurgical Processes

Albany Research Center, in conjunction with the National Energy Technology Laboratory's AR-Power program, is conducting research on advanced metallurgical processes. The research focuses on extending component service lifetimes through improving and protecting current materials, by designing new materials, and by defining the service operating conditions for new materials in order to ensure their safe and effective use. Emphasis is placed on high-temperature materials testing, development, and modeling in environments anticipated for Vision 21 type systems. In addition, research addresses long-term environmental emission and waste challenges in the ability to continue utilizing fossil fuels as major sources of energy.

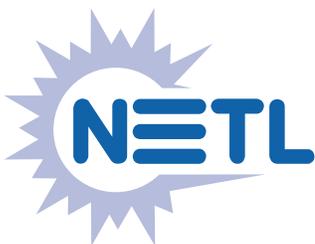
### Projects

#### 1. Advanced Refractory Technologies

Both short-range industrial needs and long-range issues in gasifiers have driven the emphasis of this high temperature material research. Program emphasis is on identifying material failure mechanisms, extending the lifetime of primary refractory liners in slagging gasifier systems, developing ways to shorten system downtime caused by refractory maintenance, and developing improved thermocouples/temperature monitoring techniques

#### 2. Advanced Casting Technologies

Advanced Casting Technologies research is focused on developing TiC reinforced iron and steel castings. Applications include extreme abrasive wear conditions for use in coal crushing and grinding operations. Modified cast austenitic stainless steels are being developed with performance characteristics necessary for process streams in advanced heat recovery and hot gas cleanup systems employed with advanced power generation systems (IGCC, PFBC and IGFC).



# ALBANY RESEARCH CENTER

## PROJECT MANAGERS

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### Advanced Titanium Processing

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### Service Life Prediction

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### Mineral Carbonation

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### 3. Advanced Foil Lamination Technology

The Albany Research Center, in collaboration with the Oregon State University and Zess Technologies (Portland, OR), has developed compact micro-channelled heat exchangers via foil lamination technology. Complex passages, machined into foils and bonded together, result in a device consisting of an intricate design of internal channels to enhance heat transfer.

### 4. Advanced Titanium Processing

Nearly 50% of the cost of titanium can be attributed to fabrication. The goal of this project is to develop a continuous and lower cost process to prepare commercially pure titanium and titanium alloys in a variety of shapes including slab, plate, and billet to reduce costs, increase the usage of titanium, and lead to environmental benefits and energy savings.

### 5. Service Life Prediction

Abrasion and erosion are significant materials-related problems in the operation of fossil energy plants. The Service Life Prediction research focuses on developing an understanding of how materials behave as a result of particle impact and examining non-isothermal oxidation and hot corrosion.

### 6. Mineral Carbonation

This project is part of the Mineral Carbonation Study Program, a collaborative research effort with participants from the Albany Research Center, Arizona State University, the National Energy Technology Laboratory, and Los Alamos National Laboratory. The process, developed at the Albany Research Center, utilizes a slurry of water mixed with a Ca/Mg silicate mineral, which is reacted with supercritical CO<sub>2</sub> (above 31°C and 73 atm partial pressure of CO<sub>2</sub>) to produce magnesite (MgCO<sub>3</sub>).

