

Innovations in Manufacturing and Energy

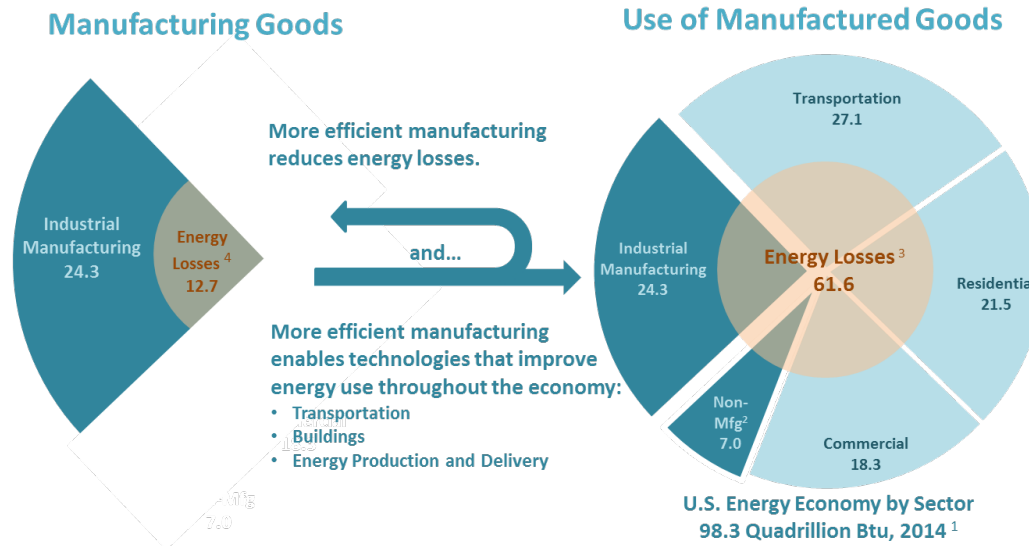
An Introduction to the Advanced Manufacturing Office: Partnerships, Projects, and Consortia

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Energy Dominance = Manufacturing Dominance

Manufacturing represents \$2 trillion in U.S. GDP and 12.4 million Direct Employment Jobs, as well as 25% of U.S. energy consumption



Technology Innovation through Early Stage R&D in Advanced Manufacturing and Energy is a Foundation for Economic Growth and Jobs in the US

AMO Vision and Mission

Vision: U.S. global leadership in sustainable and efficient manufacturing for a growing and competitive economy.

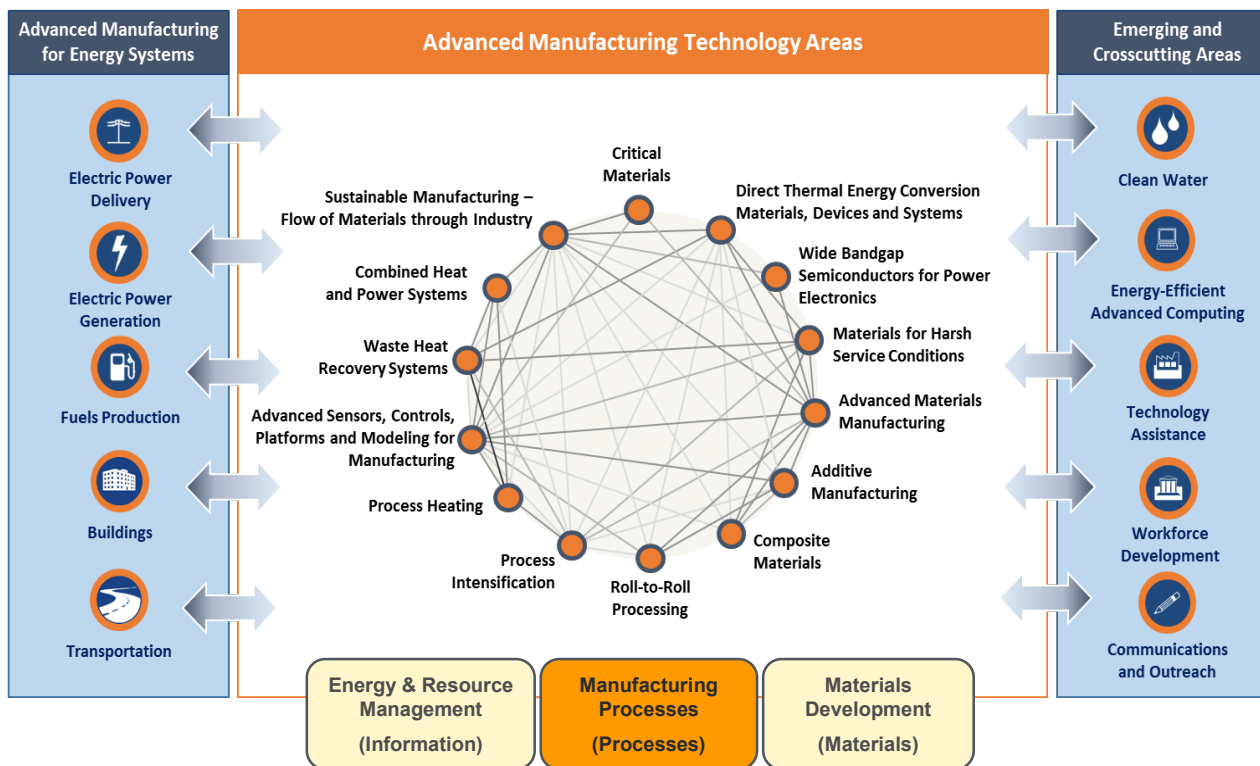
Mission: Catalyze research, development and adoption of energy-related advanced manufacturing technologies and practices to drive U.S. economic competitiveness and energy productivity.



Multi-Year Program Plan:

- Describes the Office mission, vision, and goals
- Identifies the technology, outreach, and crosscutting activities the Office plans to focus on over the next five years.

QTR and Multiyear Program Plan (Draft) Framework



Research & Development Framework



Focus on Early Stage Applied Research and Development

Technology Areas with Knowledge Gaps Applicable to Manufacturing and Energy

Merit-based R&D at National Laboratories, Universities, Companies (for profit and not for profit) and Consortia

Partner with Private Sector to Identify Technical Knowledge Gaps and Transfer Learning for Subsequent Adoption

Technical Partnerships

Technical Partnerships Programs

Efficient On-Site Energy

CHP Technical Assistance Partnerships



Energy-Saving Partnership



Better Buildings, Better Plants,
Industrial Strategic Energy Management



Student Training & Energy Assessments

University-based Industrial Assessment Centers



R&D Projects

Brings the many benefits of high-performance computing to US Industry

- Completed 4 rounds of awards
 - \$15M in total funding
 - 47 public-private projects
 - Participation from 7 National Labs
 - Other DOE offices involved
- Round 5 solicitation (Winter 2018) now open
 - \$3M total available for awards
 - Overcoming impactful manufacturing process challenges
 - Reducing energy consumption through improved clean energy technology design



8 RIVERS



TIMKEN



LanzaTech



Carbon



R&D Projects: Lab-Embedded Entrepreneurship Programs

1. Cyclotron Road @ Lawrence Berkeley

- Launched mid-2014
- Partnership with Activation Energy, Sept 2016
- Cohort 4 onboarding in progress

The logo for Cyclotron Road, featuring the text "cyclotronroad" in a lowercase, sans-serif font.

2. Chain Reaction Innovations @ Argonne

- Launched mid-2016
- Partnership with Polsky/Purdue
- Cohort 2 onboarding in progress



3. Innovation Crossroads @ Oak Ridge

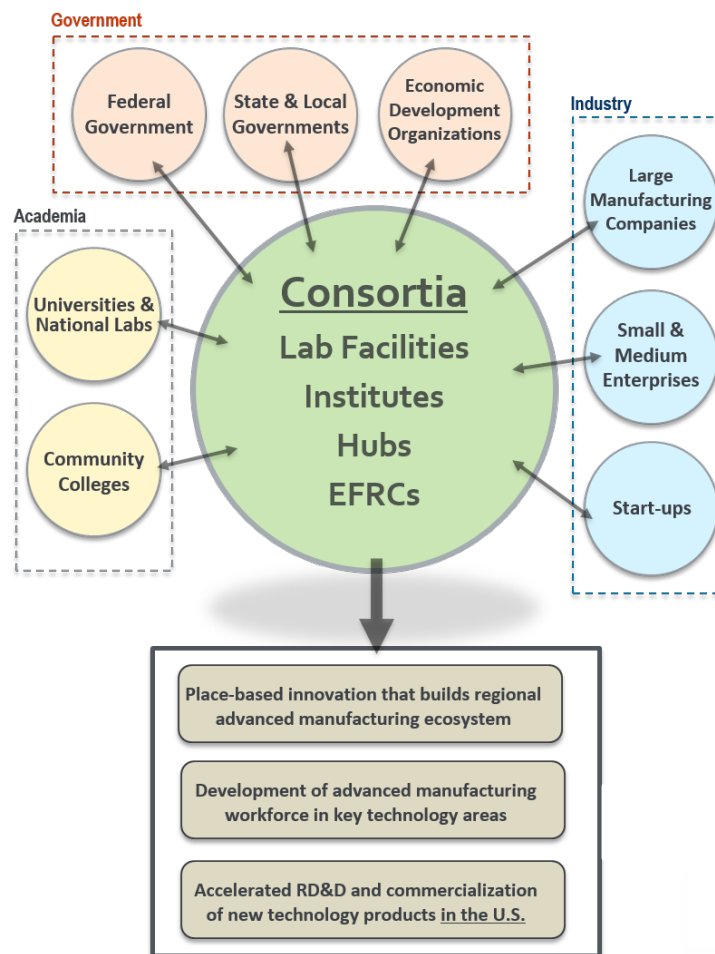
- Launched mid-2016
- Partnership with LaunchTN
- Cohort 2 onboarding in progress



R&D Consortia

AMO Consortia:

- **Critical and Rare Earth materials**
- **Wide band gap semiconductors**
- **Carbon fiber composites**
- **Smart Manufacturing**
- **Process Intensification**
- **Remanufacturing and Reprocessing**
- **(Soon) Clean Water Production**



R&D Consortia: Manufacturing USA Institutes



RAPID – Modular Chemical Process Intensification



Enabling development of breakthrough technologies to boost energy productivity and energy efficiency in domestic chemical manufacturing.

Technical Focus Areas:

- Chemical & Commodity Processing
- Natural Gas Upgrading
- Renewable Bioproducts
- Modeling and Simulation
- Intensified Process Fundamentals
- Module Manufacturing



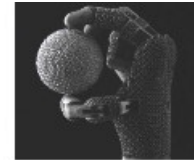
Manufacturing Demonstration Facility



R&D Goals

- Improved Performance Characteristics of AM Components Through Materials-Process Development
- Qualification and Certification Framework for AM Components
- AM Systems Optimized to Achieve Mainstream Manufacturing
- Comprehensive Understanding of AM Process Capabilities and Limits Through Physics-Based Simulation and Advanced Characterization

Electron Beam Melting



Binder Jetting



Laser Sintering

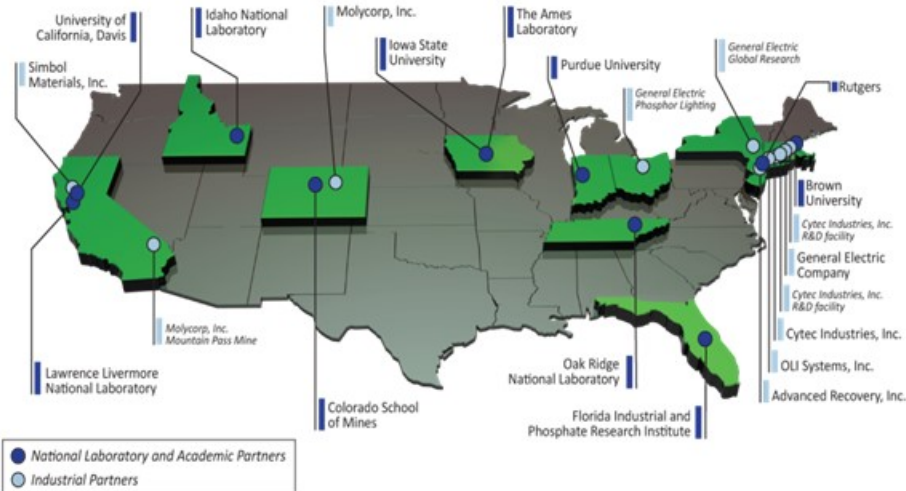


Polymer Deposition



Critical Materials Institute

Eliminate materials criticality as an impediment to the commercialization of clean energy technologies for today and tomorrow.



- Focused on advancing cost-effective separation, processing, and substitution of critical materials, to support U.S.-based supply chains for high-value add technologies that rely on these materials (magnets, aerospace components, lasers, etc.).
- In its first 4 years the CMI has filed 70+ invention disclosures, filed 35+ patent applications, and licensed 5 technologies to industry.

What does Success Look Like?

**Energy Technologies
Invented Here...**



**...And Productively
Manufactured Here!**

Goals for Today

- Utilize your expertise to map how artificial intelligence (AI) can help advance energy materials design and development.
- Identify how AI maps into AMO's priority technology areas as identified by the DOE Quadrennial Technology Review and Multi-Year Program Plan
- Assist AMO with understanding how AI can advance energy material processing and process technologies.
- Articulate how applying AI to development of material manufacturing parameters can expand upon existing government R&D investments such as the Materials Genome Initiative for Global Competitiveness.

Thank You