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National Lab Day

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10-9-2019

### National Laboratory Day

Dan Ginosar

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Critical Materials Institute  
AN ENERGY INNOVATION HUB

# National Laboratory Day

*October 9, 2019*

Dan Ginosar  
CMI Deputy Focus Area Lead



# Mission & Strategy

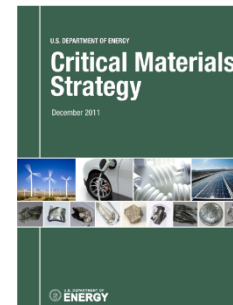
## Mission:

Accelerate the development of technological options that assure supply chains of materials essential to clean energy technologies – enabling innovation in US manufacturing and enhancing energy security.

Critical materials (a) provide essential and specialized properties to advanced products or systems, (b) have no easy substitutes, and (c) are subject to supply risk.

## Strategy:

- Diversify our sources;
- Develop substitutes to the existing materials;
- Drive better use of the existing supplies through efficient manufacturing, recycling and re-use.



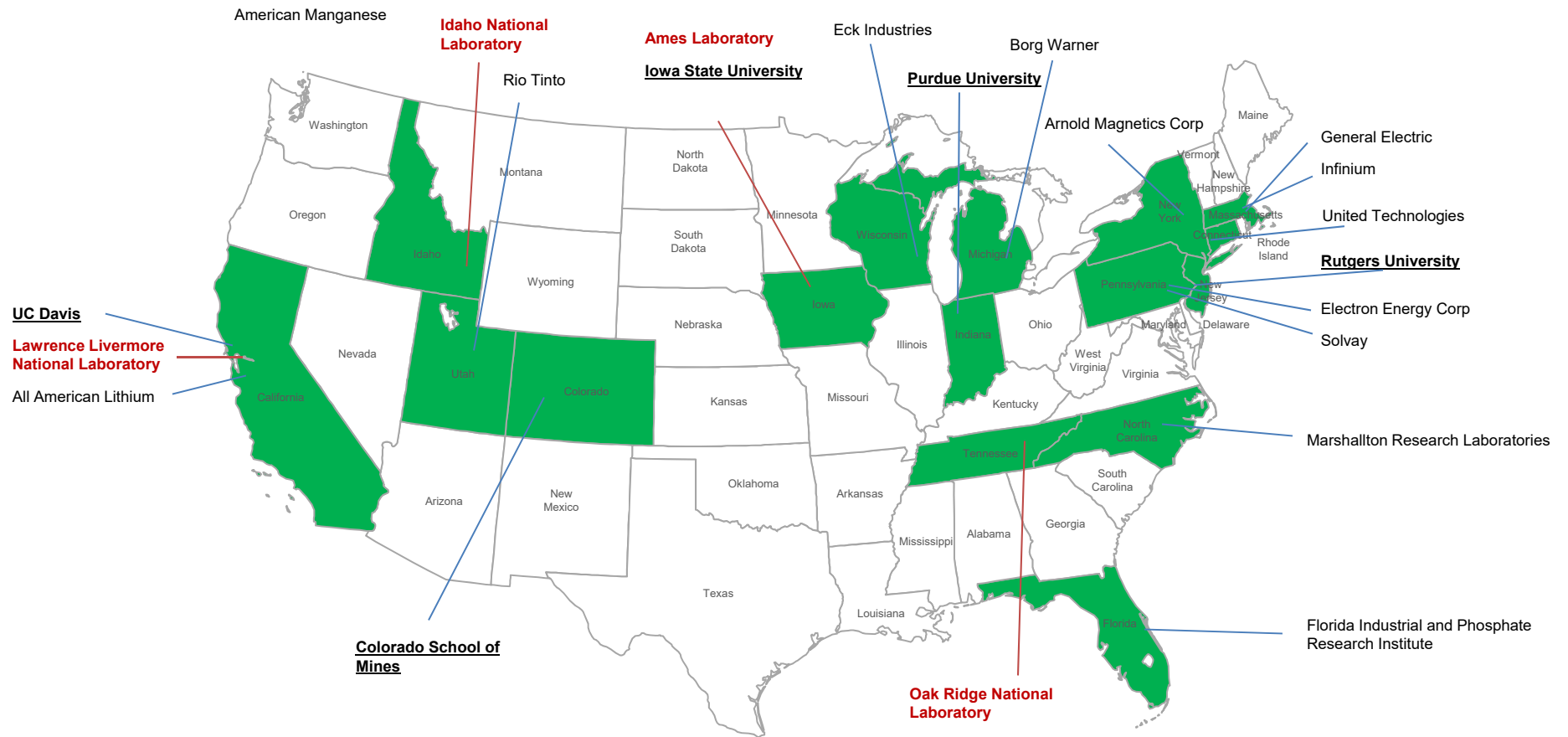
# Critical Materials in Energy Systems

	REEs *	Li	Co	C**	Ga	In	Mn	V	PGM
Vehicles/ Motors	X	X	X	X			X	X	X
Storage		X	X	X			X	X	
Solar/ Semi- conductors					X	X			
Catalysts	X								X
Lighting	X				X	X			
Nuclear	X		X			X			
Wind	X								

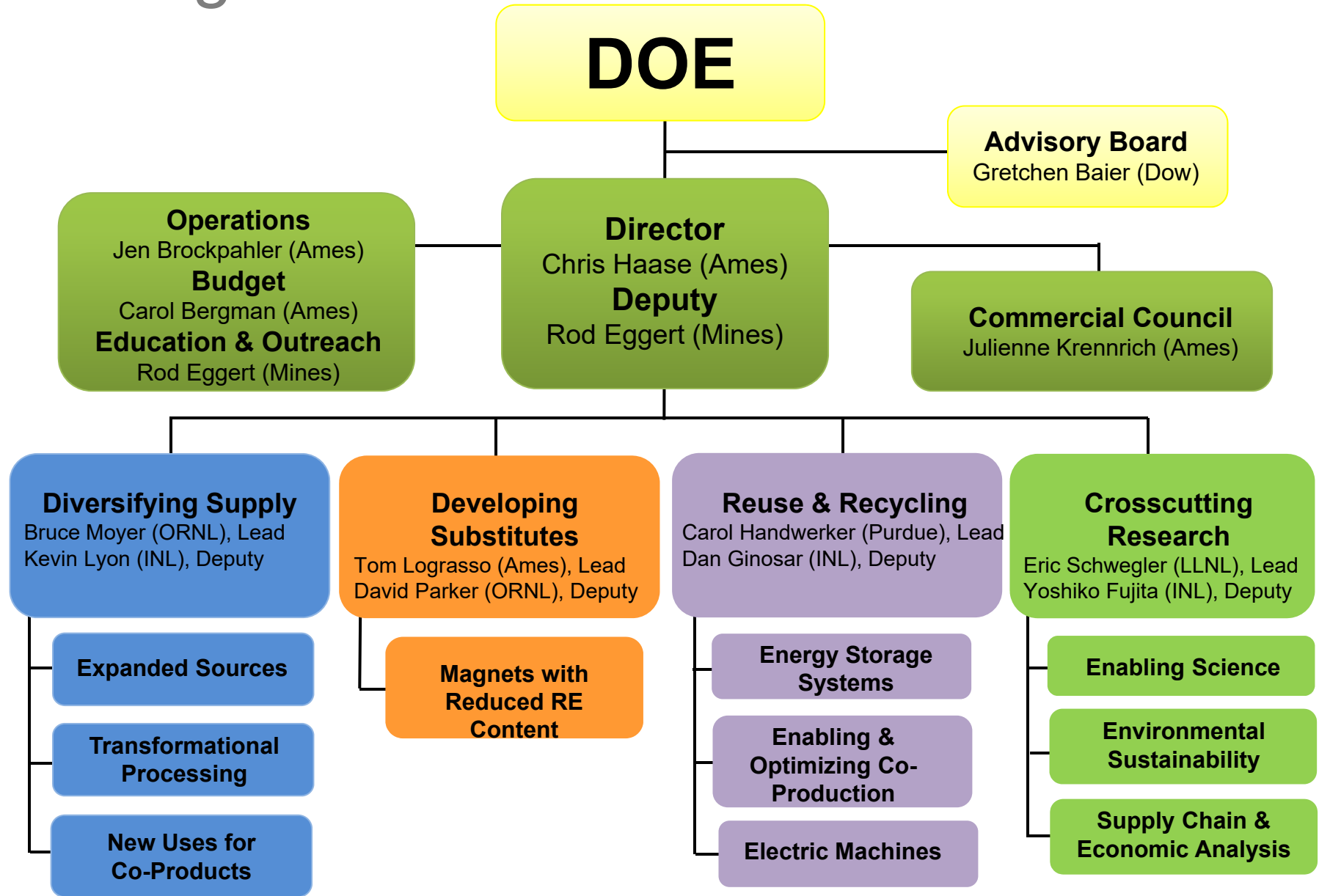
• = Selected rare earths: Nd, Pr, Dy, Sm (magnets); La, Ce (catalysts)

\*\* = Battery-grade graphite

# CMI: One integrated team with complementary capabilities



# CMI Organization



# Accomplishments

287  
Refereed  
Publications

120  
Invention  
Disclosures

350  
CMI Participants\*

56  
Patent  
Applications

10  
Awarded Patents

8  
Technology  
Licenses

4  
R&D 100 Awards

50  
CMI Affiliates\*

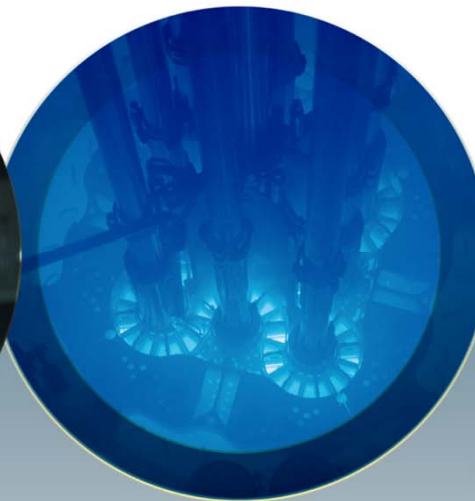
25  
CMI Team  
Members\*

# is Positioned to Address the World's Energy and Security Challenges



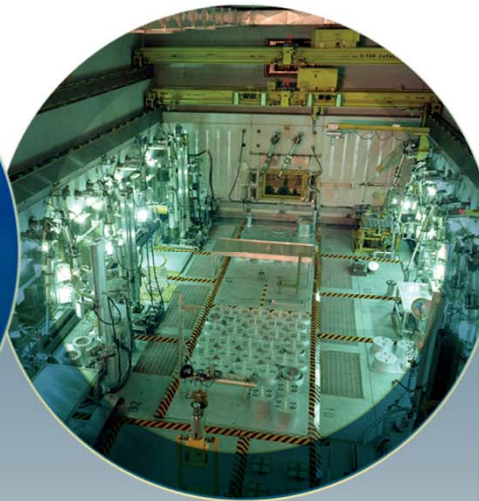
## Nuclear S&T

Advanced reactor design  
 optimization  
 nuclear fuels and  
 materials  
 fuel cycle technologies  
 advanced water reactor fleet  
 sustainability



## Advanced Test Reactor

- Steady state neutron irradiation of materials and fuels
  - Naval Nuclear Propulsion Program
  - Industry
  - National laboratories and universities



## Materials and Fuels Complex

- TREAT – Transient testing
- Analytical laboratories
- Post-irradiation examination
- Advanced characterization
- Fuel fabrication
- Space nuclear power and isotope technologies



## Energy and Environment S&T

- Advanced transportation
- Environmental sustainability
- Clean energy
- Advanced manufacturing
- Biomass

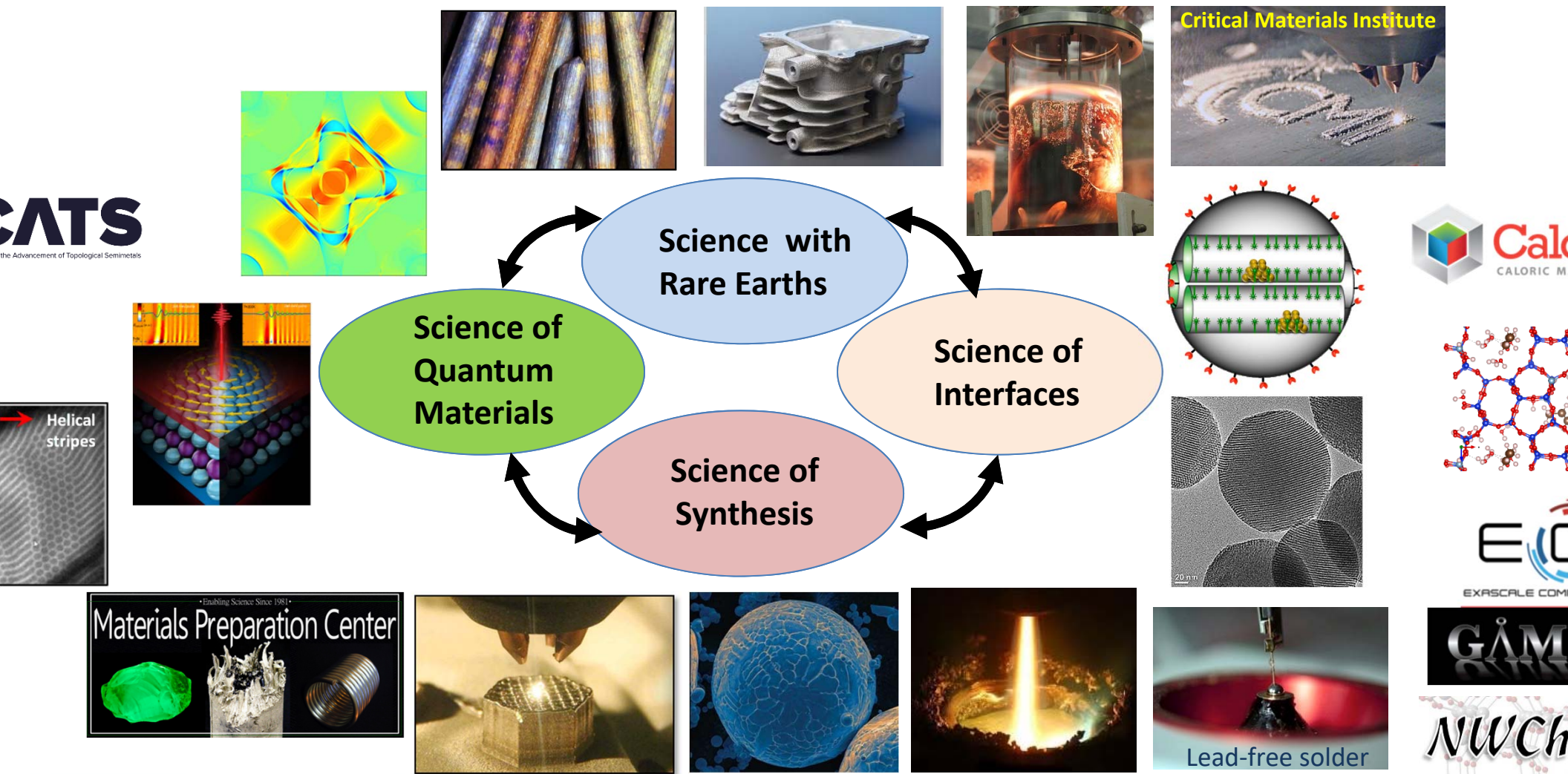


## National and Homeland Security S&T

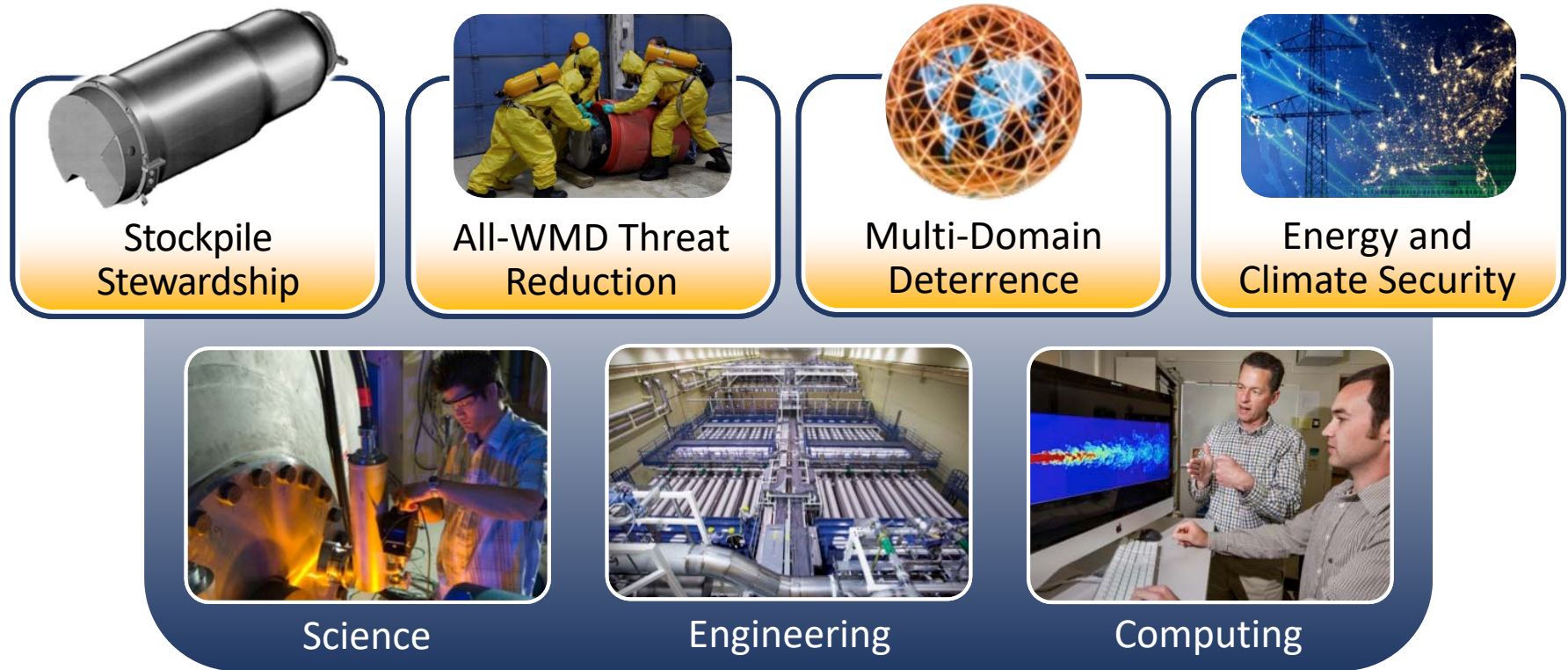
- Critical infrastructure protection and resilience
- Nuclear nonproliferation
- Physical defense systems



# Laboratory accelerates materials design, discovery and deployment by transitioning from basic science to applied science to technology commercialization



LLNL's mission is to strengthen national security through world-class science, technology, and engineering



# ORNL's goal: To be the world's premier research institution



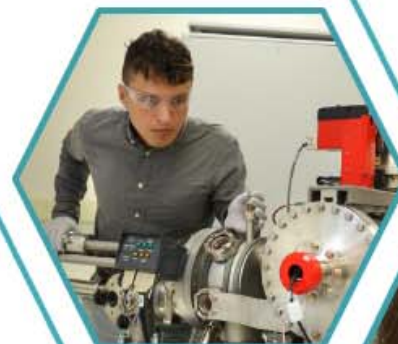
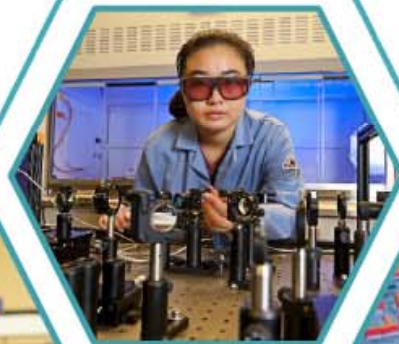
Conduct  
world-  
leading  
research



Deliver  
innovative  
break-  
throughs



Ensure  
national  
security



Secure  
energy  
future



ORNL's distinctive facilities bring thousands of R&D partners to Tennessee each year - Building Technologies Research and Integration Center; Carbon Fiber Technology Facility; Center for Nanophase Materials Sciences; High Flux Isotope Reactor; Manufacturing Demonstration Facility; National Transportation Research Center; Spallation Neutron Source; Oak Ridge Leadership Computing Facility

# Earth's Element Uncertainty

## Critical Materials Strategy Summary



- This report examines the role of critical materials in the clean energy technologies of the 2010 Critical Materials Strategy. It highlights the importance of these materials in electric vehicles, wind turbines, and solar panels.
- In the past year, DOE and other stakeholders have scaled up work to address these challenges. This includes new funding for priority research, development of DOE's first critical materials research plan, international workshops bringing together leading experts and substantial new coordination among federal agencies working on these topics.
- Building workforce capabilities through education and training will help address vulnerabilities and realize opportunities related to critical materials.
- Much more work is required in the years ahead.

This report is focused on several clean energy technologies expected to experience high growth in coming years. The scenarios presented are not predictions of the future. Future scenarios are subject to change.

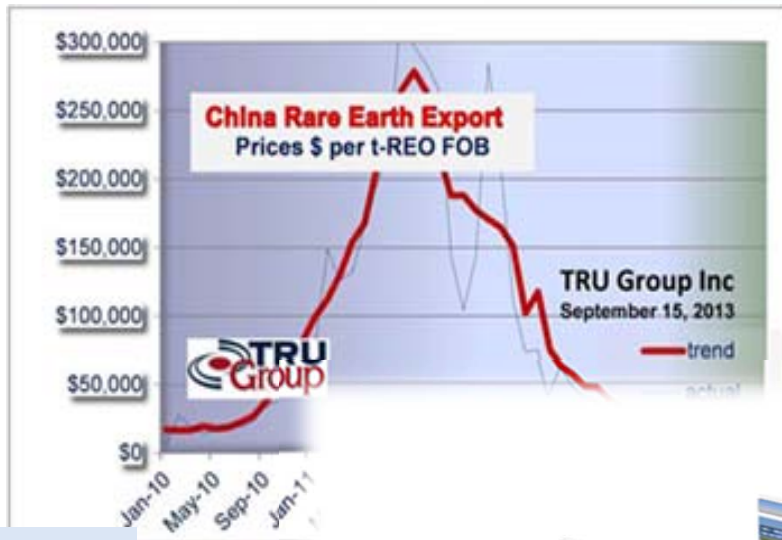
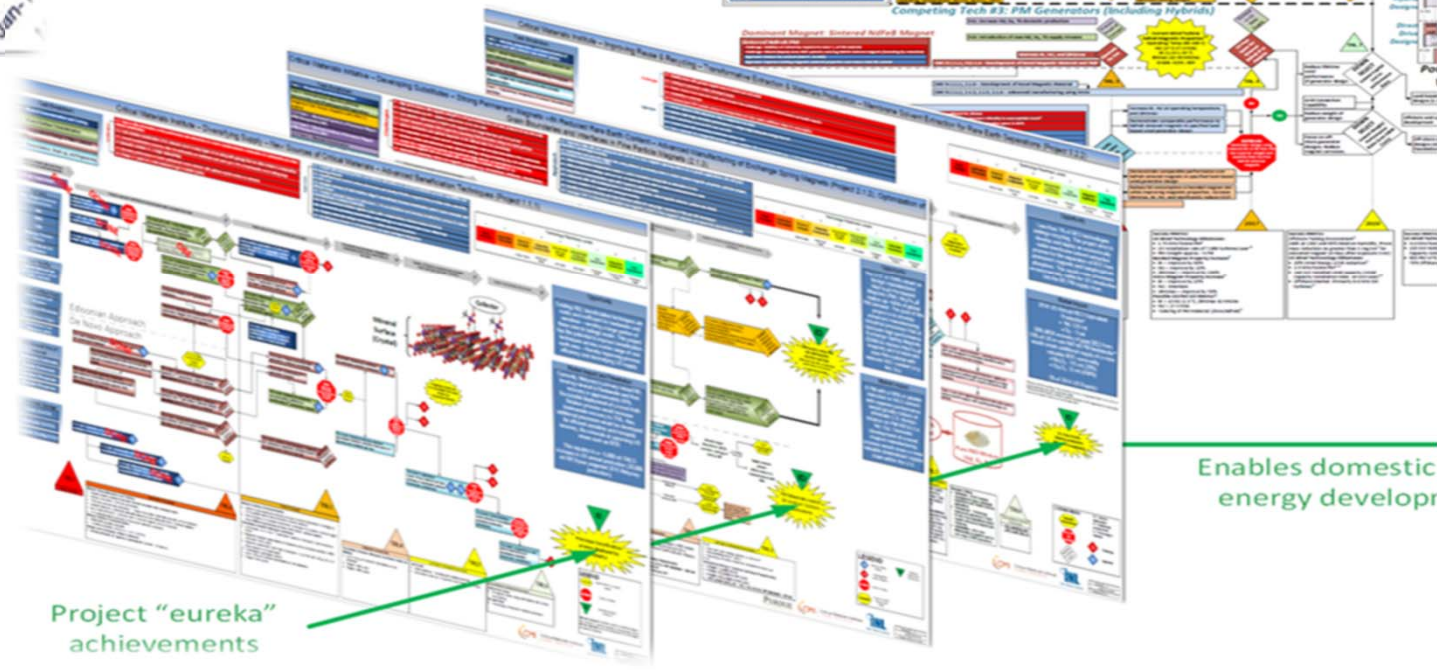
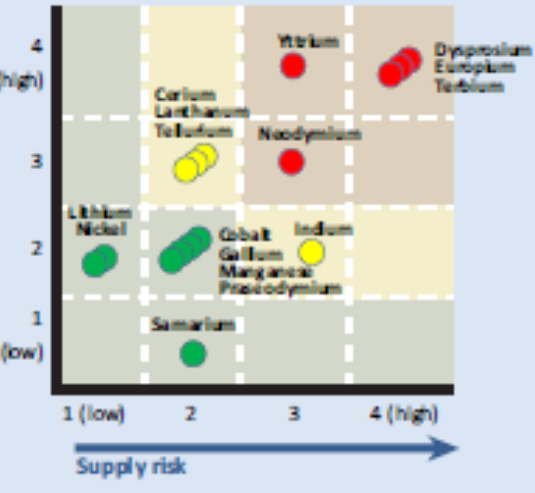


Figure 1. Short-Term (present-2015) Criticality Matrix



U.S. Department of Energy  
**Energy Efficiency and Renewable Energy**  
 Energy Efficiency and Renewable Energy  
 U.S. Department of Energy

July 2008

20% Win  
 Increasing W  
 U.S. Electric