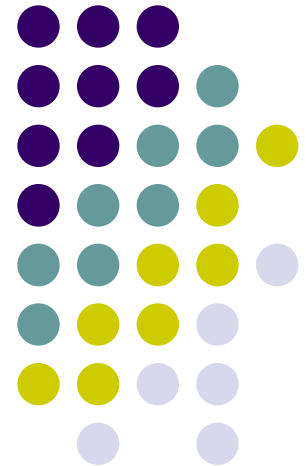


A New Consortium Addresses Issues Confronting the Rare Earth Permanent Magnet Industry

Magnetics 2010
Disney Hilton, Orlando, FL
January 29, 2010

Keith A. Delaney
Executive Director

Rare Earth Industry and Technology Association
(REITA)



Presentation Outline



Rare Earth Permanent Magnet Industry Drivers

The Case for Action

REITA

Concluding Remarks

Rare Earth Permanent Magnet Industry Drivers



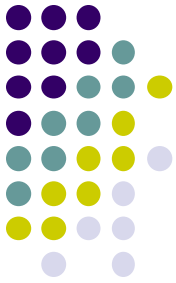
- China recognizes its Rare Earth (RE) reserves are finite
- Chinese internal demand for RE materials and technologies is forecasted to continue growing at double digit rates for the foreseeable future and could equal China's forecasted annual supply possibly as soon as 2012 or soon thereafter
- These conditions will continue to ***drive Chinese policies to limit RE production and exports to better manage its precious natural resource*** and support its ever-expanding vertically integrated industries that depend on RE's

Rare Earth Permanent Magnet Industry Drivers



- China already produces 80% of global requirement for fully dense RE permanent magnets and 100% of the global RE metal requirement for all RE permanent magnets (fully dense and bonded) produced .
- Prospects of the Chinese expanding RE raw material output beyond its own internal demand only appears to make sense if China can leverage this increased production to bring more downstream manufacturing into the country (more magnets, motors and motor assemblies for example)

The Case for Action



Available online at www.sciencedirect.com



Journal of Operations Management 26 (2008) 222–238

**JOURNAL OF
OPERATIONS
MANAGEMENT**

www.elsevier.com/locate/jom

Offshoring technology innovation: A case study of rare-earth technology

Brian J. Ficarek^{a,*}, Francisco M. Veloso^{a,b,1}, Cliff I. Davidson^{a,2}

^a *Carnegie Mellon University, Engineering and Public Policy, 129 Baker Hall, 5000 Forbes Avenue,
Pittsburgh, PA 15213, United States*

^b *Faculdade de Ciências Económicas e Empresariais, Universidade Católica Portuguesa, 1649-023 Lisbon, Portugal*

Available online 12 March 2007

Abstract

Many US firms are improving their individual competitiveness by offshoring manufacturing operations, services and, increasingly, knowledge work. Although research to date has maintained that these practices are beneficial to the offshoring firm and national economies, by reducing costs and expanding markets, little is known about the longer term effect of offshoring on the rate of innovation of home economies. This paper suggests that offshoring practices have adverse effects on innovation at the national home base. The analysis uses patents in the rare-earth element industry, a high-tech area which is among those that have evolved the furthest towards outsourcing and relocation away from the US and to developing countries. Looking at the rare-earth industry can provide insights in identifying potential long term impacts of offshoring on innovation because many other US industries are likely to adopt similar offshoring strategies.

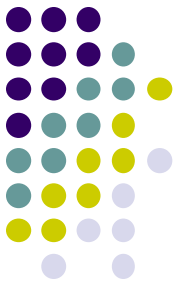
© 2007 Elsevier B.V. All rights reserved.



The Case for Action

In his paper, Dr. Ficarek and his colleagues conclude:

- **As the manufacturing of technologies employing rare earth elements has moved offshore ... “These outcomes *have significantly affected rare-earth innovation processes in the US.*”**
- **As the relative rate of successful patents by US organizations has decreased “... the likelihood that knowledge generated in the US will be used for such innovative activity is also decreasing.”**
- **“... *the need for firms to increasingly plan their innovation within a collaborative supply chain environment.*”**
- **“... *the government may need to provide support to areas subject to market failure in terms national private R&D investment because of offshoring decisions...*”**

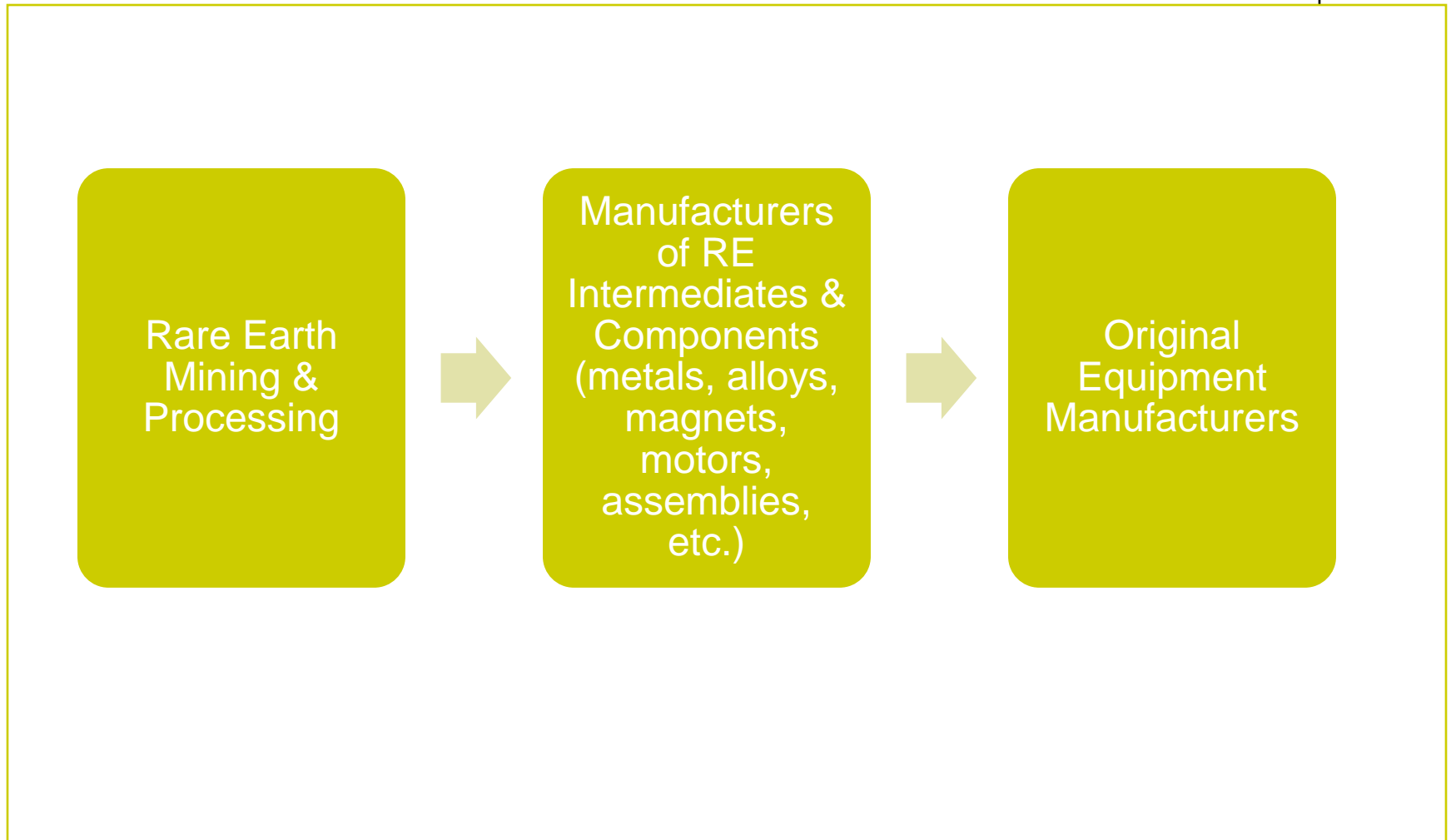
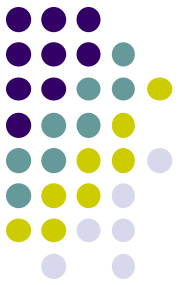


The Case for Action

What Dr. Ficarek and his colleagues *did not say*:

- RE chemistry and RE application sciences are rarely offered in US colleges and universities today
- China employs thousands of scientists in RE chemistry and RE application sciences

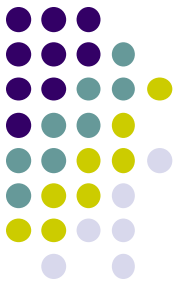
RE Magnet Industry Simplified Supply Chain





The Case for Action

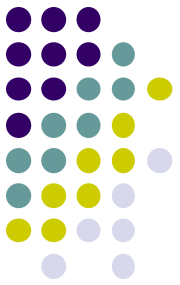
- The “Rest of the World” must take action in light of China’s policies and demonstrated practices
- Availability of RE magnet raw materials from sources outside of China will not, in and of itself, solve the problem – ***whole global supply chains for individual RE technologies including RE magnets, need to be created*** to insure secure and diverse sources of RE technologies ***for Original Equipment Manufacturers (OEMs) and other downstream customers***


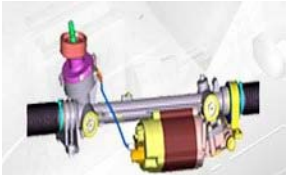
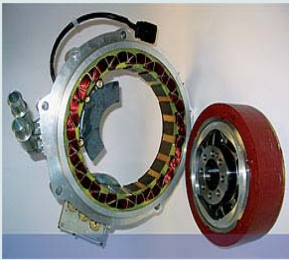



The Case for Action

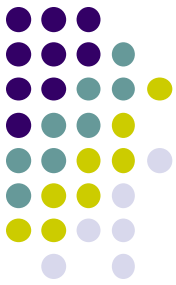
- ***The urgency to address the issues*** to meet its goals, for energy independence and national security, ***is receiving heightened attention of the US government.*** The next few slides show why.


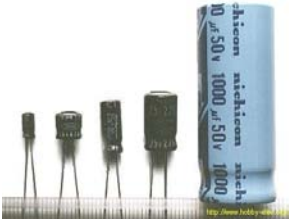


US Department of Energy Interest in RE Technologies



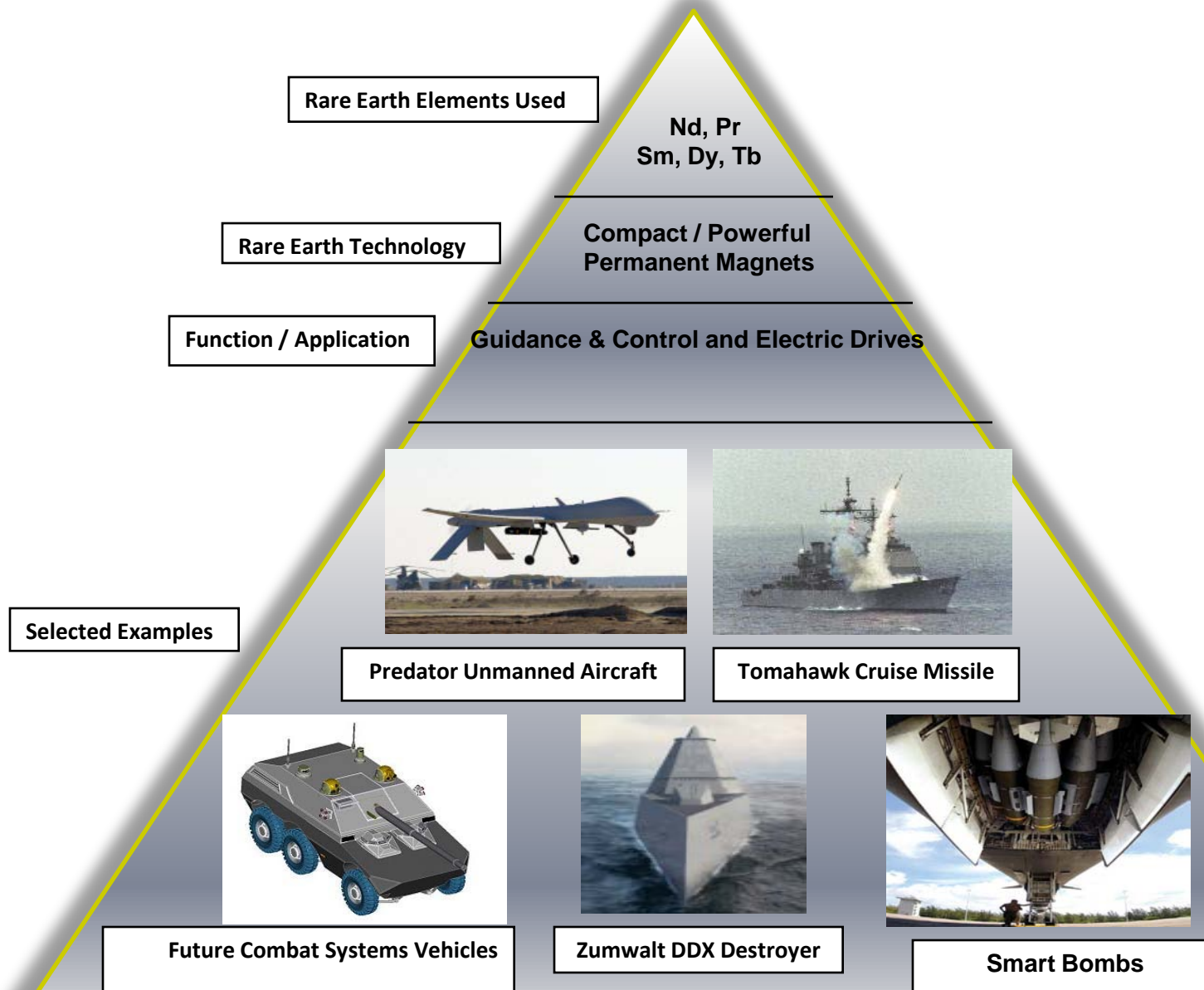
	Application	Rare Earth (RE) Technology	Enabling Functionality	RE Elements Required
 <p>Toyota Prius</p>	Hybrids, Plug-In and All Electric Vehicles	RE Permanent Magnets	Electric Traction Drives replacing or supplementing internal combustion engines	Nd, Pr, Dy, Tb
 <p>Bosch Electric Power Steering System</p>	Electric assist motors in conventional and advanced vehicles	RE Permanent Magnets	Higher MPG by taking significant loads off power trains	Nd, Pr, Dy, Tb
	Integrated Starter / Generator for Improved MPG	RE Permanent Magnets	Shuts off engine when stopped and instant restart when accelerator is pressed	Nd, Pr, Dy, Tb
	Compact and Linear Fluorescent Lamps	RE Phosphors	Ability to match color and brightness of incandescents with 70% less energy	Y, Eu, Tb

US Department of Energy Interest in RE Technologies

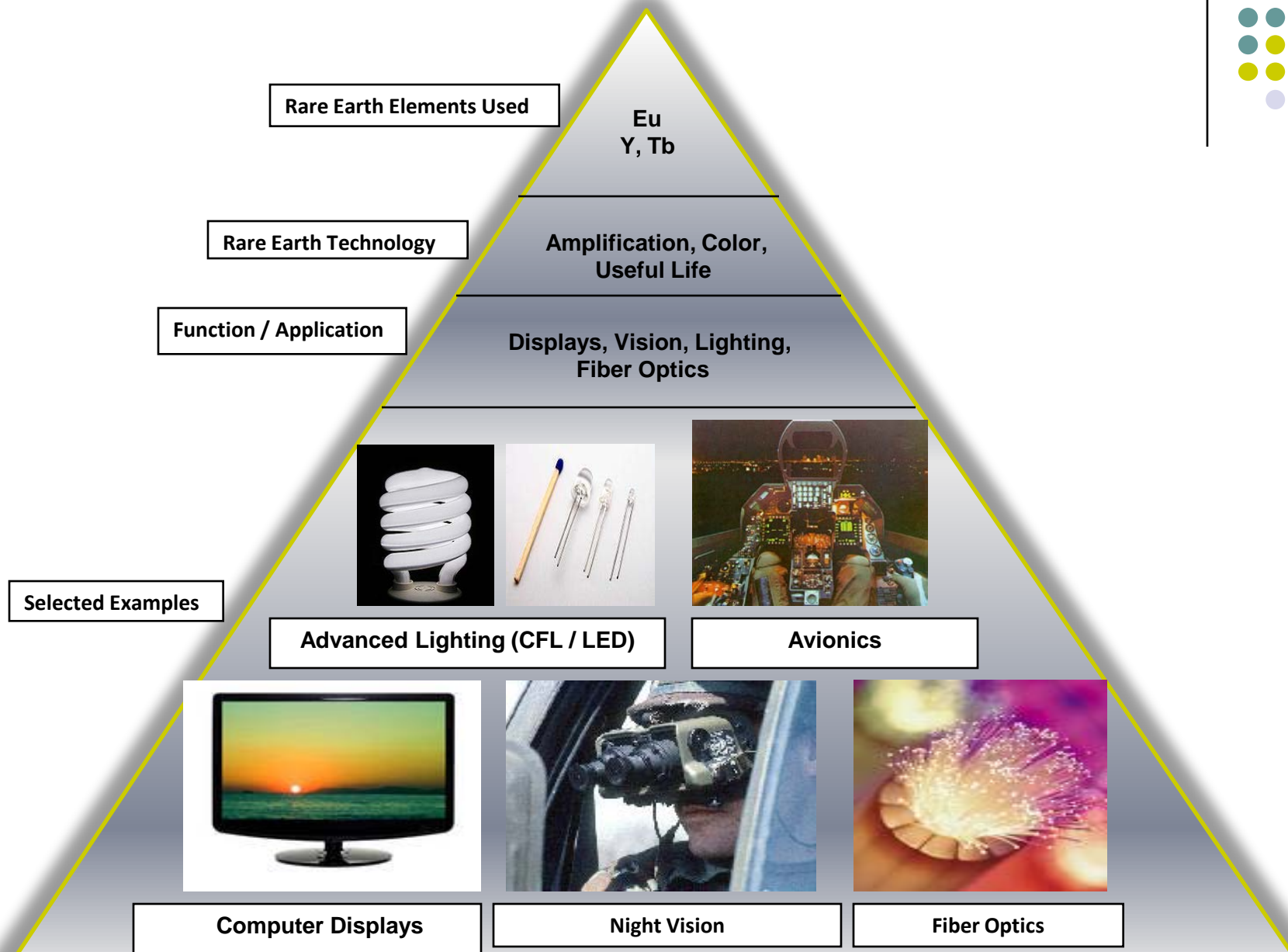


	Application	Rare Earth (RE) Technology	Enabling Functionality	RE Elements Required
 <p>High power Ni-MH Battery from Toyota Prius</p>	Ni Metal Hydride Batteries	Energy Storage	Proven and Cost Effective compared to Li Ion Battery alternatives	La, Ce
	Capacitors with High Energy Density	Rare Earth-doped ceramic , tantalum and other types of capacitors	High Energy Density compared to conventional capacitors	Various
	Wind and Hydro Power Generation	RE Permanent Magnets	Gearless generators for better reliability and online performance	Nd, Pr, Dy, Tb
	LEDs	RE Phosphors	Efficient, compact and intense light source	Y, Eu, Tb

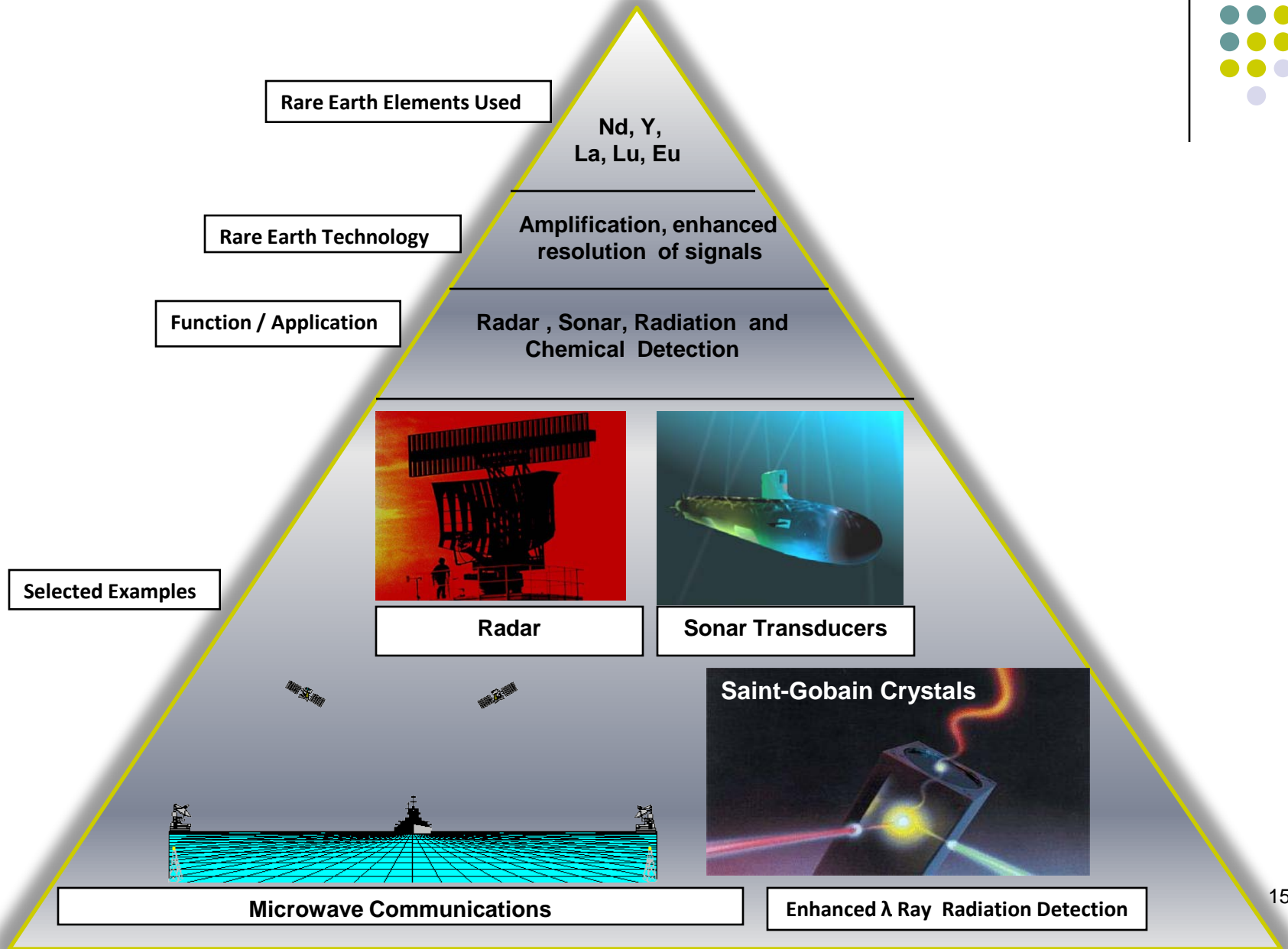
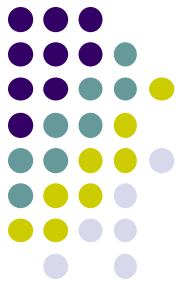
US Department of Defense Interest in RE Technologies



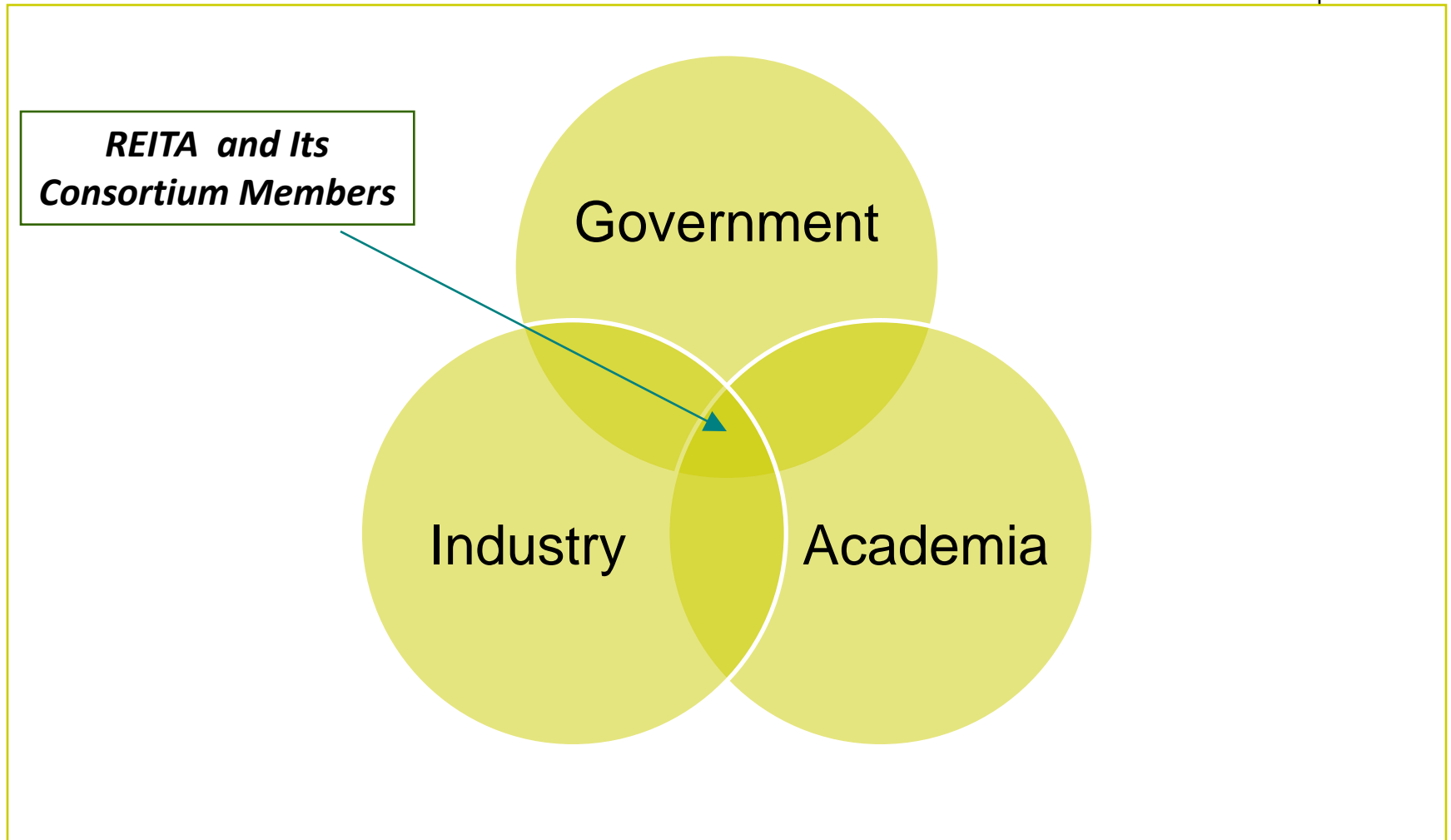
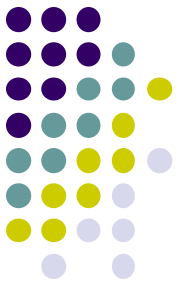
US Department of Defense Interest in RE Technologies

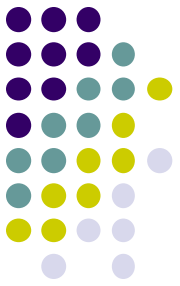


US Department of Defense Interest in RE Technologies

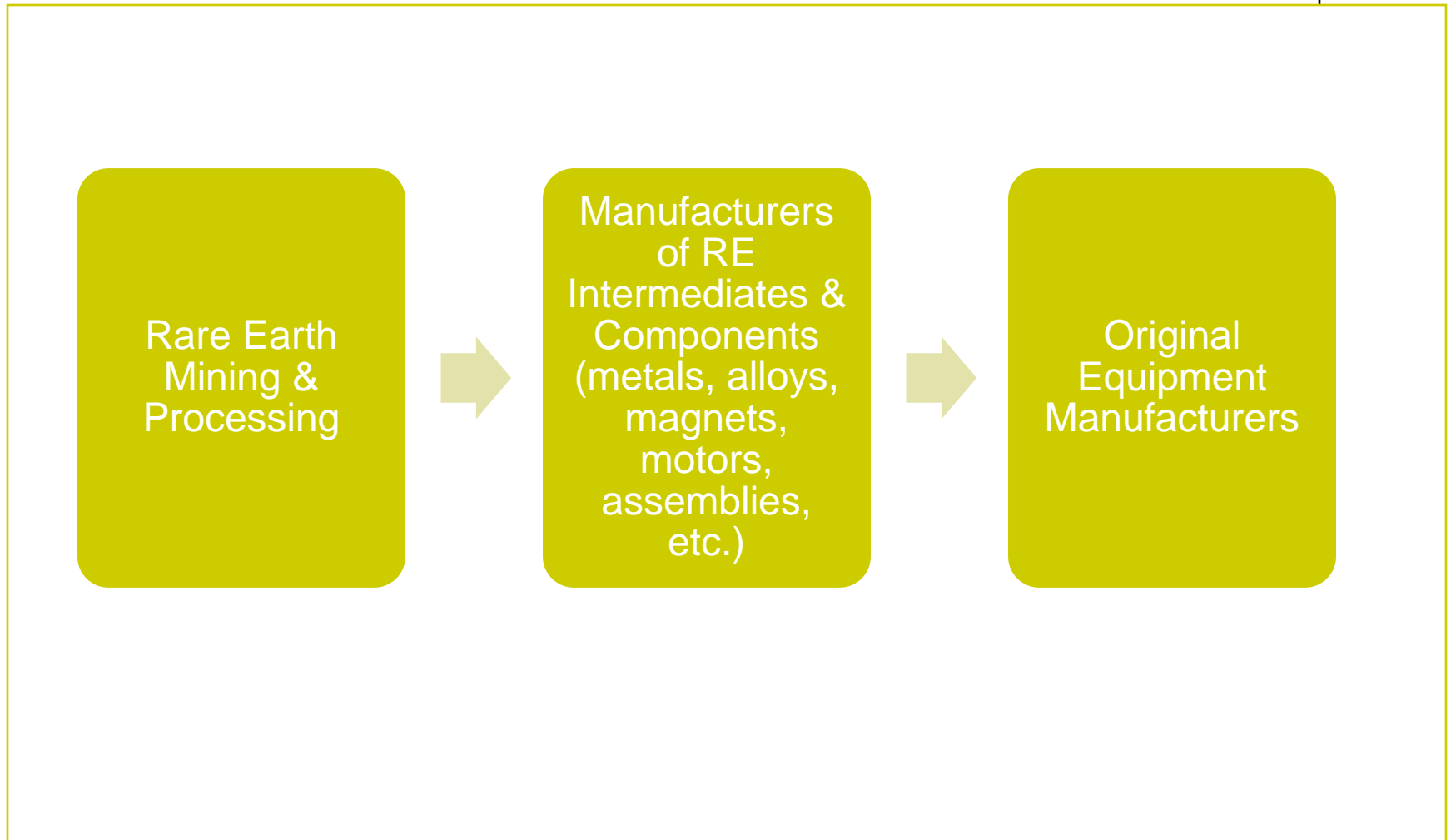


REITA at the Nexus of RE Technology Development

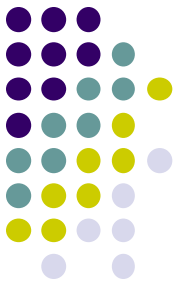




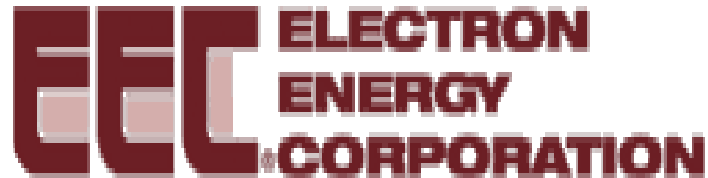
RE Magnet Industry Stakeholders



Current Consortium Members

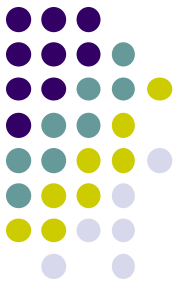


imagination at work



Jack Lifton LLC

Current Consortium Members

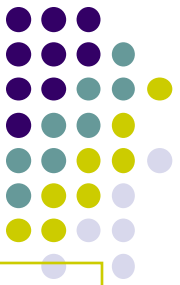


Worcester Polytechnic Institute



Iowa State University operates
The Ames Laboratory
under a contract with the
U.S. Department of Energy

REITA's Role



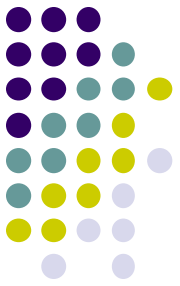
REITA serves the Consortium and the industry through a variety of initiatives and activities

As a new association of industry stakeholders, many of REITA's policies and plans are under development

REITA initiatives and activities will likely include:

- Educating congress and government agencies of industry issues
- Being the global repository and conduit of RE industry information
- Advocating for RE science programs at colleges and universities
- Being the entity contracting with the DoD for particular funding opportunities on behalf of the members

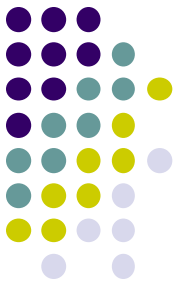
Consortium Funding Possibilities



The **Consortium** is designed after the US Department of Defense Science & Technology Division's "Innovation Enterprise Model" **qualifying REITA to contract directly with DoD** (on behalf of the Consortium members) **under extremely favorable funding instruments and terms** to pay for technology development

Acquiring DoD or other government development funding will be critical to the **Consortium achieving its mission in an expeditious timeframe**

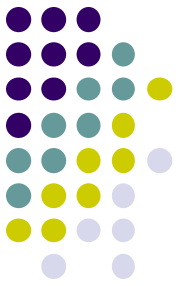
REITA Membership Qualification



REITA has an ***open membership policy for any global company or institution that is capable of playing a role in REITA's mission*** by way of RE-related technology or market expertise

Whether or not a non-USA company or institution is allowed to participate in a *specific* DoD funded program will depend on ***the nature / sensitivity of the program and the member's eligibility*** under the US Arms Export Control Act (22 U.S.C. 2778), International Traffic in Arms Regulations (***ITAR***), etc.

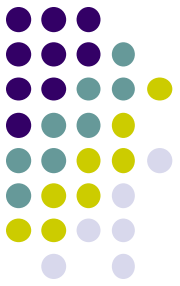
Concluding Remarks



Secure and globally diverse supply chains for RE permanent magnet technologies will help insure the realization of the green energy / energy independence goals of developed nations

Without urgent action by global stakeholders (including government and OEMs) the continued “offshoring” of RE technology manufacturing and innovation will likely conclude with China becoming the world’s sole source for RE magnets, motors and motor assemblies

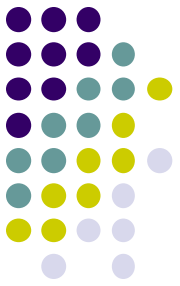
Concluding Remarks



REITA initiatives and activities will likely include:

- Educating congress and government agencies of industry issues
- Being the global repository and conduit of RE industry information
- Advocating for RE science programs at colleges and universities
- Being the entity contracting with the DoD for particular funding opportunities on behalf of Consortium members

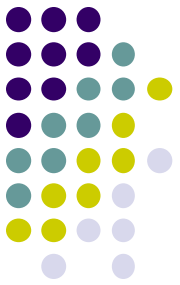
Conclusion



Please accept REITA's ***invitation to apply for membership in the Rare Earth Technology Consortium.***

Membership application / agreement can be downloaded at www.reitusa.org

Questions should be directed to Keith.Delaney@reitusa.org
1-303-409-7603



REITA

Rare Earth
Industry and
Technology
Association

Tomorrow's Technology Today