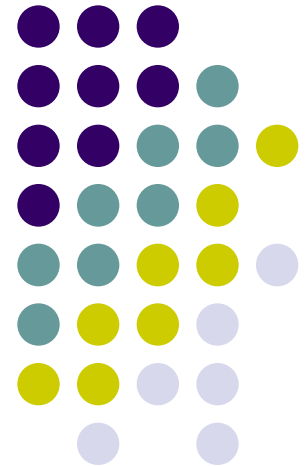
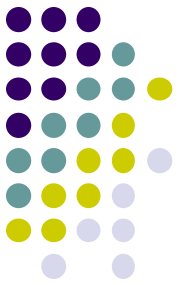


Rare Earth Permanent Magnets: The Most “At Risk” Component for Advanced Technology Vehicles

EDTA Conference & Annual Meeting
Advanced Components: Driving Advanced Performance
Washington, DC
January 27, 2010

Keith A. Delaney
Executive Director
Rare Earth Industry and Technology Association
(REITA)





What Are Rare Earths?

Periodic Table of Elements

H																		He
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt										
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	*
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

* Rare earths include the lanthanide series and Yttrium (Y)

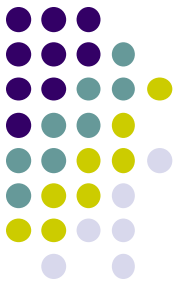
RE Permanent Magnets Enabling Advanced Vehicle Technology



Ningbo Yunsheng High-tech Magnetics Co., Ltd.

Critical Automotive Applications for RE Permanent Magnet Motors

(DC Brushless Motors)



Electric Traction Drive Motors



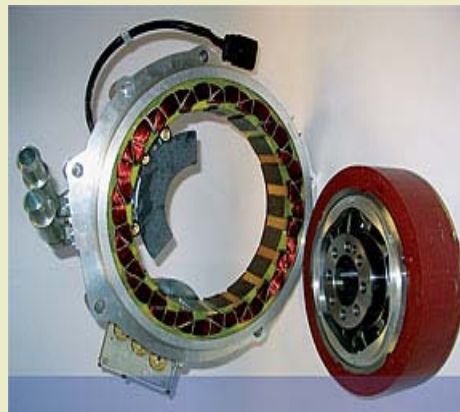
Toyota Prius



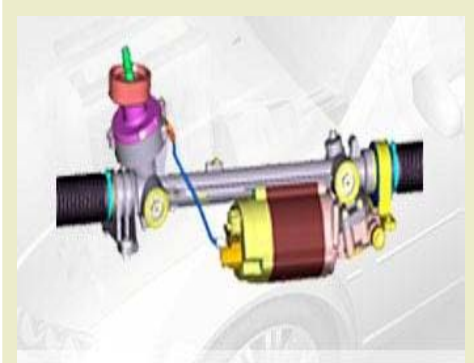
Chevy Volt

Electric Assist Motors

(also critical for new
CAFE standards for ICE
vehicles)

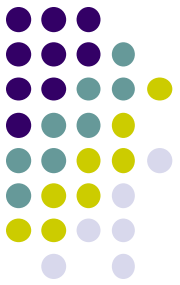


Integrated Starter Generator



Bosch Electric Power Steering
System

Competing Applications for RE Permanent Magnets



Existing Applications

(10 – 15% annual growth rate)



Consumer Electronics



Computer Disc Drives

Emerging Applications

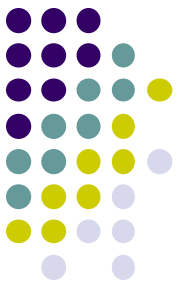


GE's 2.5 MW Series Wind Turbine

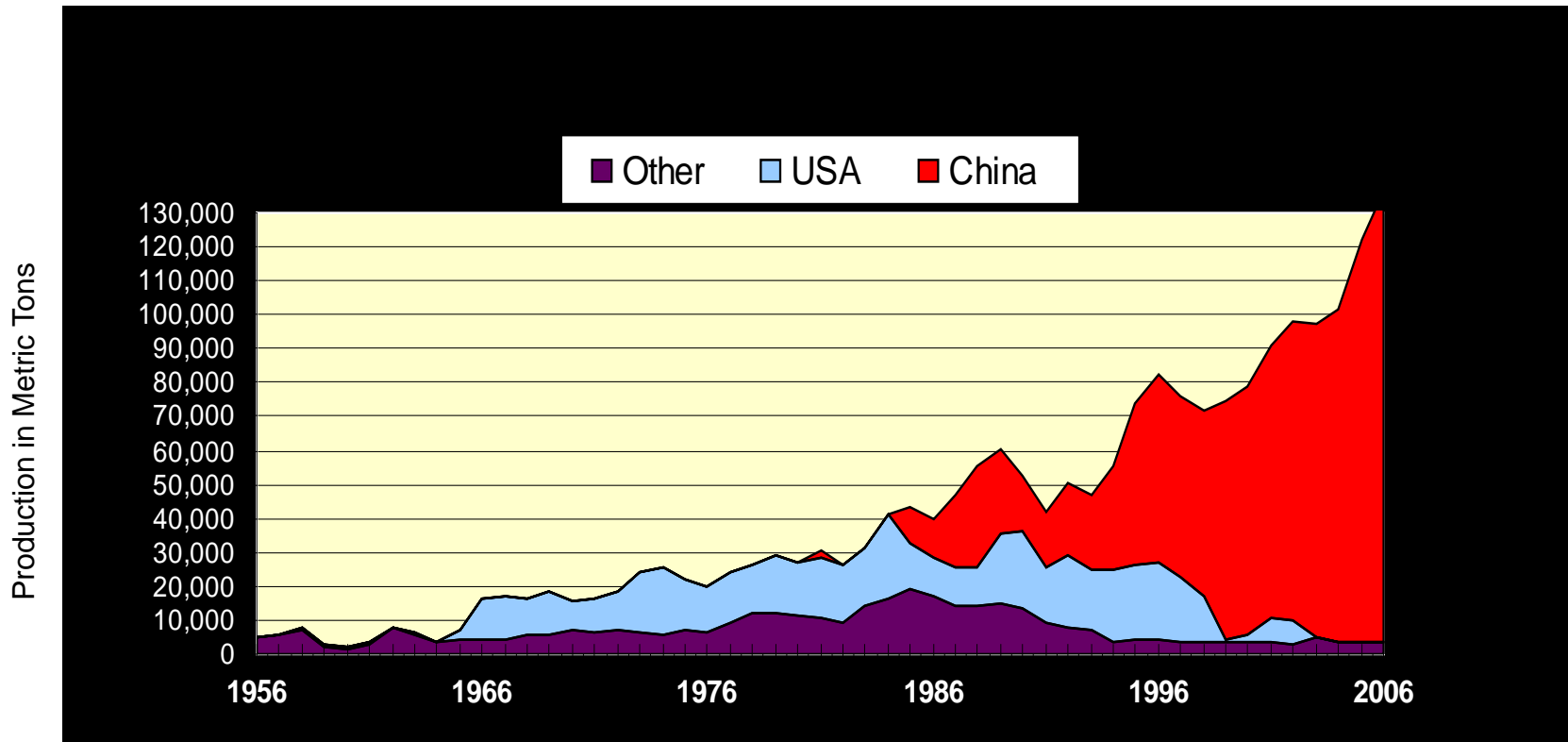


Advanced Weapon Systems

China's Virtual Monopoly for RE Raw Materials

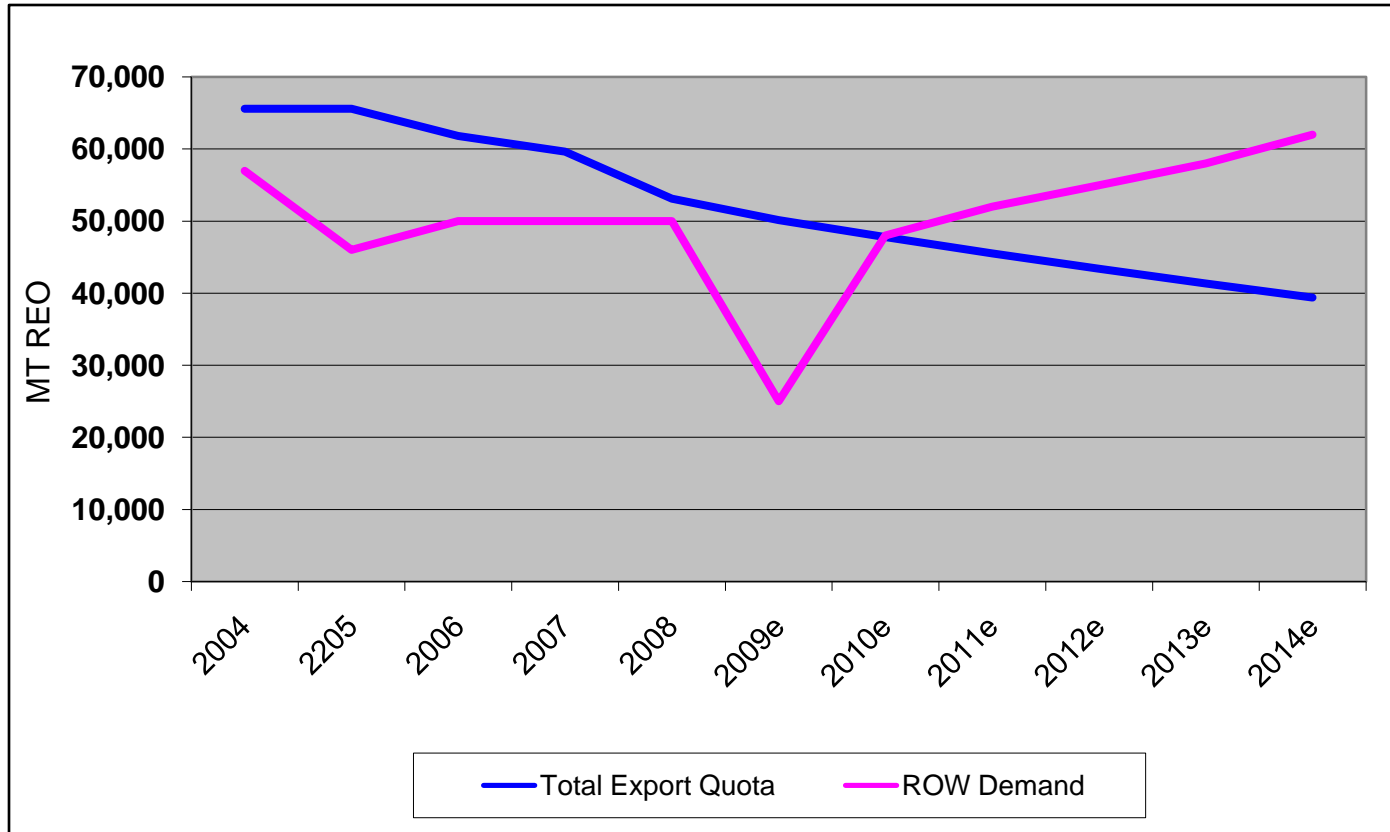
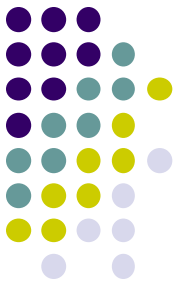


Beginning under the leadership of Deng Xiaoping, China successfully leveraged its significant reserves into a global supply monopoly for rare earth materials



Source: US Geological Survey

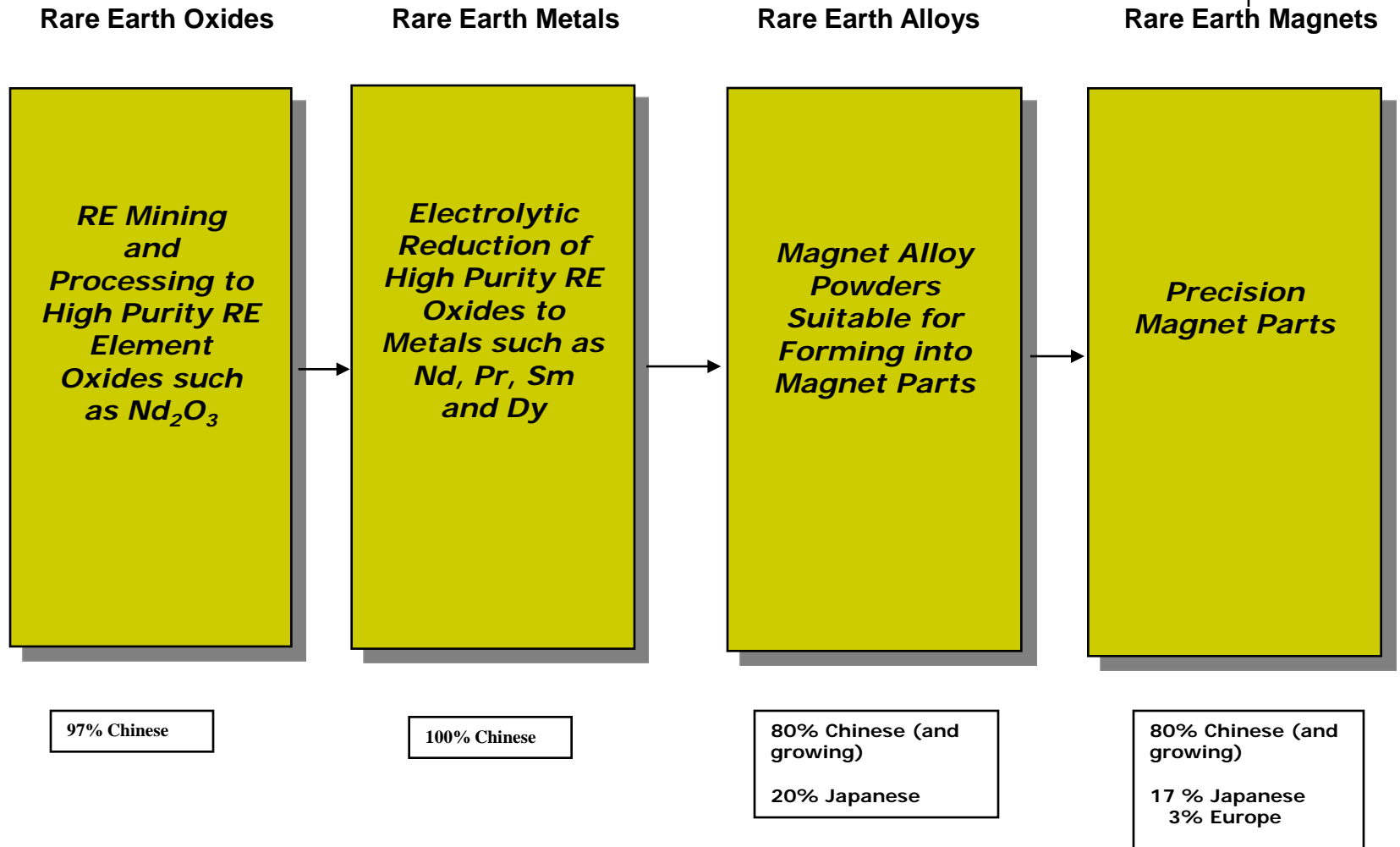
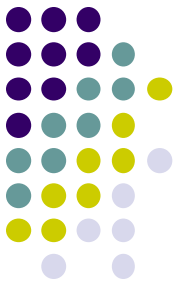
Chinese Supply Forecasted to Fall Short of Global Demand



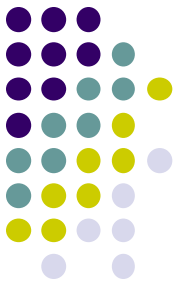
Dudley Kingsnorth, IMCOA, 2009

ROW = Rest of World

The Problem: Global Supply Chain Diversity



Supply Chain Leverage Left to the Chinese - Aim Further Downstream



Rare Earth
Mining &
Processing

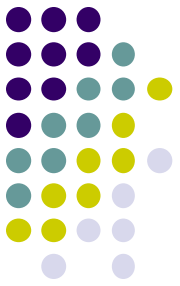


Manufacturers of
RE Intermediates
& Components
(metals, alloys, m
agnets, **motors,**
assemblies, etc.)



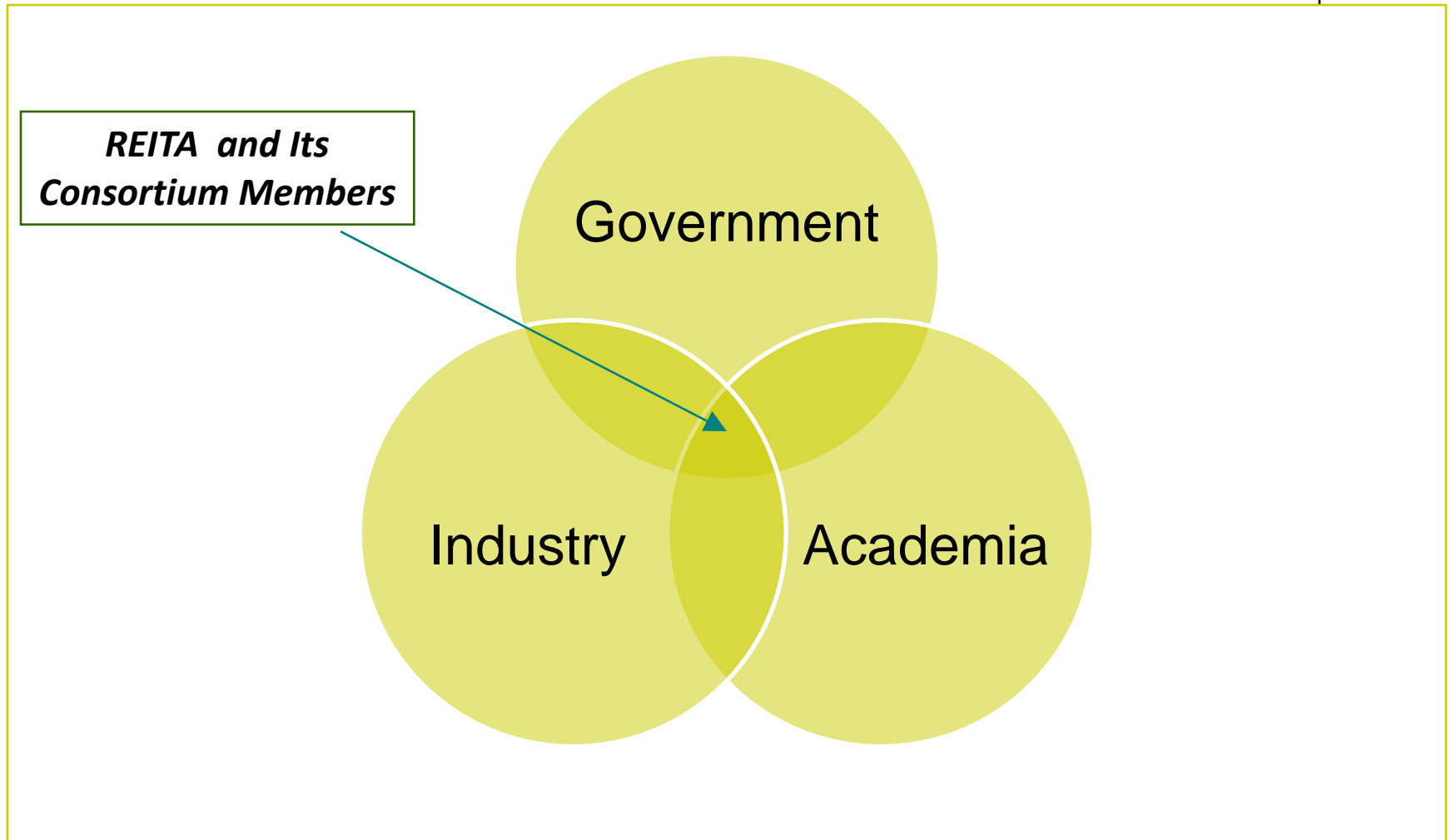
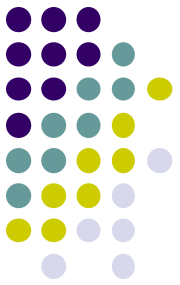
Original
Equipment
Manufacturers

The Problem: Global Supply Chain Security

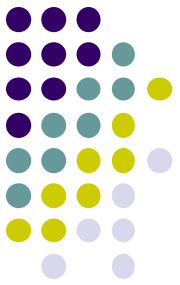


- The prospects of the Chinese expanding RE raw material output beyond its own internal demand only appears to make sense if China can leverage incremental RE production to bring more downstream manufacturing into the country - more magnets, motors and motor assemblies - creating jobs and value add manufacturing capabilities
- Availability of RE magnet raw materials from sources outside of China will not, in and of itself, solve the problem – ***whole global supply chains downstream of RE mining, including RE magnets, need to be created*** to insure secure and diverse sources of RE technologies ***for (OEMs) and other downstream customers***

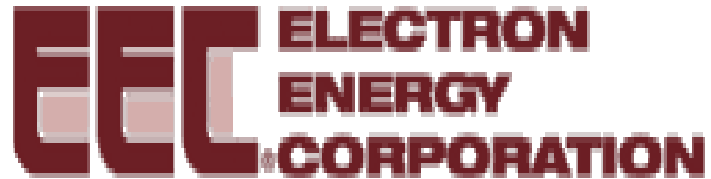
REITA at the Nexus of RE Technology Stakeholders



Current REITA Members

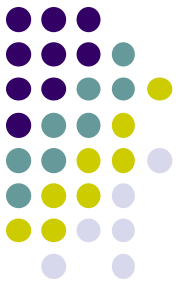


imagination at work



Jack Lifton LLC

Current REITA Members



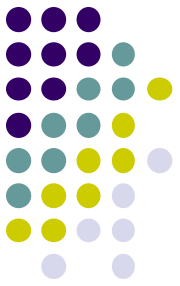
Worcester Polytechnic Institute



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

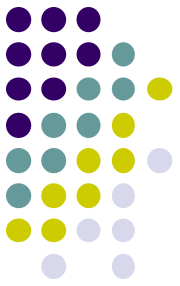


Concluding Remarks



- Green energy/clean energy goals cannot be met without rare earth's. Rare earths are indispensable in these applications.
- The world needs alternative sources of rare earth production and the associated value added downstream activities in order to produce the products required for green/clean technologies.
- REITA can help educate policy makers, advocate for long term research funding programs and facilitate the creation of educational programs/curricula to ensure continued advancement of rare earth related technologies.

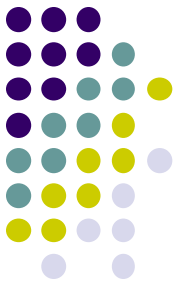
Conclusion



RE Permanent Magnet Technology Stakeholders, please accept REITA's ***invitation to apply for membership***

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

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



REITA

Rare Earth
Industry and
Technology
Association

Tomorrow's Technology Today