Managing Supply Chain Risk for
Critical & Strategic Metals

Government Action in the Strategic Materials Market

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Overview

- A Continuum of Strategic Materials
  - What's Working – Titanium/Specialty Steel
  - What's Hanging On – High Performance Magnets
  - What's Failed – Rare Earths
- Specialty Metals Clause
- Current and Future Government Action

What are Strategic Materials?

- For today's discussion –
  - Titanium
  - Specialty Steel and Super Alloys
  - High Performance Magnets (Neo, SmCo, Alnico)
  - Rare Earths
  - Other (Beryllium, Tungsten, etc.)

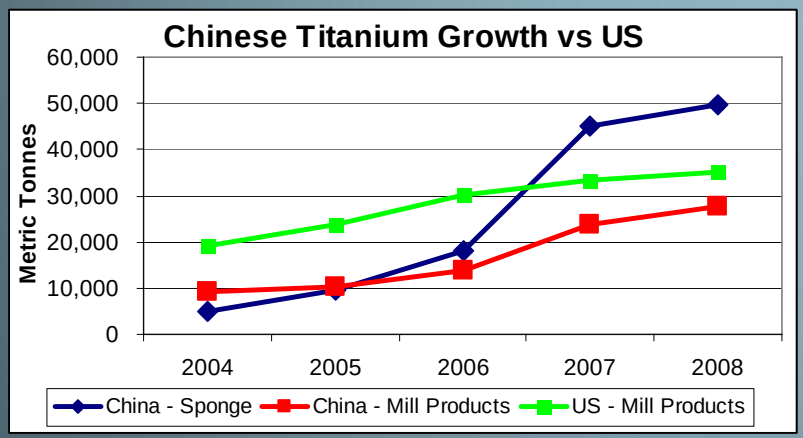
Titanium

Applications:

• Commercial aerospace (i.e. Boeing, Airbus, Bombardier passenger aircraft)

• Military Aerospace (i.e. F-35 Lightening II, F-18 E/F Super Hornet, F-22 Raptor, C-17 Transport, Blackhawk helicopters)

• Military Systems & Vehicles (i.e. Naval and Marine systems, Army combat/weapons systems, Stryker, Bradley M2A3, EFV, M1A2)



Source: Chinese Titanium Association and U.S. Geological Survey

Challenges:

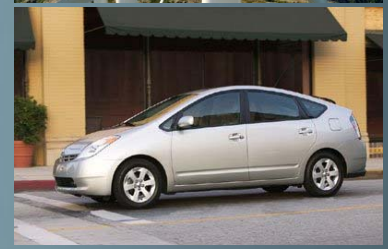
• Imports are a significant factor in domestic market

• Foreign investment is targeting U.S. market

• Rapid growth in Chinese titanium production

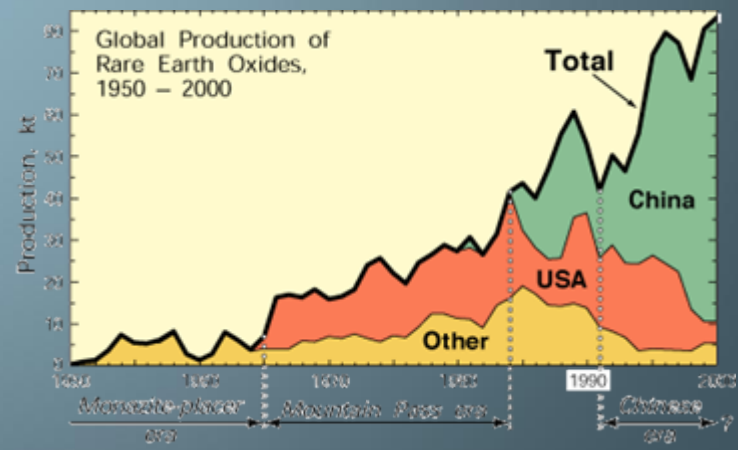
• Industry cyclicality

High Performance Magnets*



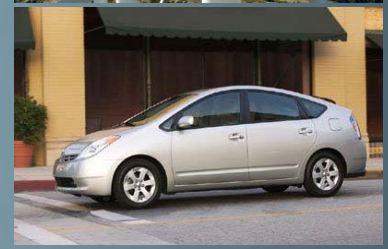
Types of Permanent Magnets Commercially Available Today:

- Ferrites (lowest cost)
- Alnico* (highest temperature)
- Samarium Cobalt* (high temp/high max. energy product)
- Neodymium Iron Boron*(highest maximum energy product)*



Source: US Geological Survey

High Performance Magnets*



Applications:

High Performance Magnets

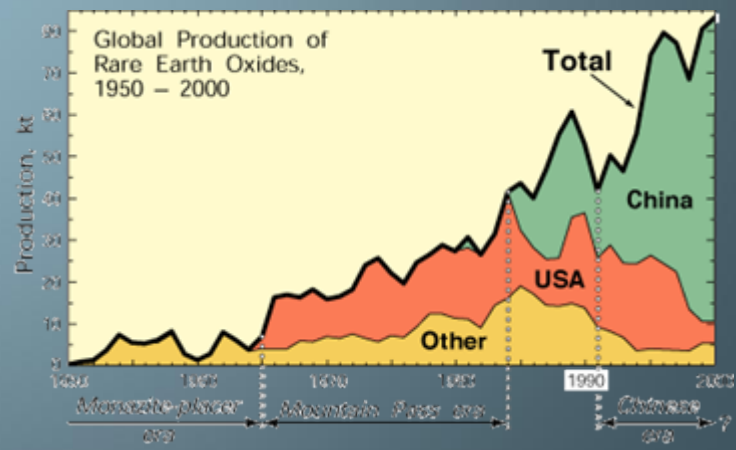
- Aerospace (sensors, relay switches)
- Industrial (motors/generators, hysteresis clutches, guitar pickups)
- Defense (radar & guidance systems, accelerometers)
- Energy (geophones)
- Medical (hearing aid transducers)

Neo Magnets

- Wind Turbines (generator)
- Hybrid Vehicles (generators and drive motors)
- Guidance systems (JDAM)
- Computer Hard Drives

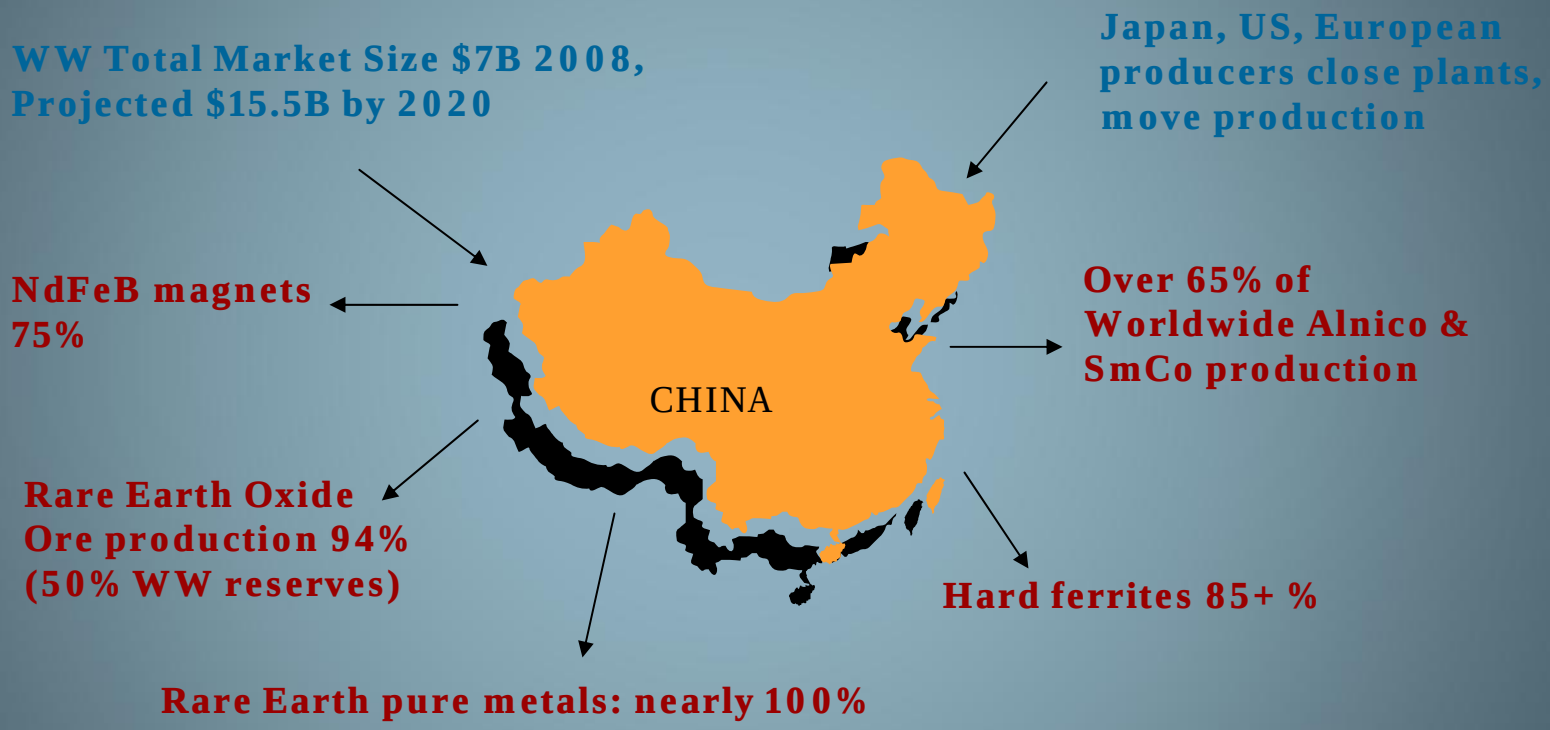
Challenges:

- China Dominates Magnet Materials
- Chinese Rare Earth Metals Price Manipulation
- Specialty Metals Clause Applies to some magnet metals but not all
- No domestic production of Neo magnets



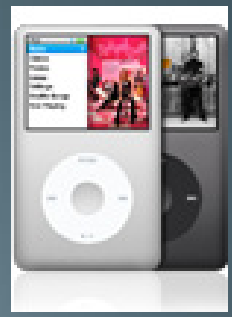
Source: US Geological Survey

China Dominance of Magnet Material Market and Implications



- Price spikes, uncertainty, supply chain disruptions
- Higher raw material prices for rare earth magnet producers
- Chinese competitive advantage over export markets
- China as critical to supply chain
- Loss of knowledge base to innovate

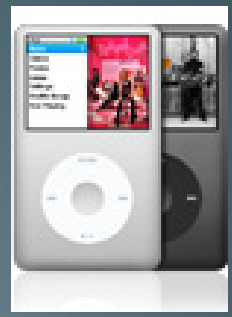
Rare Earths



What are Rare Earths?

Rare earth elements consist of a group of 15 metals, including cerium, dysprosium, erbium, europium, gadolinium, holmium, lanthanum, lutetium, neodymium, praseodymium, samarium, terbium, thulium, ytterbium, and yttrium.

Rare Earths

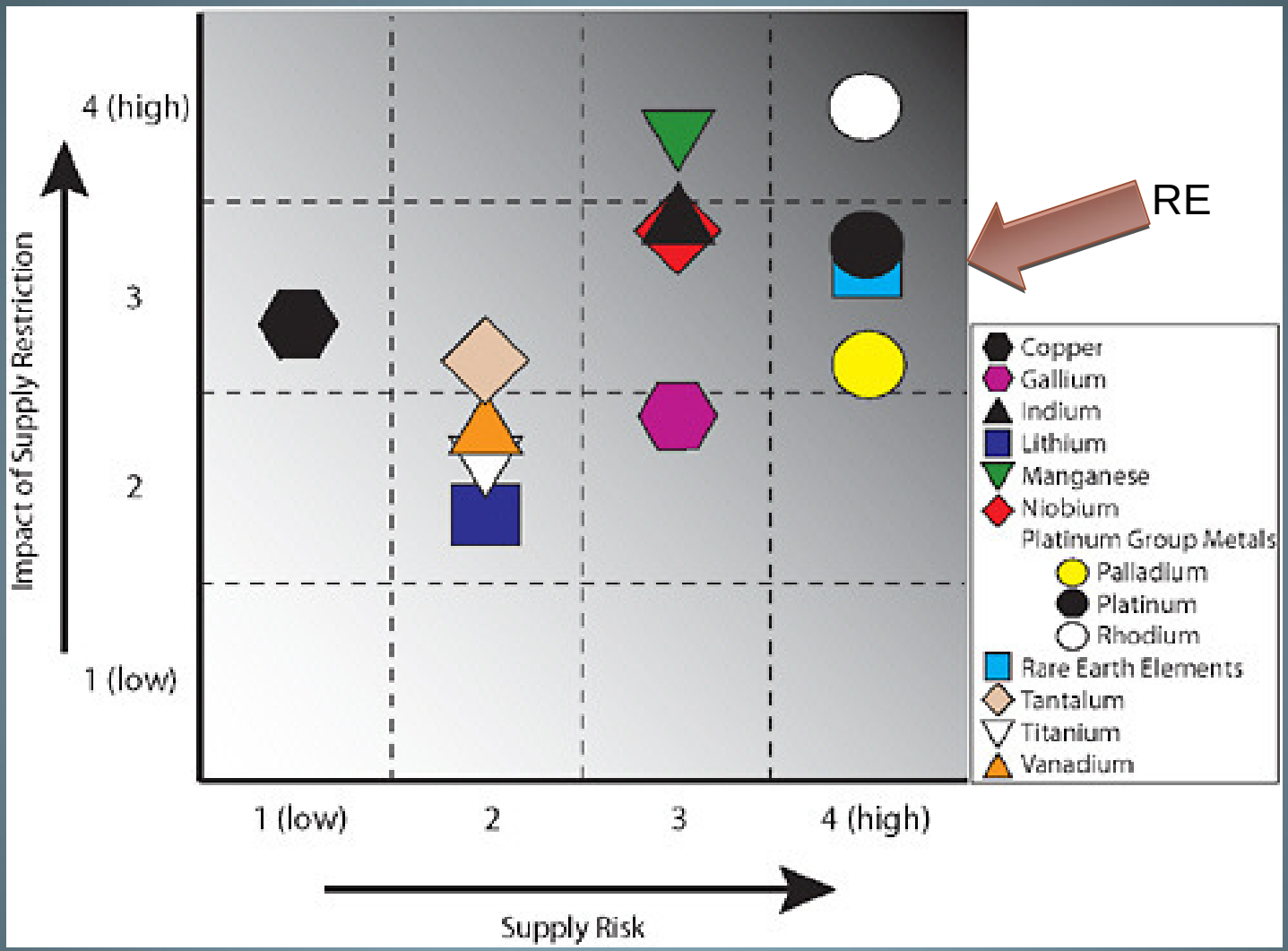


Applications:

• Emerging green technologies (i.e. wind generation, hybrid vehicles, and new battery development)
• High-tech consumer products (i.e. mobile phones, PDAs, MP3s)
• National security and defense systems require these materials to function.

Challenges:

• Worldwide demand escalating rapidly
• 95% of worldwide rare earth reserves in China or controlled by Chinese-led interests
• Chinese rare earth export quotas forcing U.S. manufacturing abroad
• Today, there is no rare earth element production of significance taking place in North America or anywhere outside of China, despite significant rare earth holdings existing in Montana, Idaho, Colorado, California, Canada, and Australia
• Chinese domestic demand for rare earth elements could easily equal Chinese production as early as 2012
•Chinese plans to limit or prohibit export of rare earths



Criticality Matrix (US National Academies, 2008)

This matrix was devised by the U.S. National Academies and published in 2008 in Minerals, Critical Minerals, and the U.S. Economy (2008)

Specialty Metals Legislative History

Legislative History

- The Berry Amendment
  - Requires the DoD to procure certain items from domestic sources
    - Origin in 1940s textile industry
  - 1973 Specialty Metals Provision:
    - Restriction on the purchase of strategic materials considered critical for national security not melted or produced in the United States

Legislative History Cont.

- Berry Amendment is not Buy American
  - Under Berry, items must be grown, reprocessed, reused, or produced in the United States
  - BAA applies to all supply purchases of domestic supplies or construction materials
  - BAA is applicable to the entire Federal Government while the Berry Amendment affects DOD

Legislative History Cont.

- Specialty metals clause lax enforcement created problems in the early 2000s
  - GAO report uncovered unjustified waivers
  - DOD moved to strict enforcement challenging the status quo in the supply chain
  - Industry advocated on both sides of the issue for reform

Legislative History Cont.

- Numerous reforms adopted by Congress FY07-08
  - Exemptions for de minimis content in commercial electronic components
  - Waivers of the clause allowed as well as “get well period”
  - Zero tolerance approach

Legislative History Cont.

- Waivers and Exemptions Expanded in 2008:
  - Exempts all electronic components
  - Exempts commercial off-the-shelf (COTS) items (not including high performance magnets)
  - 2% de minimis rule (exempts high performance magnets)
  - Market basket (i.e. comingling)
  - National security exemption added

Legislative History Cont.

- FY09 - HASC concern over DOD implementation and draft rule
  - Definition of “production”
  - Definition of “high performance magnet”
- 2009 – DOD implements “Final Rule”

Strategic Materials Protection Board

- The FY07 NDAA established the Strategic Materials Protection Board to assess the need for long-term domestic supplies of strategic materials considered critical to national security
  - Chaired by USD AT&L
  - Services Represented
  - Goal – Understand what we don't understand – dive down into the supply-chain to examine sources of supply for DOD weapon systems

2008 Strategic Materials Protection Board Report

- "...**Specialty metals are not 'materials critical to national security'** for which only a U.S. source should be used; and **there is no national security reason for the Department to take action to ensure a long term domestic supply of these specialty metals**..."
- "High purity beryllium, however, is a critical material...the Department should continue to take those special actions necessary to maintain a long term domestic supply of high purity beryllium..."

Opposition

- Industry:
  - Subcontractor compliance challenges
  - Overzealous enforcement
- Government:
  - Senate provisions
  - Administration SAP

Current Legislative Activity

July 2009 HASC Hearing on National Defense Stockpile

- Lack of information about critical materials exists
- Clear definition of strategic materials is needed
- Reconfiguration of National Defense Stockpile:
  - A new approach to meet current and future DOD strategic needs
  - An interagency, collaborative approach strengthened by the use of experts and timely global market research and intelligence
  - An integrated risk assessment construct to analyze supply sources and risks of supply chain interruption, and identify mitigation strategies

FY ’10 National Defense Authorization Acts

- Senate: DSB report on current and projected domestic and worldwide availability
- House: GAO report on availability
- The final report will likely include:
  - Source of RE
  - Projected availability
  - Use in DOD systems
  - Risk of dependence
  - Global trends

Rare Earth Options for the Future

- Single industry government/private investment as source of domestic supply
- Industry coalition to advance rare earth development and competitive market development
- Sanctions against Chinese market manipulation
- Public-Private partnership
- Domestic defense stockpile of rare earths
- Internationally supplied stockpile

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