



DEFENSE LOGISTICS AGENCY

AMERICA'S COMBAT LOGISTICS SUPPORT AGENCY



DLA Strategic Materials NDIA – E2S2

Strategic Material Supply Mitigation
Initiatives within DLA – Strategic Materials

David Hardy

May 24, 2012

Report Documentation Page

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Definitions of critical and strategic

The SMPB Executive Secretary in its meeting on December 12, 2008 detailed definitions for the following terms:

- **Strategic Material**
 - 1) A material which is essential for **important** defense systems.
 - 2) A material which is **unique** in the function it performs.
 - 3) A material for which there are **no viable alternatives**.
- Material Critical to National Security (“**Critical Material**”)
 - 1) A material for which the Department of Defense **dominates** the market for the material.
 - 2) A material the Department’s full and active involvement and support **are necessary** to sustain and shape the strategic direction of the market.
 - 3) A material (for which) there is significant and **unacceptable risk** of supply disruption due to vulnerable U.S. or qualified non-U.S. Suppliers.



The List of Strategic Materials Should Be Dynamic and Relevant

| | | | | | | | | | | | | | | | | | | | |
|------------------------------------|-----------------------------------|---------------------------------------|------------------------------------|---------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-------------------------------------|----------------------------------|-------------------------------------|----------------------------------|------------------------------------|-----------------------------------|------------------------------------|----------------------------------|------------------------------|-------------------|--|
| | | | | | | | | | | | | | | | | | | | |
| 1 H Hydrogen 1.0 2.1 | | | | | | | | | | | | | | | | | | 2 He Helium | |
| 3 Li Lithium 6.9 4.0 | 4 Be Beryllium 9.0 1.8 | | | | | | | | | | | 5 B Boron 10.8 2.0 | 6 C Carbon 12.0 2.0 | 7 N Nitrogen 14.0 2.0 | 8 O Oxygen 16.0 2.0 | 9 F Fluorine 18.9 4.0 | 10 Ne Neon 20.2 | | |
| 11 Na Sodium 22.9 0.9 | 12 Mg Magnesium 24.3 1.2 | | | | | | | | | | | 13 Al Aluminum 27.0 1.8 | 14 Si Silicon 28.1 2.0 | 15 P Phosphorus 31.0 2.1 | 16 S Sulfur 32.1 2.5 | 17 Cl Chlorine 35.5 3.0 | 18 Ar Argon 39.9 | | |
| 19 K Potassium 39.1 0.8 | 20 Ca Calcium 40.1 1.0 | 21 Sc Scandium 44.9 1.2 | 22 Ti Titanium 47.9 1.5 | 23 V Vanadium 50.9 1.8 | 24 Cr Chromium 52.0 1.6 | 25 Mn Manganese 54.9 1.8 | 26 Fe Iron 55.8 1.8 | 27 Co Cobalt 58.9 1.9 | 28 Ni Nickel 58.7 1.9 | 29 Cu Copper 63.5 1.0 | 30 Zn Zinc 65.4 1.0 | 31 Ga Gallium 69.7 1.8 | 32 Ge Germanium 72.6 2.3 | 33 As Arsenic 74.9 2.0 | 34 Se Selenium 78.9 2.4 | 35 Br Bromine 79.9 2.8 | 36 Kr Krypton 83.8 | | |
| 37 Rb Rubidium 85.5 0.8 | 38 Sr Strontium 87.6 1.5 | 39 Y Yttrium 88.9 1.2 | 40 Zr Zirconium 91.2 1.4 | 41 Nb Niobium 92.9 1.8 | 42 Mo Molybdenum 95.9 1.9 | 43 Tc Technetium 98.9 2.0 | 44 Ru Ruthenium 101.1 2.2 | 45 Rh Rhodium 102.9 2.2 | 46 Pd Palladium 106.4 2.2 | 47 Ag Silver 107.9 2.5 | 48 Cd Cadmium 112.4 1.7 | 49 In Indium 114.8 1.7 | 50 Sn Tin 118.7 2.3 | 51 Sb Antimony 121.8 2.5 | 52 Te Tellurium 127.6 2.7 | 53 I Iodine 126.9 2.5 | 54 Xe Xenon 131.3 | | |
| 55 Cs Cesium 132.9 0.7 | 56 Ba Barium 137.3 0.8 | 57 La Lanthanum 138.9 1.2 | 58 Ce Cerium 140.1 1.3 | 59 Pr Praseodymium 140.9 1.3 | 60 Nd Neodymium 144.2 1.3 | 61 Pm Promethium 144.9 1.3 | 62 Sm Samarium 150.4 1.3 | 63 Eu Europium 151.9 1.3 | 64 Gd Gadolinium 157.3 1.3 | 65 Tb Terbium 158.9 1.3 | 66 Dy Dysprosium 162.5 1.3 | 67 Ho Holmium 164.9 1.3 | 68 Er Erbium 167.3 1.3 | 69 Tm Thulium 168.9 1.3 | 70 Yb Ytterbium 173.0 1.3 | | | | |
| 87 Fr Francium 223 | 88 Ra Radium 226 | 103 Lr Lawrencium 261 | 104 Rf Rutherfordium 261 | 105 Db Dubnium 262 | 106 Sg Seaborgium 263 | 107 Bh Bohrium 264 | 108 Hs Hassium 265 | 109 Mt Meitnerium 266 | 110 Uun Ununium 267 | 111 Uuu Ununium 268 | 112 Uub Ununium 269 | 113 Uuq Ununium 270 | 114 Uuq Ununium 271 | 115 Uuh Ununium 272 | 116 Uuh Ununium 273 | 117 Uue Ununium 274 | 118 Uuo Ununium 275 | | |
| 57 La Lanthanum 138.9 1.2 | 58 Ce Cerium 140.1 1.3 | 59 Pr Praseodymium 140.9 1.3 | 60 Nd Neodymium 144.2 1.3 | 61 Pm Promethium 144.9 1.3 | 62 Sm Samarium 150.4 1.3 | 63 Eu Europium 151.9 1.3 | 64 Gd Gadolinium 157.3 1.3 | 65 Tb Terbium 158.9 1.3 | 66 Dy Dysprosium 162.5 1.3 | 67 Ho Holmium 164.9 1.3 | 68 Er Erbium 167.3 1.3 | 69 Tm Thulium 168.9 1.3 | 70 Yb Ytterbium 173.0 1.3 | | | | | | |
| 89 Ac Actinium 227.0 1.1 | 90 Th Thorium 232.0 1.3 | 91 Pa Protactinium 231.0 1.5 | 92 U Uranium 238.0 1.7 | 93 Np Neptunium 237.0 1.3 | 94 Pu Plutonium 244.1 1.3 | 95 Am Americium 243.1 | 96 Cm Curium 247 | 97 Bk Berkelium 247 | 98 Cf Californium 251 | 99 Es Einsteinium 252 | 100 Fm Fermium 257 | 101 Md Mendelevium 258 | 102 No Nobelium 259 | | | | | | |

Standard Materials
 Specialty Materials
 "New" Materials

The Periodic Table is not all inclusive! It includes only elements!

4 Managed by UT-Battelle for the U.S. Department of Energy





Shortfall Shortage Mitigation Strategy

- Improved **re-use** and **recycling** of materials through targeted end of life actions and in-process **conservation** of materials.
- **Understanding** of the current levels of recycling and re-use of defense materials and components.
- **Identification of the barriers** to greater levels of recycling and re-use, particularly for materials identified as strategically important to defense or critical in terms of supply risk.
- **Development of programs and applicable policy** solutions to mitigate strategic and critical materials issues.

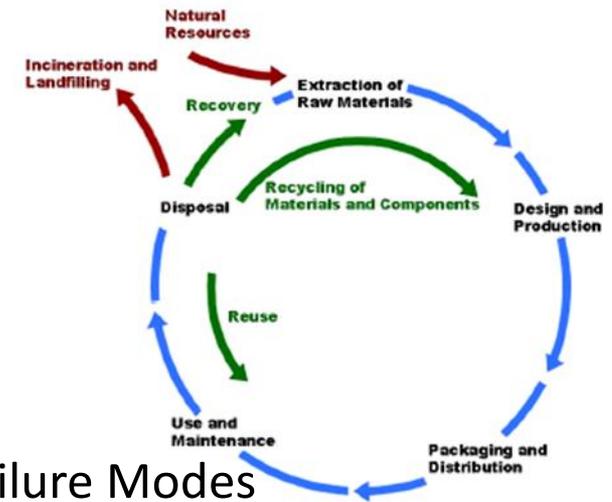


Shortfall Shortage Mitigation Strategy

RECYCLING (will require coordinated effort)

Efficiency (reduce front-end scrap)

- Near Net Shape Processing
- Intimate Processing
- **END of Life (long-term recovery)**
 - Life cycling modeling
 - Predictive Means to Evaluate Multiple Failure Modes
- **Material(s) Identification**
 - Multi-tiered Supply Chain
 - Bar-Coding, Labeling, Inscribing
 - Data Codes into FLSS/NSNs



Life Cycle Diagram



Materials Processing



End-Items



DLA Strategic Materials

- Programs listing (8)
 - DLA and Strategic Materials Management (Materials Identification)
 - Beryllium (DoD and DOD applications, Bulk Billet Upgrade) (Materials Conservation, Recycling)
 - Germanium (Billet Wafering and recovery) (Upgrade, Conservation)
 - Insensitive munitions (TATB, Fuze Molding Powders) Recycle
 - Super-Alloys (Rhenium, then Cobalt and Nickel) Possible Recycle Program
 - Magnetics (Master Alloy Buffers) Conservation
 - Rare Earths (Policy, Industrial, Dy, Er, Eu, Gd, Nd, Pr, Y)
 - Titanium (armaments and recovery policy) Conservation



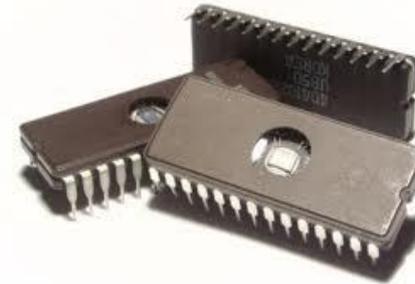
Strategic Materials Management



Clothing & Individual Equipment



Platforms, Guidance and Control



Microcircuits



Batteries



Strategic Material Management System

DLA SM and DLA R&D

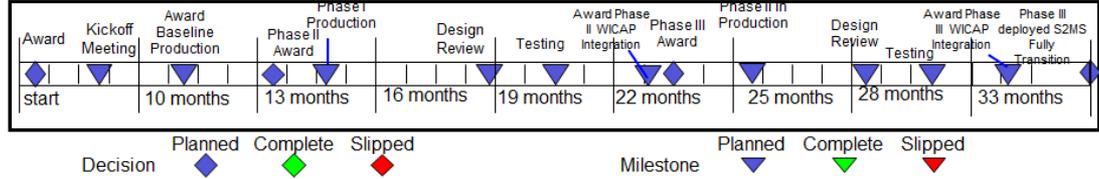
- Development of Statement of Work to Design Program (Draft Under Review)
- Intra-Agency Program which will involve many DLA Staff Offices (J3, DLA DS, DLA R&D, etc.), plus Interface with DoD (Services)

| | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------|---------------------------------------|
| Portfolio: SCM | Sponsor: Mr. Luis Villarreal | Customer: Buyer/Industry | Implementer: J-74/MTS/Deloitte |
| Strategic Plan/Director's Guidance Link: Warfighter Support Enhancements and Business Process Refinements | | | |
| Project sends, receives, or stores data (IT): Yes J-6 POC (if applicable): Patrick Mulcahy (IA) R&D Mgr: N. Seiling 804-279-5120 | | | |
| Program Manager's Assessment: ████████ S2MS included in IBMS/WICAP IT Dashboard – Baseline to deploy NLT 3/31/2010 | | | |

Problem: Raw materials represent a critical path constraint to defense manufacturers. Availability directly impacts an industry's capability to surge production during war or to meet other surges in demand (e.g., grounded weapon system for safety requiring 100% replacement). **Additionally, the Defense National Stockpile Center (DNSC) as manager of the Strategic Material Security Program (replaced National Defense Stockpile) requires identification of strategic materials required to support DoD Weapon Systems, supply chain risks and actions to mitigate the risks.**

Objective: Develop tool set for functionality for the Worldwide-web Industrial Capability Assessment Program (WICAP) to collect and analyze material production requirements and market intelligence (capacity, capacity, product lines, closings, expansions, feeder stocks), assess supply chain risks and identify mitigation strategies.

| Project Costs: (\$ in Millions) | | | | | Insert total cost here | | Key Performance Indicators | | Threshold | Objective | Actual |
|---------------------------------|----------------------|-----------|-----------|-----------|------------------------|--|----------------------------|--------|-----------|-----------|--------|
| | FY Year 1 | FY Year 2 | FY Year 3 | FY Year 4 | FY Year 5 | | | | | | |
| R&D | 0.800 ¹ | 0.500 | 0.250 | | | | Companies Registered | 50 | 200 | 0 | |
| Other | 1.250 ^{2,3} | 0.080 | 0.080 | | | | Part-to-Material Mapping | 50,000 | 140,000 | 0 | |





DLA R&D Conclusions for DLA Strategic Materials

R&D Challenge:

- Automated capture of commercial and engineering data into the Federal Logistics Information System (FLIS)

R&D Objectives:

- Improve the quality, speed, and cost of logistics data acquisition and management
- Effectively map the Strategic Materials within Defense Weapons Systems
- Develop the process and tools for managing acquisition, reutilization and disposition decisions related to Strategic Materials content



Plans:

- Provide tools to military activities via DoD Engineering Drawing & Modeling Group
- Initiate projects in technical data mining

Methodology:

- Leverage capabilities of DLA Logistics Operations R&D (J335)
- Parametric search tools for product characteristics (DLIR)
- Logistics and technical data sharing with OEMs (DLIR, WSS)
- Mapping technical characteristics (Casting & Forging)
- Develop decision-based and risk assessment tools (WSS, SCM)
- Conduct business process analysis and roadmaps (WSS)



Beryllium

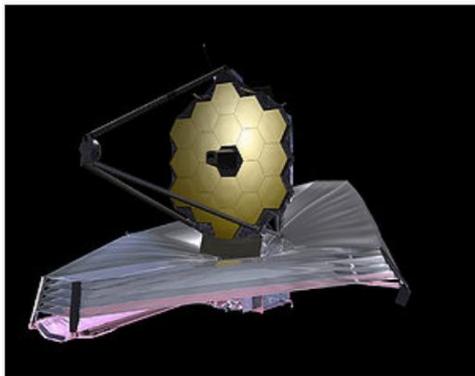
■ Pure Be and high Be composites

- Light weight, stiff (guidance, optics, missiles, etc.)
- Good thermal properties (electronic packaging)
- Transparent to x-rays (medical, etc.)
- Neutron reflector (weapons, reactors, etc.)

■ Two thirds of Beryllium Products' revenue (90% of the Be by weight) is defense and space

■ Major commercial applications

- x-ray windows (medical, industrial)
- detectors (scientific)
- acoustics (speakers)
- optical scanners
- semiconductor processing equipment



3/4 view of JWST from the "top" (opposite side from the Sun).

■ Fission test reactors

- Reflectors
- Detectors

■ Fusion reactors

- JET
- ITER

■ DoE Weapons

■ Nuclear fuels

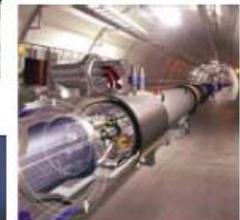
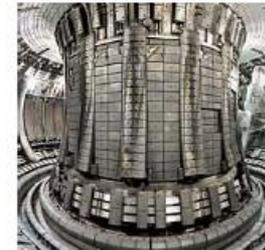
- Braze materials
- Additives (developmental)



Beryllium IMU

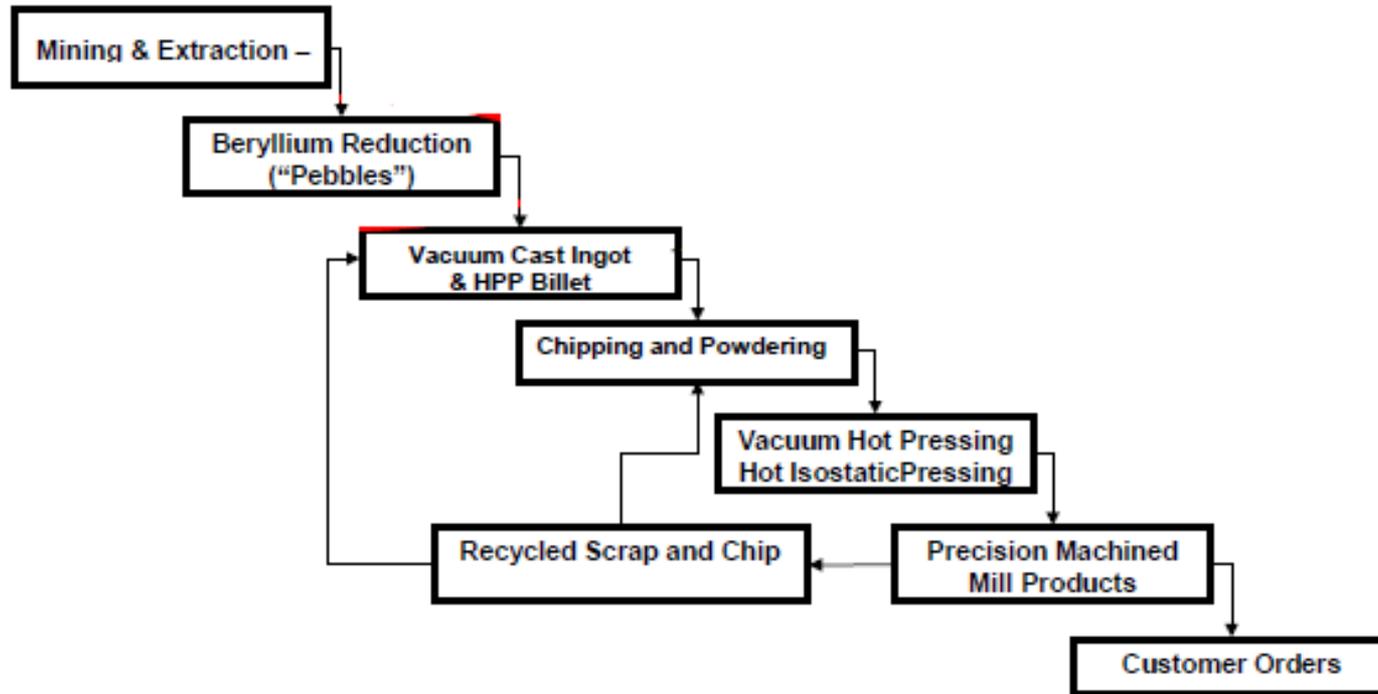


Beryllium Sunshade and Optics





Manufacturing Process for Be Metal Products



NOTE: Recovery of scrap presents a technology issue. As oxide will readily form, especially on fines, thus severely limiting ability to place back into process. Ideally, material is sourced to support near-net forming, thus minimizing waste and scrap up-front rather than design for recovery at product end-of-life.



Beryllium NDS Upgrade

FY 2017 – desired Beryllium Stockpile Upgrade complete

FY 2015 - program review possible contract award

FY 2015 - Apr program review possible contract award

FY 2014 - program review possible contract award

FY 2013 - program review possible contract award

FY 2013 – Qualification of quality sample deliveries

FY 2012 - initial contract award (pilot volume quantities)

FY 2012 – Final Review of Offers

FY 2012 - Issue Solicitation

Nov 2011 - Issue RFI

Oct/Nov 2011 – Prepare and Coordinate SOW within team

Jun/Oct 2011 – Review requirements & prepare/distribute Determination documents

May 2011 - FY11 and FY12 AMPs signed, Jul 2011 – FY11 Authority received for sales only

Feb 2011 – Initial upgrade proposal presented by Materion

Feb 2011 – FY12 AMP submitted, requesting authority for Be upgrade

Feb 2010 – FY11 AMP submitted, requesting authority for Be sales and upgrade

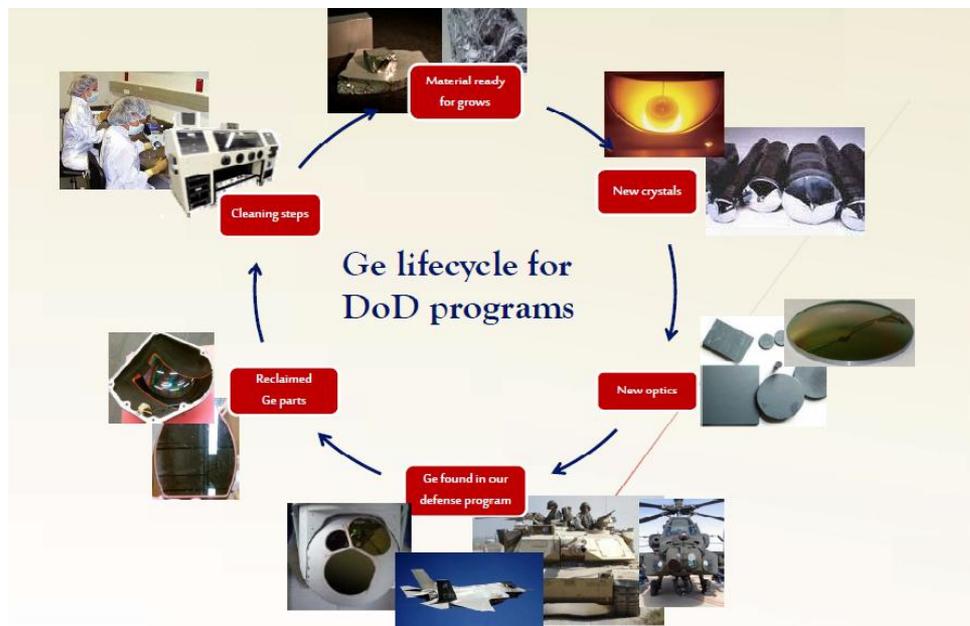
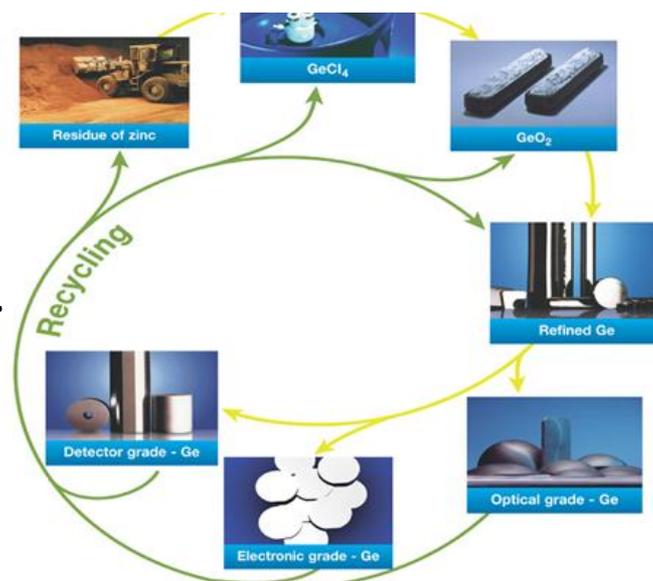
Project Scope:

Upgrade Be NDS to yield 50 tons total of 5 different HIP powders and nominal 20 tons of bulk metal

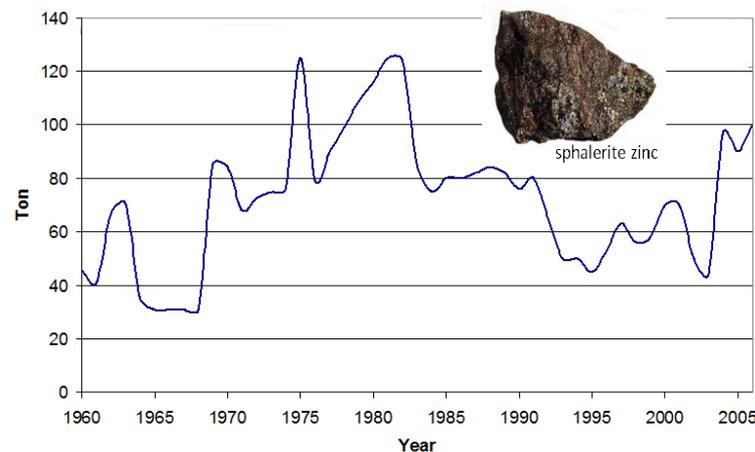


Germanium

- In 2007 35% of the demand was met by recycled germanium
- DoD requires Ge for wide range of products and applications such as “windows” and photovoltaic (PV) application (both terrestrial and space)
- Processing material further “up” supply chain, i.e. oriented doped wafers, conserves material while positioning stockpile to respond to DoD requirements, due to needs (crisis or natural disaster)



Ge world production



Sources of data are the U.S. Bureau of Mines and the U.S. Geological Survey—Minerals Yearbook (MYB); Mineral Commodity Summaries (MCS) and Commodity Data Summaries (CDS)



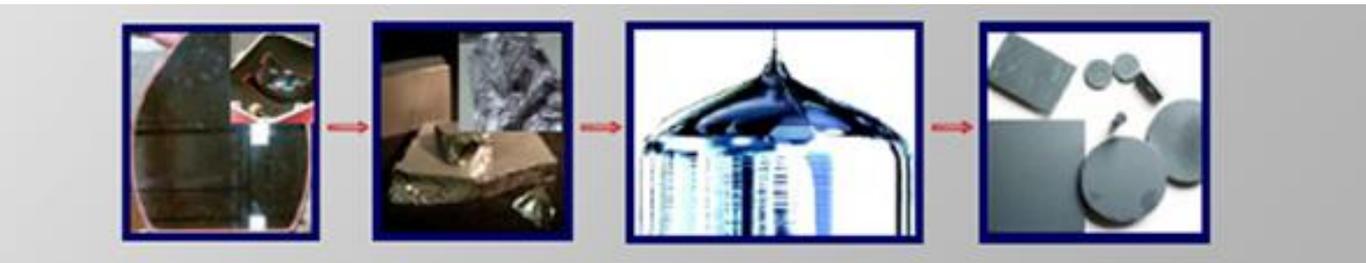
On-Going - Product End-of-Life Recycling (DCMO)

Department of Defense Germanium Reclaim/Recycling Program

Decommissioned infrared (IR) transmission windows which are used for target imaging are recycled. These windows, of various sizes and curvatures are found in FLIR components, such as laser guidance, missile targeting and night-vision/thermal imaging/sensing devices used in many system platforms, such as M1 tanks, Apache helicopters, AF fighter jets, ships, etc.



Any hazardous coats, such as Thorium must first be removed from recovered scrap/reclaimed materials. However accomplished, the scrap is refined for regrowth of new crystal boules/ingots for use in new IR components for platform applications.





Germanium Billet Upgrade (Material Conservation)

* Approved Project Scope:
 Phase 1 – FY 12 Upgrade 3,000 kg of NDS metal to unfinished, epi-ready space certified wafers
 Phase II - FY 14 Purchase 3,000 kg of 5N metal for the NDS

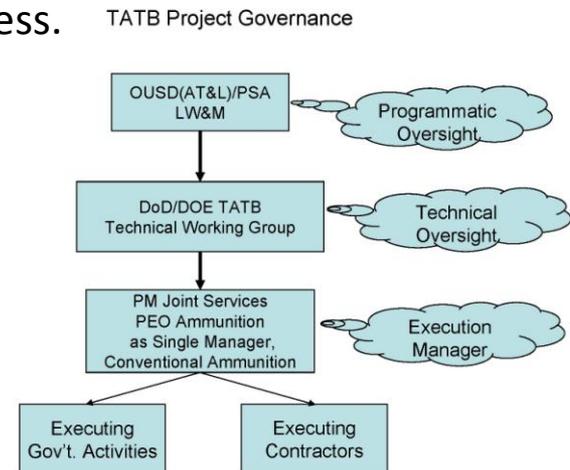




1,3,5-Triamino 2,4,6-Trinitrobenzene (TATB) Facilitization, A Joint DOD / DOE Collaborative Program

(Establish Process and Reclaim/Recycle Munitions)

- Memorandum of Agreement was executed on TATB in 2009, between the Department of Defense (DOD) and the Department of Energy (DoE). The MOA established a collaborative Program effort to develop and qualify a domestic production source for 1,3,5-Triamino 2,4,6-Trinitrobenzene (TATB) explosive.
- The Agreement facilitated by the Office of the Secretary of Defense, Land Warfare and Munitions (LW&M), was established between the Departments of Army, Navy and Air Force, and the National Nuclear Security Administration, DoE to produce TATB via the Benziger Synthesis Process.
- DLA SM to support efforts for Insensitive High Explosive (IHE) Triaminotrinitrobenzene (TATB) Based Molding Powders used for PBXN-7, PBXW-14, PBX-9502 and LX-17-series





Insensitive High Explosive Munitions (IHE)

1,3,5 trichlorobenzene (TCB), triaminotrinitrobenzene (TATB) and Molding Powders for PBXN-7/PBXW-14/PBX-9502/LX-17 series Fuzes

| TATB Facilitization Program | FY2009 | | | | FY2010 | | | | FY2011 | | | | FY2012 | | | | FY2013 | | | |
|---------------------------------------------------------------------------|----------------------------------------------|----|------------|------------|--------|----|----|----|--------------|----|------------|--------|--------------|--------------|--------------|----|--------|----|------------------|----|
| | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q | 1Q | 2Q | 3Q | 4Q |
| Department of Energy (DoE) Provides Services TATB from Strategic Reserves | [Yellow bar spanning FY2009 Q1 to FY2012 Q4] | | | | | | | | | | | | | | | | | | | |
| DoD Acquisition Strategy Approved | | | Sep 2009 ▲ | | | | | | | | | | | | | | | | | |
| Process Development Contracts Awarded | | | | Nov 2009 ▲ | | | | | | | | JULY ▲ | | | | | | | | |
| Design & Facilitization Contracts - BAE Only | | | | | | | | | [Yellow bar] | | | ▲ | | | | | | | | |
| Gate Review and Plant Construction | | | | | | | | | | | | | | [Yellow bar] | | | | | | |
| Debug and Proveout/ EM Qualification | | | | | | | | | | | | | | | [Yellow bar] | | | | | |
| Transition to Production | | | | | | | | | | | | | | | | | | | | ▲ |
| Reclamation and Qualification Program | | | | | | | | | | | | | | | | | | | | |
| DOD Decision to Proceed and Reclamation Contract Award to BAE | | | | | | | | | | | JAN 2011 ▲ | | | | | | | | | |
| Department of Energy (DoE) Provides PBX-9502 and LX-17 for Reclamation | | | | | | | | | | | | | | | | | | | | |
| Establish Reclamation Process, Prove-ou and Formulate N-7/W-14 | | | | | | | | | | | | | [Yellow bar] | | | | | | | |
| Testing and Shipping | | | | | | | | | | | | | | [Yellow bar] | | | | | | |
| DOD Qualification Testing | | | | | | | | | | | | | | | | | | | EM Qualification | |
| Reclamation Process Available to DOD | | | | | | | | | | | | | | | | | | | [Yellow bar] | |



DLA Strategic Materials is Active Member :

- **Interagency – Interservice Working Group** on Insensitive High Explosive Materials
- **Interservice Working Group** on Energetic Materials

Active DLA Strategic Materials Programs On-Going:

- **Funding** in-place for NNSA and DoE services TATB certification/qualification
- **Determinations complete** with intent to bring TATB and Molding Powders into the stockpile.

Program Accomplishments:

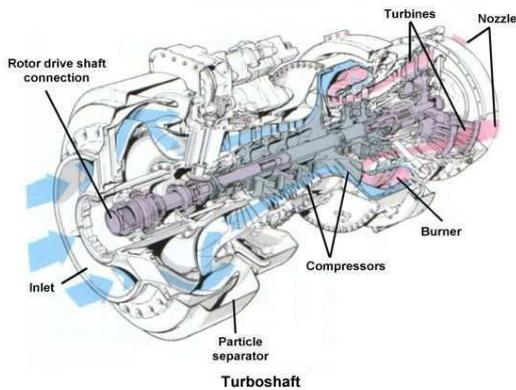
- Title III Installation completed and reclamation process developed by BAE Industries at HAAP.
- TATB pilot run using “reclaim” performed end-of-month April 2012.
- Process and results reported by DOD/DOE Working Group at JANNAF Conference, 30 April – 4 May 2012.
- Commercial effort reported on by BAE at NDIA IMEM, 14 – 17 May 2012.

DLA Strategic Materials Program Objective:

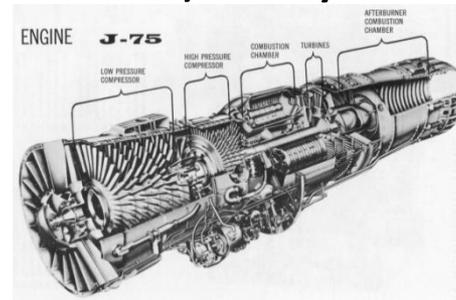
- Establish temporary **Vendor-Held Buffers for TCB and TATB**, (Eliminating requirement to re-introduce domestic TCB manufacture).
- **Acquire TATB and Molding Powders** for Sequestered Stockpile
- **Fund** Certification and Qualification Requirements for DoD and DOE uses.



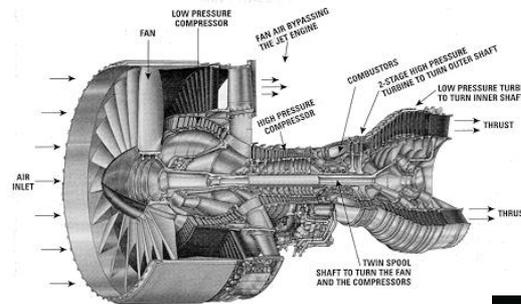
Super-Alloys (Rhenium, then Cobalt and Nickel) Recycle Potential



Refractory metal alloys include Rhenium, Nickel, Cobalt, Niobium, Molybdenum and Tantalum based alloys are used in Jet engines and rocket motors.

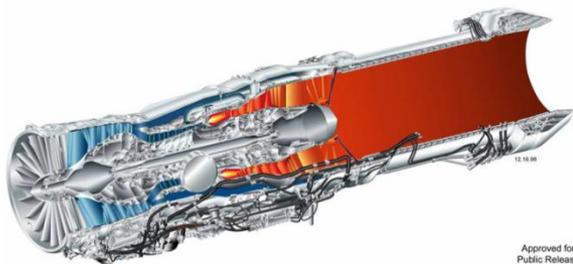


The twin-spool type Pratt & Whitney J-75 turbojet engine with afterburner as used in the F-105B Thunderchief



This is a Pratt & Whitney PW4084 turbofan

Joint Strike Fighter
F-35 Lightning II Propulsion
F135 Conventional Take-Off Landing



Approved for Public Release

Pilot end-of-life 3-year metals 2008-2011, recovery program at Tinker Air Force Base, from engines focused on Nickel alloys netted funds to cover cost-of-program, vendor profit and allow General US Treasury deposits.



Apollo CSM with the dark rocket nozzle made from niobium-titanium alloy



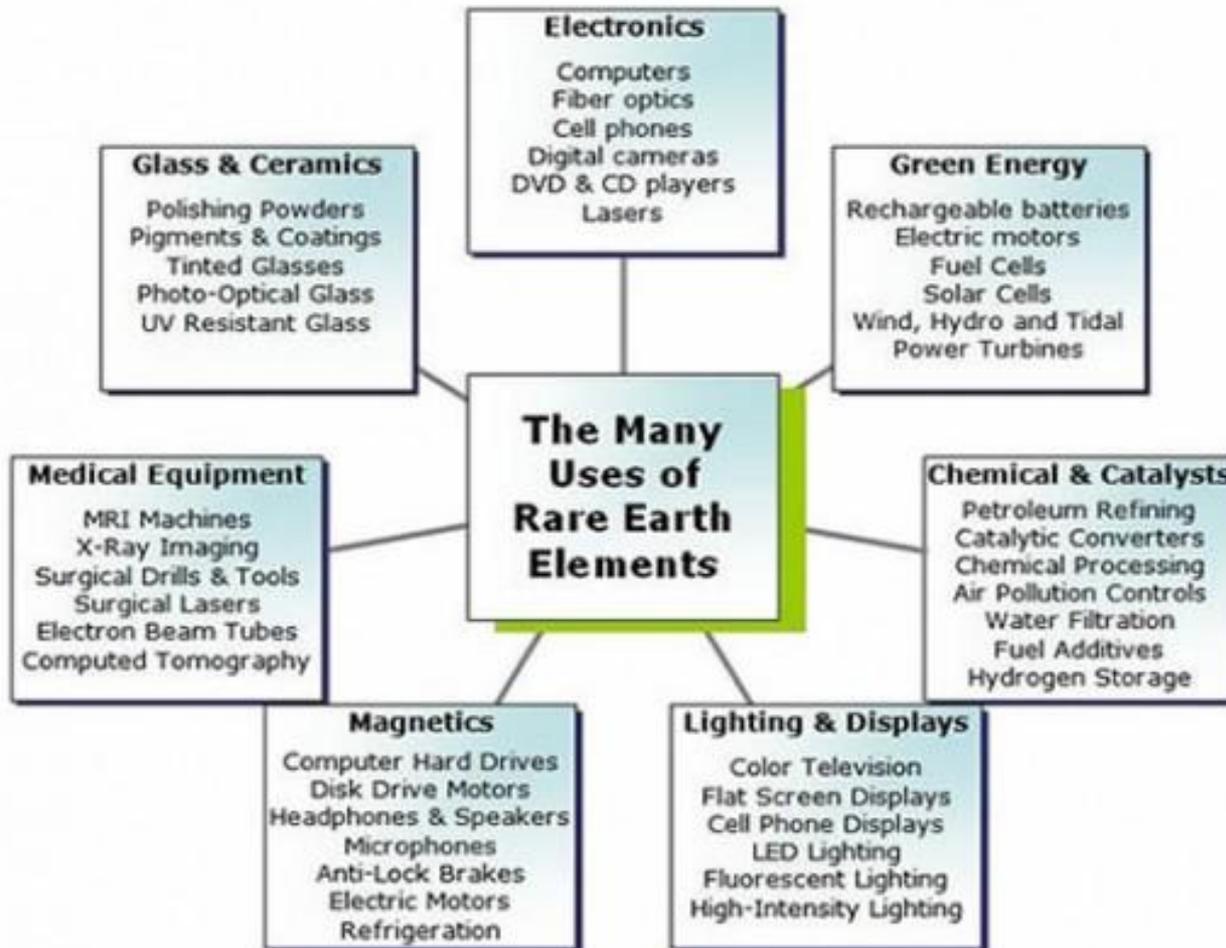
S&CM Recovery & Reuse Programs

- 2003-2008 – Rhenium costs and OEM lead times increase by 10X – Sourcing availability and DoD programs impacted
- 2008 – Services Sponsored Programs to Recover Refractory
 - April 2008, MetalOC-ALC Tinker AFB / GDIT start SMRRP Period of Performance
 - Jul 2008 – DA Sec Def directs NAVAIR to work w/ USAF, DLA (DNSC), DRMS, DSCR, and Gen. Arthur Morrell (No results noted - Navy explores independent “credit only” proof of concept with GEA.
 - Jun 2009 – Navy/GEA pilot “credit only” deal signed
 - May 2009 – SMRRP first “Notice of Availability “ to GE & Pratt for super-alloy auction
 - Jun 2010 – NAVAIR formal multi-year contract with GE
 - Jul 2010 – DLA-SM-MO outreach with AMARG regarding S&CM aviation scrap recovery results in contacts with Tinker AFB SMRRP representatives
 - Oct 2010 – DLASM delegation to ALC/processing facilities for process evaluation & meetings
 - Apr 2011 - USAF Economic Analysis reports SMRRP Proof of concept self funding & self sustaining with significant ROI
 - May 2011 - Air Force Audit Agency reports no adverse findings in SMRRP
- FY 2012 – DLA SM “DRAFT” Material Disposition Determination Documents for rhenium completed
 - Program under review regarding legal and work to be performed
 - Services and DLA SM coordination still on-going



Rare Earth Materials Program (Policy)

17 REEs, known as lights (cerium group – La, Ce Pr, Nd, Pm, Sm, Eu) and heavies (yttrium group – Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu), with “1000’s” of applications.

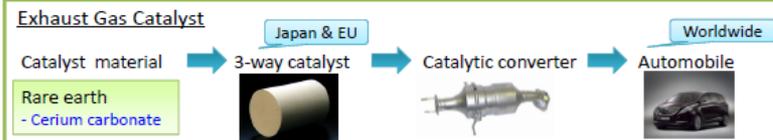
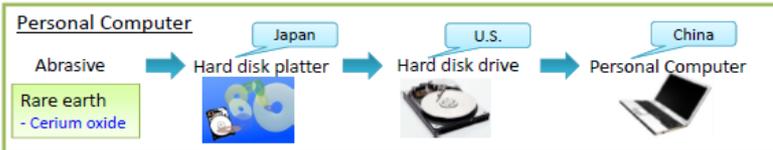




Rare Earth Materials Programs (Recommend Policy)

Examples of global supply chain

➤ The supply chain is integrated on a global scale.



- Base Ores, Processing and Final Products Involve World-Wide Trade Activities

Examples of global supply chain





DLA Strategic Materials, Actions to Effect Policy

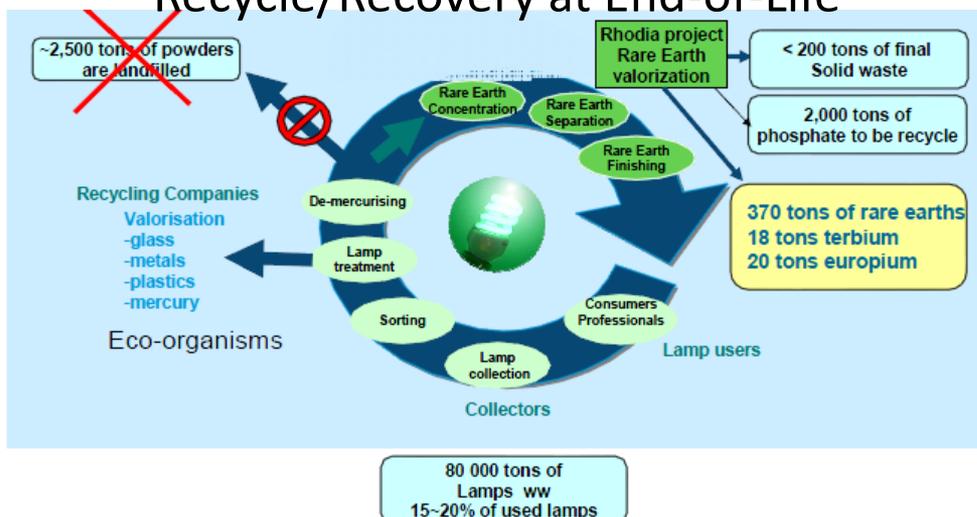
- **2011 NDAA, section 843**, report to congress on criticality of REE to DoD and Essential Civilian, finalized Jan 2012
- **2011 DLA SM RR Update** to congress, established REE strategic need for DoD and Essential Civilian.
- **2012 NDAA, section 853**, report to congress on establishment of NDS REE inventory, in work and expected to congress Sep 2012.
- **2012 NDAA, Section 1080**, HRC 112-329, report to Congress on REE Recycle Desirability and Feasibility is “in-work”.
- **2013 DLA SM RR** report to congress, material list focuses on REE strategic and DoD critical needs, in work with suspense of Jan., 2013.
- **Participant and member** in series of private industry/academic, inter-agency and international working groups;
 - Yale University (Materials Criticality Working Group)
 - “843/853” Working Groups (inter-service)
 - DOE (AMO, HUB, tri-lateral US, EU, JP)
 - TTCP (international GB, CA, AU, NZ), METI/JOGMEC (international US, JP)



Examples of Existing Governmental Policy and Incentive Programs

EU Program for Phosphors

Recycle/Recovery at End-of-Life



Japan Program for Abrasives Recycling

A example of policy package in Japan

Cerium oxide for abrasives

6/2011 Inport-157ton

1. Promoting repeated use by improvement of abrasive process

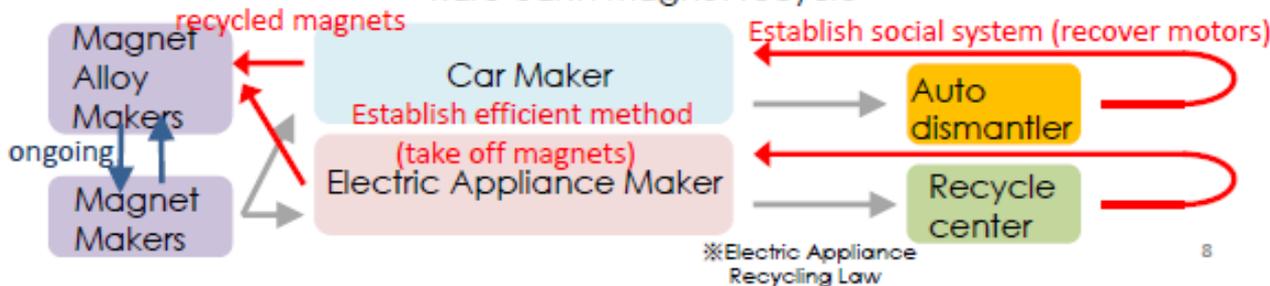
2. Promoting recycling by improvement of abrasive machine

3. Promoting the development of substitute materials (Substitute materials ZrO₂, Mn₂O₃)

Japan's domestic demand for cerium is expected to decrease by half.

Proposed EU Program Promoting Magnet Recycling

Rare-earth magnet recycle





Titanium Plate Purchase Program (Front-End Material Conservation, Recycle)

- Joint program between DoD and ARDEC to take advantage of established contracts at DLA Strategic Materials
- Using IDIQ contract, using set price and set customer and order
- Processing of purchased plates using water-jet cutting technology to minimize scrape and mill tailings.



Future possible programs

- Fluorspars (reclaim of industrial by-products)
- Ir upgrade - reclaim
- Sn upgrade (recovery of oxidized materials)
- III-V Metals (CZT wafering and Te program excess)
- Alternative Energetics
- Recovery of all DOE and other service/agency DOD program related excess materials (Be, BeO, Te, etc.)



QUESTIONS?

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DEFENSE LOGISTICS AGENCY

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