



# Beryllium Health and Safety Committee

Steve Abeln, Committee Chairman

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## Draft Meeting Minutes

June 18 – 19, 2003

DOE HQ Forrestal Facility, Washington DC

Meeting Minutes:

Steve Abeln, Dave Weitzman provided the welcome, J. McKenney went on an overview of the last meeting minutes.

### Steve Abeln - The Beryllium Metal Supply:

#### **Beryllium: What is it?**

Lightweight, 66% lighter than aluminum

Rigidity, 4x>aluminum, 2.5x>Titanium, and 1.5>steel

Heat capacity, highest of all metals

Thermal conductivity, 4x greater than steel, half of copper, equivalent to aluminum

Damping capacity, superior to aluminum and steel by a factor of two

Reflectivity: 98% in the infrared range

Transparent to X-rays

#### **Why do we need it?**

To maintain our military/surveillance strategic and tactical advantages:

- Strategic satellite applications
- Missile applications
- Target Acquisition (FLIR)) applications
- Nuclear applications

#### **Who supplies it?**

Sources:

- Western world supplier – BW
- Russia – Kazakhstan
- China
- India

Users:

- Currently 30% defense, remainder in foreign (our allies) and commercial

#### **How much do we have of it?**

In 2000, BW shut down their pebble process. Projected usage for the billet for beryllium would have lasted through 2016. This is time needed to build a beryllium facility. The present demand for beryllium is approximately 40-50k lbs./year.

We have only the National Defense Stockpile:

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- Congressional and Defense Department are pushing to liquidate the NDS assets.
  - We have already sold the BeCu alloy and beryllium ingot (450,000 lbs.)
- There remains between 200,000 and 250,000 lbs. Of usable beryllium billet in the NDS
  - Equates to approximately 20 to 25k lbs. Of parts (assuming a 10% utilization after machining)
- Protection of beryllium billet assets in the NDS is essential based on the unpredictable position of Brush Wellman
  - All of the NDS holdings of Be billet would be required to meet DOE START II rebuild scenarios

### **What threatens the supply?**

- Sole source supplier – Brush Wellman
  - Insufficient metal market to justify corporate capital investment
- Prevalence of CBD and liability for the commercial supplier
- Agency for toxic substances and disease registry (ASTDR) investigations
- DOE Rule making
- Obsolete commercial facility and operations
  - Plant built in the late 1950's
    - Engineering controls – HVAC, access control, environmental controls
    - Manufacturing technologies – refining, powder production, consolidation, machining
- Beryllium operations – part of plant on respirators
  - Approximately 100 workers
- Aerosol containment problems resulted in BW closing its metal refining operations (2000)
  - Currently buy Be ingots from the NDS (360k lbs.)
- Plant Layoffs nearly halved BW worker population from 800 to 550
- Under current economics, BW cannot justify a plant of their own

### **What happens if we lose the domestic supply?**

- Beryllium – no replacement and no substitute in several critical defense technologies
  - Provides the U.S. with both strategic and tactical advantages
  - Its loss will force the U.S. and its allies to become dependent on foreign sources
- Take no action and the U.S. will lose critical expertise
- If U.S. loses beryllium production control, U.S. also loses export control

### **DOD Usage**

- Strategic Missile Maintenance
  - Minuteman, Peacekeeper, Others
- Strategic Missile Defense
  - Ground Based Interceptor/Exoatmospherical Kill Vehicles
  - LEAP
  - Arrow, Others
- Applications
  - Guidance components
  - Optics
  - Electronic substrates
- Fighter Aircraft
  - F-22, F-16, JSF, others
- Helicopter
  - V-22, Comanche, others
- Applications

- Countermeasures
  - ATIRCM, SIRFC, Classified
- Fighter FLIR
  - LANTIRN, SNIPER/ATP, Terminator, IFTS, F-22 IR
- Helicopter FLIR
  - TADS/PNVS, Arrowhead, ATFLIR
- New developing UAV
- Computers, Power modules
- Radar subsystems
- Microwave substrates
- Strategic Missile Defense
  - SIBRS high and low, classified satellites
- Surveillance
  - Classified
- Communications
  - Classified
- Applications
  - Launch detect, tracking
  - Optic visual
  - Satellite Gimbals, structure
  - Nuclear survivability
- Nuclear Related Applications
  - Weapons maintenance
    - US DOE
    - UK MOD, France
  - Test Reactors
    - US DOE
      - HIFR, ATR, others
      - Fusion, ITER, JET
  - Others
    - Universities, Japan, Europe
  - Spallation Neutron Source
    - Oak Ridge, LANL
- Space Applications
  - Reusable launch vehicles
  - Science Missions
    - Next Generation Space Telescope, MARS Lander
  - Weather
    - NPOESS, Others
  - Commercial
    - Communications
      - Iridium, Globalstar, etc.
      - Imaging

Action Needed – Next Generation Beryllium Plant

The estimated 15 years to design and build a modern beryllium plant.

Requirements:

- Establish staffing

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- Safety Data
  - ARF data generation
  - Safety assessment report
- Technology Selection and Development
  - Process Modeling
  - Pilot scale prove-in
- Facility design
  - Approval of mission need
  - Preliminary conceptual design

### **Andy Wallo / Jack Blanchard - The Beryllium Metal Supply**

Need for Beryllium Coordinating Committee

Supply and lifespan of beryllium would be the focus of this committee.

There is a memo currently going through the concurrence process, EH has concurred, Science is reviewing, and will then be forwarded to the NNSA process. Once signed the deputy secretary will send out a memo officially forming the committee.

WT will be managing the committee, the near term supply will be the responsibility of NNSA and WT and will go forward with the development of a domestic supply.

The committee – subcommittee structure is being looked at so as to prevent a redundancy (i.e. the role of the BHSC in the committee).

In the initial start of the committee, DOE, NNSA, NASA, and DOD will have a constituency in the new committee. DOE will initialize the committee and then roll in the other agencies as it makes sense.

### **Kathy Creek (LANL) – The history of the Beryllium Health and Safety Committee**

The BHSC has been an ad-hoc forum for some number of years.

Presently, the officers are as follows:

Steve Ablen – Chairman  
 Kathy Creek – Vice Chair  
 Tom Ford – Vice Chair  
 John McKenney – Secretary

Formation of Committee / Subcommittee

- DOE / DoD Be coordination committee chartered to ensure future supply of Be

First Chair – Dick Corle, Rocky Flats Plant

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Members – LLNL, RFP, Y-12, LANL, Brush Wellman, USAF, AWE, LRRI, DOE HQ's, DOE AL

BMS Charter:

Standardization  
Environ. Surveillance  
Medical surveillance

Occupational health WG

- Medical surv.
- LPT
  - Standardization, validation
  - Epidemiology
- Animal Studies

Environmental Monitoring WG

- Definitions
  - Be worker, controlled areas, swipe samples, etc.
- Aerosol science
- Instrumentation
  - Standard, real time, analytical techniques
- Procedures, SOP's, training

Analytical Round Robin WG

- Formed to provide program of standards preparation, etc.

Approach of the BMS

- Plan was to develop work task description for submission to the Beryllium Coordinating Committee (BCC)

In 1992 the DoD source funding was cut by congress and the BCC was disbanded.

In 1995 Dick Corle retired and Rob Hadley from LLNL was selected as Chair. In 1997 Steve Ablen took over as chair.

We are now looking at becoming a subcommittee of the BCC again. There are FACA issues that will come into play since not every committee member is a federal government.

The committee has worked on standards documents, but there has not been a past push to make them part of the DOE standards. The question was raised on whether this committee should be a part of that. The committee reached consensus that while this is possible; we are not at that point. David Weitzman pointed out that in the interim, the federal employees would be the ones to present the documents and get them into the DOE system.

The Good Government Improvement Act conflicts with FACA to some degree, so it is possible that we could align ourselves with the GGIA to allow us to take advantage of our resources in private industry. Presently, the BCC has not had a meeting as of yet and has not defined what the possible roles and responsibilities of the BHSC will be.

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- PRO
  - We get to take advantage of the present
  - If we are to operate at a standards level, we need to have additional support. Until this happens, the effectiveness of the committee could be nominal
- CON
  - Heavy administrative work on the front end

The committee also discussed the formation of two different groups, one federal and one ad hoc group to coordinate meetings at the same time.

### **Ken Groves – Update: DOE-EH Annual Report Project**

Update:

- Completed revised “Be questionnaire” in Nov. ‘02
- Completed “Draft NNSA Be Annual Report (Pilot) – Dec. ‘02
- Discussions ongoing between DOE-EH, LANL, and NNSA-HQ as we speak

If a decision is made to implement “Demonstration Report” can be issued in less than 60 days

Report format:

- Forward
- Executive Summary
- Section 1 – Introduction
- Section 2 – Requirements
- Section 3 – Occupational Exposure to Beryllium at NNSA
- Section 4 – Exposure Reduction Activities at NNSA
- Section 5 – Surveillance Be Assoc Workers by work history
  - Current work
  - Work history of exposure
  - Signs or symptoms of exposure
  - Receiving Medical Removal Protection
  - To fill out the questionnaire at the 3 facilities that were looked at took approximately 1 person day per facility

### **Jim Slawski / Paul Wambach – North Las Vegas Investigation**

Paul Wambach briefed us on a case of CBD that the site became aware of in March of ’02. Paul briefed us regarding the data on the surface sampling results. There was Be machining that happened in the 80’s, and the buildings were decommissioned in the early 90’s and refurbished in 1994 as office space.

Once the exposure was detected, surface sampling was initiated. No substantial beryllium was detected that was suspected based upon the legacy usage. The building was vacated so that destructive testing could be performed (DOE investigation team was formed).

Carpet dust samples were obtained:

- All dirt removed from 1 square meter
- Weighed sample (grams)
- Analysis
- Calculate

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- No non-detect
  - Substantial beryllium levels were detected in the carpet samples in the first floor of the primary building where the exposures to personnel were the highest.

In addition, there is some data regarding lead in carpet. Once particulate is in a carpet, a fair amount of lead remains embedded into the material. The workers that were involved in the processing of the beryllium introduced the beryllium into the building. This was consistent with the findings of the team with no significant beryllium on surface samplings and air samplings. It is at least plausible that vacuuming the carpet may have been a transport mechanism from the carpet to exposure. (\* Note – extensive employment backgrounds of the sensitized employees were performed to rule out exposures from previous employment sources)

Paul briefed us on the background beryllium levels:

- Limit of quantification = 0.1 micrograms / gram
- Background in nearby soil = 0.35 micrograms / gram
- Background in carpet dust is less than the LOQ, but above the limit of detection and estimated to be = 0.077 microgram / gram
- Carpet dust is not solely dirt infiltrating in the building but includes dust generated inside the building.

Basic Characterization:

- DOE 10 CFR 850 requires basic characterization but there is no DOE guidance on methods.
- Bulk settled dust has fewer non-detects than wipe sampling.
- In North Las Vegas, microgram per square 100 cm was easier to interpret than microgram/gram data

### **Mandy Edens – Status of OSHA Rulemaking**

Since the last time that we met, last month OSHA announced that we would be proceeding with the proposed rule. The Small Business Regulatory Enforcement Fairness Act process will be initiated to ensure that the ruling will be fair in November of 2004. The main purpose of the site visits will be to see what the exposures to workers is, and what types of controls are being utilized, so that limits can be determined. This will feed into the economic and technological implementation feasibility regarding the final OSHA ruling. There is some concern regarding users outside the DOE / NNSA complex where the industry may not necessarily have the level of sophistication to accommodate a lower level.

The ruling will mandate that the limits be met with engineering controls. Some provision for PPE (i.e. respiratory protection, gloves, coveralls, etc.) measures are made only if the limits cannot be met with engineering controls, but these will be defined as well.

In addition, there is some guidance work for recycling (i.e. electronic components). The aim is to develop some guidance similar to that developed for the dental industry. It is premature to say what the ruling will encompass at this time since we are in the initial stages of the development rule. There is a review of mass versus particulate sizes as well as an airborne measurement.

Mandy also requested the input of the committee members as a resource for the ruling. SBREFA will be initiated in November of 2004. Once the panel is convened, a report will be generated and submitted for review of the recommendations to the OMB. Shortly thereafter it will be

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published as a formal proposal and open for public comment. An optimistic timeline for the publishing may be in the first quarter of '05.

The potential impact to the DOE rule, it's virtually assured that whatever OSHA's changes are, the DOE/NNSA will almost certainly mirror that. The rule references OSHA's limits, so there is not a reasonable way that it won't change. DOE has a history of adopting the most stringent rule.

### **Mike Watkins – DOE Release Criteria Guidance**

Release Criteria Guidance:

- Committee developed set of questions needing answers
- David Weitzman organized questions into rough outline
- Some of you submitted program documents and white papers from your site
- David and I made first attempts to extract answers from your documents
- Very rough first draft
  - Many questions are unanswered
- Please send additional information to
  - Mike Watkins (865.241.3341)
  - [watkinsrm@ornl.gov](mailto:watkinsrm@ornl.gov)
  - CC to [David.Weitzman@eh.doe.gov](mailto:David.Weitzman@eh.doe.gov)

Workshop will be in eh.doe.gov go to chemical management, there will be a notice for the workshop in November 4-6 here in Washington

### **David Weitzman – DOE/NNSA Research Agenda**

David Weitzman briefed the Committee on the numbers of DOE Beryllium Disease Current and Former Workers) of CBD and BeS cases.

Beryllium Health and Safety Issue:

- Operations with beryllium continue
  - Production, Clean up, and research

Knowledge Gap Categories:

- Workplace risk factors
- Exposure measurement methods
- Necessary levels of protection
- Disease process, diagnosis, and treatment

Limited Research is underway:

- Inventory identified 39 projects
- Most not DOE funded
- Not meeting DOE – wide needs

Worker Registry will help

Why an Integrated Program?

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- Events of Past Year Focused Attention
- Need Integrated Program to:
  - Better Protect Workers
  - Focus research to support DOE mission, e.g.
    - Real Time monitors
    - Fixatives as a disposal option
  - Avoid unproductive redundancies
  - Fill The knowledge gaps

Integrated Activities:

- DOE Offices and Field
- Other Federal Agencies
- Private Organizations

Implementing an Integrated Program:

- Inclusive Process for Determining Research Needs
  - Programs
  - Researchers
  - Workers
- Peer and Program Review of Research
- Application of Results to Mission

Next Steps:

- Recommendations to Senior Managers:
  - Need to be “actionable”
  - Background:
    - Time and Funds already spent
    - Need
    - Benefit
  - Proposed Schedule
- Provide recommendation in a couple of weeks

In the sheet today, we would like to add the columns to the existing research needs sheet of how it impacts the mission, and the crosswalks.

**Jay Larson – Presentation of the DOE Industrial Hygiene “Don Ross Award”**

Don Ross presented Paul Wambach with this year’s award.

**Kathy Creek – Beryllium Advanced Technology Assessment Team Final Report**

Background:

The DOE Rule change precipitated this report:

At the Beryllium Particulates and their Detection conference, the BeATAT was formed

NSSE's Advanced Technology Teams are appointed to assess the NWC technology needs and status.

Tasks:

- Specifications for instruments or methods
- Standard protocols for Method testing
- Plan for validation of instruments
- Communication
- Funding Resource List
- Priority Research List
  - Recommendations go to NNSA and the NW complex

Objectives:

- Improved Worker and public protection
- Improved productivity
- Characterize contamination migration
- Evaluate Legacy Areas

Kathy briefed us on the following instrumentation:

- LIGA instrumentation (currently being evaluated at Rocky Flats),
- Aerosol Focusing Laser Induced Breakdown Spectroscopy,
- ADA's LIBS Instruments,
- Los Alamos Monitor for Air Particulates (microwave plasma spectroscopy),
- AMZIL Beryllium Air Monitoring System,
- Surface-Enhanced Raman Scattering (SERS),
- Aerosol time of flight mass spectrometry (ATOFMS) – commercial unit,
- Adsorptive Stripping Voltametry Analysis of Beryllium in Dusts and Air Samples

In addition, Kathy briefed us on the Be ATAT members and the accomplishments to date (see presentation on web site).

Other briefing categories:

- Status of Technology development: Ten Instruments, zero have been validated.
- Criteria of evaluation
- Evaluation protocols
- Funding Resource List
- Path Forward (see costs in presentation on web site)
  - Phase I ID blue ribbon panel of experts
    - Establish contract for management of instrument development/evaluation
    - Establish contract to certify standard test materials
    - Year 1
  - Phase II – Instrument Development
    - Contractor to manage instrument development
    - Contractor to certify
    - Year 2 to 4
  - Phase III – Instrument Verification
    - Contractor to manage verification
    - Use EPA's Environmental Technology Verification as model

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- Year 5 on

Timeline: approximately 3 – 5 years to bring a suitable instrument to market.

Program Needs:

- Endorsement of approach
- Authorization to establish interagency agreements
- Assistance in providing required funding, staffing, and facilities.

### **All BHSC – Award Presentation**

Don Ross presented Paul Wambach with this year's award.

Break for lunch

### **All BHSC – Research Needs List**

The committee broke into subgroups to discuss the research needs list priorities, additions, deletions, corrections, etc.

The committee reconvened and discussed the results from the three groups. While some consensus was reached by the end of the day, the committee closed with agreeing to reset the ground rules tomorrow.

### **Mark Sutton – Beryllium Interactions with Aerogel-GAC Composites**

Aerogel:

- Silica based aerogels developed at LLNL have extremely low density, non flammable, non-toxic, lightweight and thermally stable up to 650 degrees C
- LLNL researchers have previously shown adsorbing properties of aerogel for uranyl and hexavalent Cr ions
- Granular activated charcoal added as solid support to increase mass, volume, and ease of handling
- BET analysis shows active surface area of aerogel?GAC composite  $500^2\text{m}^2/\text{g}$

Sorption Theory:

Charged surfaces can arise either from a chemical reaction of ionizable groups at the surface or from lattice imperfections

Chemical sorption is a chemical interaction between the solute and the surface

Experiment Details:

Mark briefed us with the details of the experiments and the results of the experiment. These specifics can be found in the electronic presentation on the web site.

Mark noted that the beryllium sorption was found between a pH of 4 and 10, and explained the mechanisms of the sorption.

Mark noted some improvements, noting that work is being done to improve specific beryllium sorption by incorporation of beryllium specific chelators.

Applications:

- Environmental and workplace cleanup of liquid beryllium waste
- Beryllium is used in a variety of industries across the US and the globe
- Scrap yards (especially electronics recycling)

Mark summarized his results, applications, and acknowledgements to the committee. These comments can be found on the electronic version of his presentation that will be posted on the web site.

### **All BHSC – Research Needs List Priorities**

Steve Abeln and Kathy Creek discussed the ground rules to debate the Research Needs Priorities List.

Three categories:

The need

The payoff

A lot of bang for the buck / the likelihood of success

How fast can we do it?

This list will be presented to the senior managers to give them an informed decision as to what support.

During the course of the general committee discussions, the group reached consensus that we should as a committee mission develop a book of case studies

Dr. David Wehrley briefed the group on considerations for the integration of the ideas in the Research Needs Priority List:

Biological / Medical:

Be subs/forms associated with risk

Exposure / Disease threshold

Screening Test

Diagnostic Test

Basic biological response / processes:

- Genetic susceptibility
  - Cause
  - Sufficient cause
  - Synergisms
- Immunologic / cellular responses in vivo
- Sensitization progression to CBD (risk / rates of progression)

Interventions / therapeutics:

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- Prevent sensitization in susceptibles
  - Immunization / pharmaceuticals
- Stop progression from sensitization to CBD
- Cure / induce permanent remission of CBD

The committee voted on the research needs list after editing the research needs for additions, deletions, clarifications and changes.

The final tally was submitted to David Weitzman for tallying and final formatting.

The following table shows the end result of the tally. Since the Needs rank and the Payoff rank were not significantly different, the Committee decided to combine the two and make only one rank as listed, final rank.

Needs Rank	Item #	Payoff Rank	Item #	Final Rank	Item # (brief description)
1	5	1	1	1	5 (Improve screening & diagnostic tests)
2	1	2	5	2	1 (Validate fine particulate lung deposition method)
3	10	3	10	3	10 (Real-time monitors)
4	15	4	9	4	15 (Animal model)
5	9	5	15	5	9 (Determine physico-chemical properties as they relate to risk)
6	2	6	8	6	2 (Develop method to quantify skin/mucous exposure as they relate to risk)
7	13	7	13	7	13 (Develop leading-edge engineering controls)
8	23	8	2	8	23 (Develop near-real time monitoring methods)
9	12	9	11	9	12 (Determine general population sensitization and CBD prevalence)
10	18	10	18	10	18 (Characterize operations in terms of health risk)
				11	16 (Determine relationship between surface contamination and health risk)
				12	19 (Develop standardized & validated surface/bulk sampling methods)

The committee approved the Beryllium Health-Related Research and Development Priority List.

#### **Next Meetings:**

It was decided that the next meeting would be held on November 3<sup>rd</sup> prior to the Chemical and Beryllium DOE meeting in Washington, D.C. The Committee may decide during the meeting on November 3<sup>rd</sup> to meet later in the week during the conference. The meeting in the Spring is tentatively scheduled for April 21-23 at the AWE in Aldermaston, England.

#### **Election of Officers:**

Kathryn Creek was unanimously elected Chair of the committee. The other officers, Tom Ford as Vice Chair and John McKenney as secretary were not changed.

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