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Executive Summary of the Beryllium Health & Safety Committee (BHSC) 2024 Spring Meeting

The Beryllium Health and Safety Committee (BHSC)
Washington, DC, U.S.A.
URL: https://berylliumhealthandsafetycommittee.com/

Executive Summary of the Beryllium Health & Safety Committee (BHSC) 2024 Spring Meeting

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The Beryllium Health & Safety Committee (BHSC) 2024 Spring Meeting was held on 23-24 April 2024 at the New Hope Center at the Y-12 National Security Complex in Oak Ridge, Tennessee, U.S.A. The meeting has been held annually since 1995, with a break due to the recent pandemic.

This Executive Summary is an abbreviated version of the Minutes of the Spring Meeting, which has omitted the images of the slides from the bulk of the technical presentations. A copy of the Meeting Minutes containing all presentation slides is available to dues-paid BHSC members in the Members Only section of the website, which may be accessed here: Login (berylliumhealthandsafetycommittee.com)

BHSC dues are $40 (USD) per individual per year and may be paid here:
Get Involved (berylliumhealthandsafetycommittee.com)

As participation in events like the BHSC Spring Meeting is offered with no registration fee, if attendees found the meeting to be worthwhile, it is hoped that they will consider becoming members. Support from paying dues helps to make it possible for the BHSC, a non-profit organization run exclusively by volunteers, to continue its work in the field and offer more meeting programs like this one in the future.

The BHSC 2024 Spring Meeting was organized by the BHSC's Meetings & Symposia Sub-Committee, with local support from members of the US Department of Energy (DOE) in Oak Ridge. The meeting was held both in-person and online. Overall, there were more than 120 participants, who came mainly from the U.S., but also from Canada, the UK, Germany, Switzerland, and India.

Keywords: Beryllium Health & Safety Committee (BHSC), Beryllium, Beryllium Oxide, Fusion Engineering, Irradiation Effects, Beryllide Intermetallic Compounds, Beryllium Fluoride, Plasma-Facing Materials, Neutron-Multiplier Materials, Health and Safety, Chronic Beryllium Disease, Beryllium Sensitization, Fusion Start-Ups, Molten Salt, FLiBe, FLiBe Purification, FLiBe Corrosivity, Tritium Extraction, Fluorescence Analysis, New Hope Center at Y-12, Oak Ridge National Laboratory, Y-12 National Security Complex

Table of Contents

Introduction & Post-Meeting Overview

The Beryllium Health & Safety Committee (BHSC) 2024 Spring Meeting was held on 23-24 April 2024 at the New Hope Center at the Y-12 National Security Complex in Oak Ridge, Tennessee. This meeting has been held annually as an in-person event from 1995-2019. Due to the pandemic, the Spring Meeting was not held from 2020-2022, and it was finally resumed again in 2023. There is also an annual Fall Meeting, and a larger BHSC Symposium that typically happens bi-annually.

Mission Statement

The BHSC is committed to promoting activities/efforts that will help to understand and prevent beryllium-induced conditions and illnesses, including beryllium sensitization (BeS) and chronic beryllium disease (CBD), that may be caused or exacerbated by workplace exposure to beryllium. The BHSC mission is primarily educational in nature, and is accomplished through generation, collection, and dissemination of information to members and other interested parties.

The Spring Meeting is an activity resulting directly from carrying out the foregoing Mission Statement. This year's meeting was organized by the BHSC's Meetings & Symposia Sub-Committee, with major technical support from U.S. DOE staff. Participants came mainly from the U.S., but also from Canada, the UK, Germany, Switzerland, and India. Some key aspects to this year's meeting:

- Run in a hybrid format with both in-person and online attendees and presenters
- Highlighted beryllium molten salt (FLiBe) as an up-and-coming product form
- Featured presentations from U.S. DOE facilities as well as fusion-focused research
- Announced the formation of a new FLiBe Sub-Committee, and they met for the first time
- Included participation from vendors, who presented their products and services in the field

The technical portions of the meeting were comprised of 14 presentations, including introductory remarks by U.S. DOE and NNSA senior leadership; updates and beryllium worker protection program activities from the U.S. Department of Energy and the NNSA; history of the U.S. DOE's beryllium medical surveillance program and Beryllium-Associated Worker Registry (BAWR); beryllium research activities in the fusion industry, including FLiBe molten salt; designing and building of a new, state-of-the-art award-winning beryllium fabrication facility in the UK; demolition of a beryllium-contaminated legacy reactor facility in the U.S.; and a call to action for revising the Beryllium Practitioner's Guide, a critically important BHSC activity that is now being launched in earnest. All of these presentations called attention to the importance of beryllium health and safety to ensure the success of the research.

There was also a BHSC business meeting, at which it was announced that the BHSC 2024 Fall Symposium would be held from 28-30 October 2024 in Las Vegas, Nevada.

The final BHSC 2024 Spring Meeting agenda is included near the beginning of this document to introduce the abstracts and presentations that follow. A list of organizations represented at the Meeting may also be found in the Appendices. Thanks again to all who participated to make this a great meeting!

Josef SOBIERAJ
Chair, BHSC Meetings & Symposia Sub-Committee
April 2024

BHSC 2024 Spring Meeting Agenda

The meeting agenda was organized under the leadership of BHSC Meetings & Symposia Sub-Committee Chair, Josef SOBIERAJ, with help from Committee Members Chris DORN of Kyoto Fusioneering and Be4FUSION, Gary GRIFFIN of GEG Consulting, Julie FOWLER of the NNSA, as well as BHSC Chair Roland CHRETIEN. Local support from U.S. DOE staff in Oak Ridge was provided by Katie McCLURE and Holly WALKER. Below is the version of the agenda that was presented at the meeting.

AGENDA – Beryllium Health and Safety Committee Meeting
23-24 April 2024 – New Hope Center at the Y-12 National Security Complex, Oak Ridge, Tennessee

All times listed below are Eastern Daylight Time (EDT)

Day 1 – Tuesday, 23 April 2024
Wamp Auditorium

Time (EDT)	Activity	Task Lead(s) or Speaker(s)
Morning (EDT) - available via webinar		
07:30	Coffee and Pastries / Meet and Greet	
08:30	BHSC Welcome and Overview	Chretien, Dorn, Sobieraj
08:45	Break	
09:00	YFO and CNS Senior Leadership Remarks	Hitson, West
09:15	Past to Present: History of DOE's Beryllium Medical Surveillance Programs and the DOE BAWR	Golden
09:45	Update to 10 CFR 850	Brown
10:15	Break / Group Picture	
10:30	Design and Implementation of Molten Salt Safety Program	Devine
11:00	BHSC FLiBe Subcommittee	Heldt
11:30	Overview of the Beryllium Field and Mobile Accreditation Program	Morton and Griffin
12:00	**Lunch**	
Afternoon (EDT) – available via webinar except for Tours		
13:30	Proposed 850 Limits for Beryllium – Is ICP an Option?	Bennett
14:00	Update on Beryllium-Related Activities in ASTM and ISO	Brisson
14:30	Break	
14:45	Nano-textile as Wipe to Decontaminate Surfaces	Doshi
15:15	Wrap-up	Chretien, Dorn, Sobieraj
15:30	Tours (TBD for In-Person Registrants)	
18:00	Evening Reception: Calhoun's Restaurant featuring Ray Smith, Y-12 National Security Complex Historian (Ret.)	Griffin

(Second day on next page)

Day 2 – Wednesday, 24 April 2024
Wamp Auditorium

Time (EDT)	Activity	Task Lead(s) or Speaker(s)
Morning (EDT) – available via webinar		
07:30	Coffee and Pastries	
08:30	Second-Day Agenda Review	Chretien, Dorn, Sobieraj
08:45	Challenges & Successes of Building a Beryllium Facility	Walker
09:15	Break	
09:30	Safe Demolition of a Be-Contaminated Legacy Test Reactor	Holden
10:00	Beryllium H&S in Fusion Materials Research at KBHF	Goraieb
10:30	Break	
10:45	A Practitioner's Guide to Beryllium Hazard Management	Field, Chretien, Adams
11:15	**Lunch**	
Afternoon (EDT) – available via webinar		
13:00	Vendor Technical Presentations	Moderator: Griffin
13:30	Break	
13:45	BHSC Business Meeting	Members
14:30	Break	
14:45	Subcommittee Breakout Sessions	Members
15:15	Break	
15:30	Reports from Subcommittee Breakouts	S/C Chairs
16:00	Wrap-up	Chretien, Dorn, Sobieraj
16:30	**Adjourn (End of Day)**	
End of Day 2		

(Note: BHSC Board Meeting: Monday, 22 April 2024)

BHSC Meetings & Symposia Sub-Committee

Name	Position	Organization
Josef SOBIERAJ	Chair	National Nuclear Security Administration
Chris DORN	Communications, Program, Logo Design, and Meeting Minutes	Kyoto Fusioneering America Ltd. Be4FUSION LLC
Gary GRIFFIN	Vendor & Sponsor Liaison Meeting Hotel Arrangements	GEG Consulting LLC
Julie FOWLER	Website Pages including Links Meeting Participant Registration & Coordination	National Nuclear Security Administration

BHSC 2024 Spring Meeting Vendor Organizations

The organizers of the BHSC 2024 Spring Meeting would like to thank the following vendors for their support of the event:

ALS Testing Services **Salt Lake City, Utah, U.S.A.**	**GVS-RPB:** **Respiratory Protection Solutions** **Royal Oak, Michigan, U.S.A.**	**Scientific Sales, Inc.** **Oak Ridge, Tennessee, U.S.A.**

Day 1: Beryllium H&S: DOE & CBD Program Updates, Fusion, Fission & FLiBe Molten Salt, and Field & Mobile Accreditation

Past to Present: A History of the U.S. DOE's Beryllium Medical Surveillance Programs including the Beryllium-Associated Worker Registry (BAWR)

A. GOLDEN (Oak Ridge Associated Universities, Tennessee, USA)

Past to Present: A History of the U.S. DOE's Beryllium Medical Surveillance Programs including the Beryllium-Associated Worker Registry (BAWR)

Ashley GOLDEN

Oak Ridge Associated Universities, Oak Ridge, Tennessee, U.S.A.
Oak Ridge Institute for Science & Education (ORISE), Oak Ridge, Tennessee, U.S.A.

The U.S. Department of Energy (DOE) Beryllium-Associated Worker Registry is a collection of health and exposure information of individuals potentially at risk for chronic beryllium disease (CBD) due to their work at DOE-owned or leased facilities. Data reported to the Registry are analyzed and summarized for use in managing CBD prevention programs.

Title 10, Code of Federal Regulations, Part 850 (10 CFR 850), "Chronic Beryllium Disease Prevention Program," requires DOE sites to inventory and assess beryllium exposure hazards to determine whether employees are at risk for CBD. Sites that determine employees are at risk due to ongoing or past work must implement CBD prevention programs that include reporting health and exposure data to the DOE Beryllium-Associated Worker Registry.

Health data are collected through the operation of medical surveillance programs for current workers. Exposure data are collected through the operation of industrial hygiene programs at sites that have continuing beryllium operations.

The Oak Ridge Institute for Science and Education (ORISE) maintains the Beryllium-Associated Worker Registry for the Office of Environment, Health, Safety and Security (EHSS-13).

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10 CFR Part 850 Chronic Beryllium Disease Prevention Program Rulemaking Update
A. BROWN (US Department of Energy, Maryland, USA)

10 CFR Part 850 Chronic Beryllium Disease Prevention Program Rulemaking Update

April BROWN

US Department of Energy, Office of Worker Safety & Health Policy (EHSS-11), Germantown, Maryland, USA

The U.S. Department of Energy (DOE) published a Notice of Proposed Rulemaking (NOPR) for public comment in the Federal Register on 7 June 2016, proposing to amend its existing Chronic Beryllium Disease Prevention Program (CBDPP) regulations. In August of 2023, DOE proposed a new supplemental notice of proposed rulemaking to instead of adopting OSHA's current or prospective Time Weighted Average (TWA) Permissible Exposure limits (PEL).

The Department's proposed TWA PEL, short-term exposure limit (STEL), and action level would be consistent with OSHA's current TWA PEL, STEL, and action level. This presentation will discuss the upcoming final rule and will dive into final rule preparation process.

The presentation will also discuss the Implementation Guide for use with 10 CFR Part 850, Chronic Beryllium Disease Prevention Program. The purpose of this guide is to provide supplemental information and describe implementation practices to assist responsible employers in effectively developing, managing, and implementing a CBDPP.

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Design & Implementation of Molten Salt Safety Program

M. DEVINE (Commonwealth Fusion Systems, Massachusetts, USA)

Design and Implementation of Molten Salt Safety Program

Meghan S. DEVINE

Commonwealth Fusion Systems, Devens, Massachusetts, USA

The utilization of molten salts, specifically those containing beryllium, presents unique challenges in establishing a comprehensive safety and health program. This abstract outlines the primary hurdles encountered by Commonwealth Fusion Systems (CFS) in implementing such protocols, focusing on the inherent risk of beryllium exposure and understanding how exposure with molten salts differs from traditional metallic beryllium.

The decision to use beryllium molten salt for the ARC (Affordable, Robust, Compact) fusion device's design resulted in the development of a cross-disciplinary team to establish the needs of our first research space. Due to the need for flexibility, a temporary space was identified for the first lab work at CFS. During this set up and design, the Beryllium Worker Protection model was employed. This design focused on ensuring that beryllium containing material always had multiple layers of containment between beryllium workers and employees outside of the space, including gloveboxes, dressing rooms, and HEPA (High-Efficiency Particulate Air) filtration. As the design was completed, the team was able to focus on the logistics of completing work and how we would assess potential contamination.

CFS uses multiple methods for determining exposure and potential migration of beryllium in and outside the lab space. For personal and area air monitoring, OSHA 125G has been used. These results, however, cannot be used when real-time data is needed for informed decisions. This need has been supplemented by the Berylliant system, which has allowed us to take wipe samples and analyze immediately. This has been crucial in understanding where packaging could be contaminated and how effective cleaning is. During the setup and initial experimentation with FLiBe (lithium-beryllium-fluoride), we have learned crucial lessons on sampling and data interpretation, PPE (Personal Protective Equipment) selection for worker safety and comfort, and continued education for non-beryllium workers to understand their personal safety.

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Beryllium Health & Safety Committee: FLiBe Sub-Committee

G. HELDT (Materion Brush Inc., Ohio, USA)

Beryllium Health and Safety Committee: FLiBe Sub-Committee

Gregory H. HELDT

Materion Brush Inc., Mayfield Heights, Ohio, USA

Historically, beryllium health and safety efforts have revolved around controlling occupational exposure to commercially available forms of beryllium, including beryllium metal, beryllium alloys, and beryllia ceramics. In October of 2023, Kairos Power, in partnership with Materion, completed the production of 14 tons of lithium beryllium fluoride (Li_2BeF_4), or FLiBe, for a fluoride salt-cooled high-temperature reactor. This initiated the largest FLiBe transfer since the US Molten Salt Reactor Experiment at Oak Ridge National Laboratory in 1969. Universities, private industries, and government agencies are increasingly researching FLiBe for application in new energy technologies.

FLiBe is a molten salt made from a mixture of lithium fluoride (LiF) and beryllium fluoride (BeF_2) with potential applications as a coolant in molten salt-cooled nuclear fission reactors and as a liquid blanket for ARC fusion reactors. Beryllium salts, such as BeF_2 and FLiBe, are soluble compounds and require special industrial hygiene and design considerations beyond typical controls used for insoluble metal forms of beryllium.

To address the growing commercial and research presence of FLiBe, the Beryllium Health and Safety Committee proposed the formation of a new subcommittee to engage private industry, government agencies, and universities on the safe and responsible handling of FLiBe for use across a broad range and scale of fission and fusion energy applications. The subcommittee is meant to act as a clearinghouse of information to share and establish best practices and worker protection models for the reduction of occupational exposure to soluble forms of beryllium, control of beryllium migration from designated beryllium work areas, and the prevention of beryllium sensitization and chronic beryllium disease.

The scope applies to all uses of FLiBe, from laboratory-scale research efforts to FLiBe production and purification systems, to the implementation of FLiBe for prototypes and energy-producing machines. Those working with FLiBe, or are planning to work with FLiBe, are encouraged to join and contribute to the subcommittee.

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Overview of the Beryllium Field and Mobile Accreditation Program

C. MORTON & G. GRIFFIN (American Industrial Hygiene Association, Virginia, USA)

Overview of the Beryllium Field and Mobile Accreditation Program

Cheryl O. MORTON[1] and Gary E. GRIFFIN[1,2]

[1]American Industrial Hygiene Association (AIHA) Laboratory Accreditation Programs, Falls Church, Virginia, USA
[2]GEG Consulting LLC, Shorewood, Illinois, USA

AIHA Laboratory Accreditation Programs released a new Policy Module (Module 2 G) on May 15, 2023 called the Beryllium Field/Mobile Accreditation Program (BeFAP.) Developed in collaboration with members of the Beryllium Health and Safety Committee, BeFAP gives mobile units and field operations analyzing Be the same opportunities as fixed site stationary laboratories to become accredited.

Each accredited mobile or field entity will have its own independent accreditation (and AIHA LAP identification number and symbol) and may be able to share quality management systems with other field/mobile operations.

AIHA LAP is a third-party, internationally recognized accreditation body that conforms to the requirements of the ISO/IEC 17011:2017, while laboratories seeking accreditation must conform to the requirements of the ISO/IEC 17025:2017, in addition to program-specific requirements as detailed in AIHA-LAP. The speakers will provide an overview of AIHA LAP and provide details about BeFAP and its requirements including how site assessments will be conducted.

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Proposed 10 CFR 850 Limits for Beryllium: Is ICP an Option?

J. BENNETT et al. (Lawrence Livermore National Laboratory, California, USA)

Proposed 10 CFR 850 Limits for Beryllium: Is ICP an Option?

Jack BENNETT and Cora MADDEN

Lawrence Livermore National Laboratory (LLNL), Livermore, California, U.S.A.

Inductively coupled plasma - optical emission spectroscopy (ICP-OES) is a cost-effective method of analyzing samples for beryllium. However, there have been concerns about the ability of ICP-OES to meet the proposed limits under 10 CFR Part 850.

This may have been the case with older instrumentation, but modern instrumentation can easily meet these limits. This presentation will provide data to support that premise derived from both Revisions 1 and 2 of the U.S. Environmental Protection Agency (EPA) Method Detection Limit (MDL) procedure.

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Update on Beryllium-Related Activities in ASTM and ISO
M. BRISSON (Savannah River National Laboratory, South Carolina, USA)

Update on Beryllium-Related Activities in ASTM and ISO

Michael BRISSON

Savannah River National Laboratory, Aiken, South Carolina, USA

This presentation will review activities over the last two years in developing and updating consensus standards in ASTM (American Society for Testing and Materials) International and the International Organization for Standardization (ISO) related to sampling and analysis of beryllium materials. Anticipated future activities will also be discussed.

Fusion facilities are of interest to the beryllium community since that metal is typically used in such facilities. In ISO, standards development activities have begun for aspects of fusion facilities, and these will be briefly mentioned.

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SRNL-MS-2024-00130, Rev. 1
RIRR #58142

Cleaning Media for Decontamination of Equipment & Structures

Jayesh DOSHI, Sam WALL, Meg MURALI, and Joe CARIGNAN

eSpin Technologies Inc., Chattanooga, Tennessee, USA

eSpin Technologies Inc., under U.S. DOE (Department of Energy) contract, has successfully developed and executed a feasibility demonstration of a novel category of high-performance decontamination wipes, designed to efficiently remove radiological and hazardous contamination and minimize exposure risks.

The technology notably demonstrated superior decontamination efficacy compared to the wipes currently utilized by Deactivation & Decommissioning (D&D) contractors. The presentation will discuss the technology, cleaning efficiency, and potential uses of technology.

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Day 2: Beryllium H&S: New Be Facility Construction, Old Be Facility Demolition, and Be Materials in Fusion Research

Challenges of Building a New Beryllium Facility

B. WALKER (Safer Environment Ltd., England, UK) et al.

Challenges of Building a New Beryllium Facility: The Wins from Challenges Faced when Creating a Facility Specifically Designed to Manufacture Beryllium Parts with Safety of the Staff at the Core

Beth WALKER[1], Lee CROSS[2], and Jayrajsinh JADEJA[2]

[1]Safer Environment Ltd., Burtle, England, United Kingdom
[2]Novanta Technologies UK Ltd., Taunton, England, United Kingdom

Three years ago, Novanta Technologies UK Ltd. decided to move to a new facility in Taunton, England. This presentation will give an overview of that facility, including an update on the challenges faced and successes achieved in the design and construction of this state-of-the-art beryllium manufacturing facility.

This new facility is a bespoke building that was designed with beryllium safety at the core, safety of the staff, the wider environment, and the customer. Novanta is now shortlisted for a Safety and Health Excellence award in the manufacturing category, due to safety being so intrinsic to the design of the building.

Designing and building such a complex facility came with many challenges, world firsts, and specifically designed equipment. This presentation gives a broad overview of the considerations made when dealing with these challenges, the standards we have set for the building to become operational, and the progress the building has made since opening 2 years ago.

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Safe Demolition of a Beryllium-Contaminated Legacy Test Reactor
V. HOLDEN (UCOR LLC, Tennessee, USA)

Safe Demolition of a Beryllium-Contaminated Legacy Test Reactor

Vern HOLDEN

UCOR LLC, Oak Ridge, Tennessee, USA

Deactivation and demolition of legacy nuclear reactors may potentially expose workers and the public to hazardous substances such as asbestos, beryllium, lead, crystalline silica, and various radioactive isotopes. Deactivation and demolition of U.S. Department of Energy (DOE) facilities must comply with all applicable federal regulations including those in Title 10 Code of Federal Regulations Part 850 Chronic Beryllium Disease Prevention Program.

Beryllium is present in neutron reflectors and moderators in three generations of DOE thermal reactors and in nuclear weapons components. Process knowledge indicates that beryllium is a constituent of fuel rods. De-cladding and dissolution of fuel elements may have resulted in generation of airborne beryllium oxide, dust, fume, or mist. Potential beryllium sources also include fuel improvement experiments, laboratories, maintenance shops and maintenance activities in various facilities and in support buildings from storage of beryllium containing materials and use of non-sparking beryllium alloy tools.

Diligent facility assessment includes targeting early beryllium characterization when beryllium is a potential contaminant based on process knowledge, legacy information, empirical sampling results and/or visual inspection. If beryllium surface contamination is found, then the primary goal is to remediate, remove, decontaminate and down-post Beryllium Controlled Areas and Beryllium Regulated Areas. If excessive removable surface contamination remains, then the secondary goal is fixative application to prevent airborne dispersion of beryllium particulates. Post remediation verification sampling is performed to evaluate the effectiveness of decontamination efforts and fixative application. If airborne OELs for beryllium are exceeded or if excessive removable surface beryllium contamination remains in area(s) in a facility prior to demolition, then applicable beryllium controls are implemented.

Deactivation and demolition are extremely intrusive work activities. Field execution of classic hazard controls is integral to the ability of those operations to ensure protection of workers and the public from chemical and physical airborne contaminants during demolition. This conclusion underscores the importance of source identification and control of beryllium contamination in work site preparation prior to mobilization.

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Beryllium Health & Safety in Fusion Materials Research at KBHF

A. GORAIEB (Karlsruhe Beryllium Handling Facility, Germany) et al.

Beryllium Health & Safety in Fusion Materials Research at KBHF

Aniceto GORAIEB[1] and Christopher DORN[2]

[1]Karlsruhe Beryllium Handling Facility (KBHF), Leopoldshafen-Eggenstein, Germany
[2]Be4FUSION LLC, Upland, California, U.S.A.

The Karlsruhe Institute of Technology (KIT) in Germany is one of the world leaders in fusion materials research. In the course of that work, KIT has fostered the development of on-site, autonomous laboratory and pilot industrial resources. First came GVT (Goraieb Versuchstechnik) in 1993, and that led to the eventual founding of the Karlsruhe Beryllium Handling Facility (KBHF) in 2009. KBHF is a "spin-in" organization that is located on the KIT North Campus and works closely with other research labs within KIT, but it also can function independently and seek projects with fusion collaboration partners external to KIT.

Beryllium metal has been important in fusion research since the 1980s, first as a plasma-facing material in JET (Joint European Torus). Research progressed on beryllium for use as a neutron-multiplier material in solid breeder-blanket concepts in the designs of magnetically confined fusion machines, such as ITER and DEMO (Demonstration Power Plant). Those investigations included higher-temperature performance materials, such as beryllide intermetallic compounds, in the form of pebble beds and blocks. With the rise of commercial fusion companies over the past several years, beryllium in the form of FLiBe (lithium-beryllium-fluoride) molten salt is now being considered as a liquid breeder material.

Since its inception, KBHF has worked continuously with all these forms of beryllium. The importance of safety in all aspects of fusion research cannot be overstated, and that includes this specialized work with beryllium, which brings its own particular EH&S (Environmental, Health & Safety) challenges. This presentation will delve into KBHF's work with beryllium over the years, focusing on the systems that have been put in place to ensure the safe handling of the various forms of the material to protect both the workers and the environment.

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A Practitioner's Guide to Beryllium Hazard Management

D. FIELD (National Nuclear Security Administration, Washington, DC, USA) et al.

A Practitioner's Guide to Beryllium Hazard Management

Danny FIELD[1], Roland CHRETIEN[2], and Wesley ADAMS[3]

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The Beryllium Health and Safety Committee (BHSC) promotes activities and efforts that help people better understand and prevent beryllium-induced conditions and illnesses, including Beryllium Sensitization (BeS) and Chronic Beryllium Disease (CBD). The BHSC mission is primarily educational in nature, and is accomplished through generation, collection, and dissemination of information to members and other interested parties. The BHSC furthers its mission through meetings, symposia, and publications.

In this regard, the BHSC issued *A Practitioner's Guide to Beryllium Hazard Management*, First Edition, dated February 2018, to provide a single information source that describes the history of beryllium disease, exposure levels and regulations, conduct of sampling, conduct of laboratory analysis, data evaluation, hierarchy of controls, release of equipment and items, training, risk communication, medical surveillance, recordkeeping requirements, and support references and web sites.

There have been regulatory changes and significant advances regarding beryllium safety and health since the 2018 publication of the Practitioner's Guide. The BHSC Technical Practices Sub-committee will be leading a team to update this document with respect to its current chapters, as well as additional focus areas including:

- Handling of lithium-beryllium-fluoride (FLiBe) for use across a broad range and scale of fission and fusion energy applications; and
- Best practices for addressing beryllium exposure and contamination for energetic activities conducted outdoors.

The BHSC Technical Practices Sub-committee will establish a working group at the BHSC 2024 Fall Symposium to update the Practitioner's Guide.

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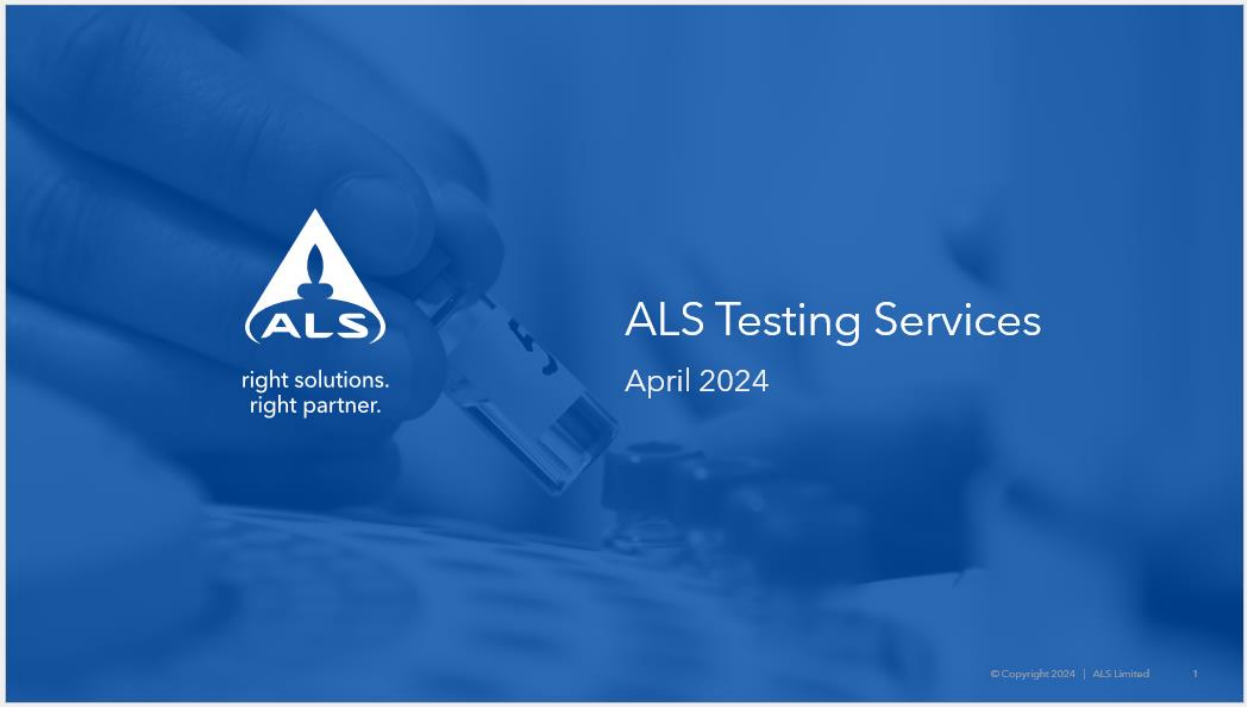
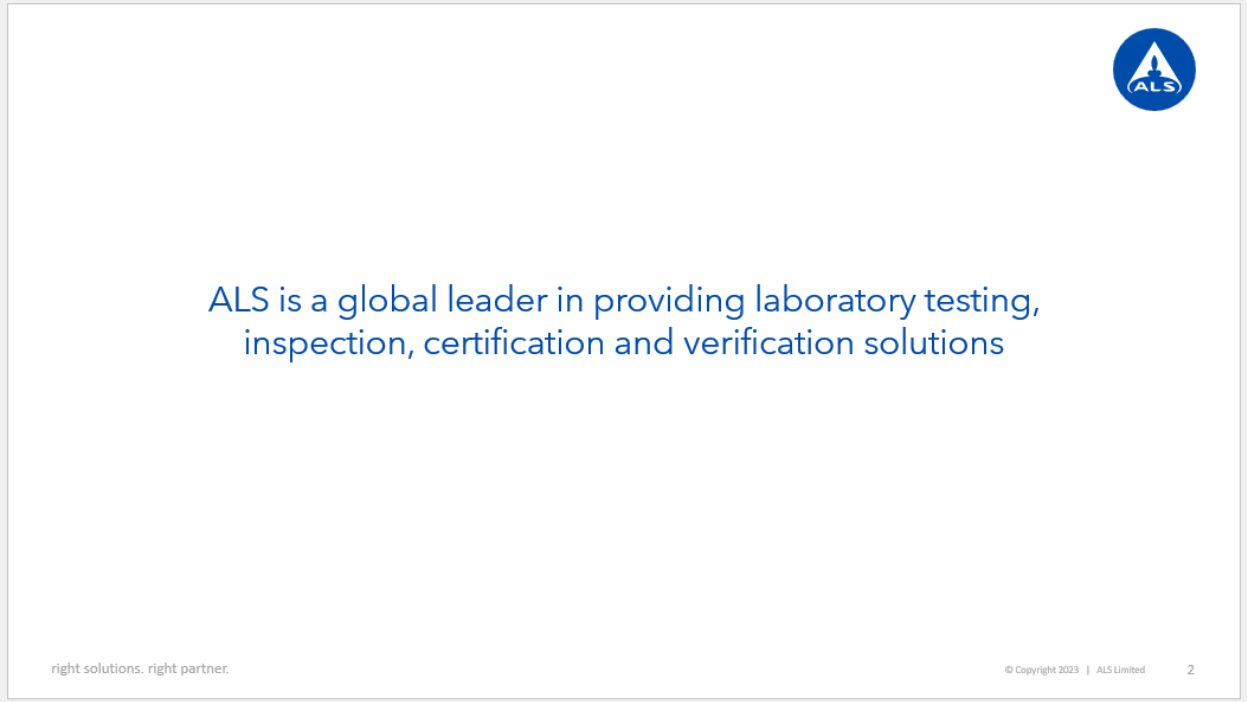
Day 2: Vendor Technical Presentations

ALS Testing Services, Salt Lake City, Utah, USA

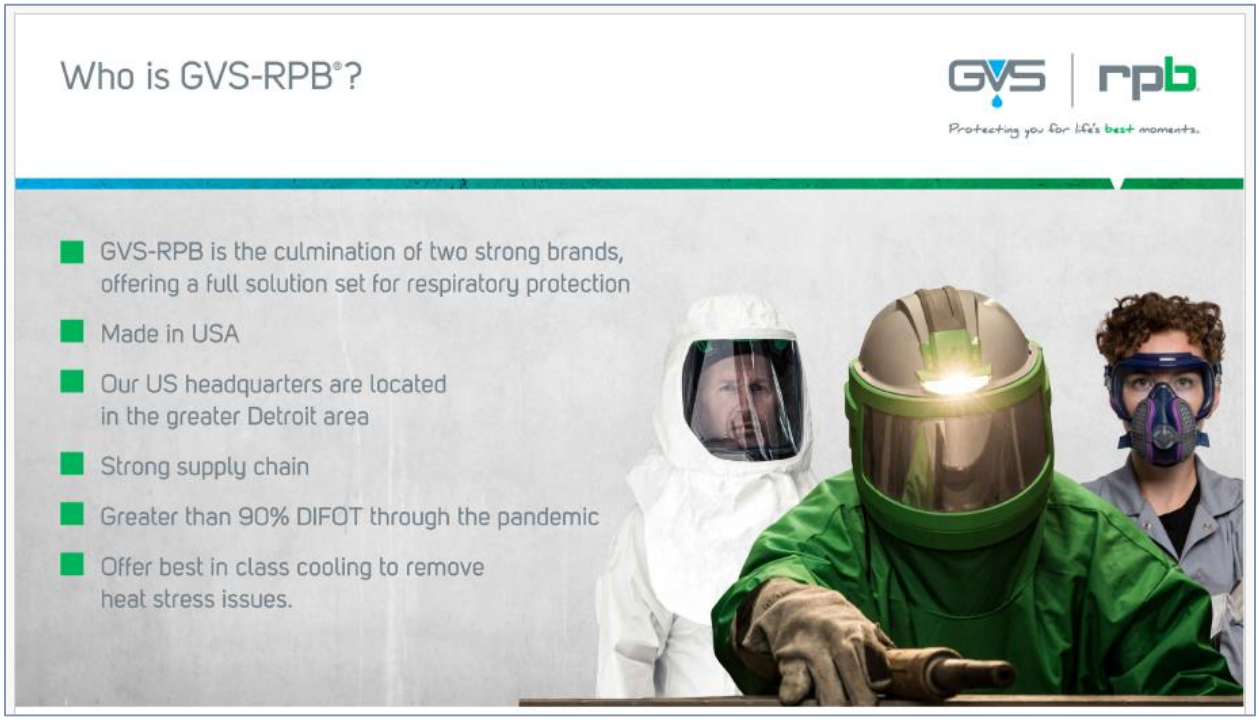
Mr. Bevan MEADE





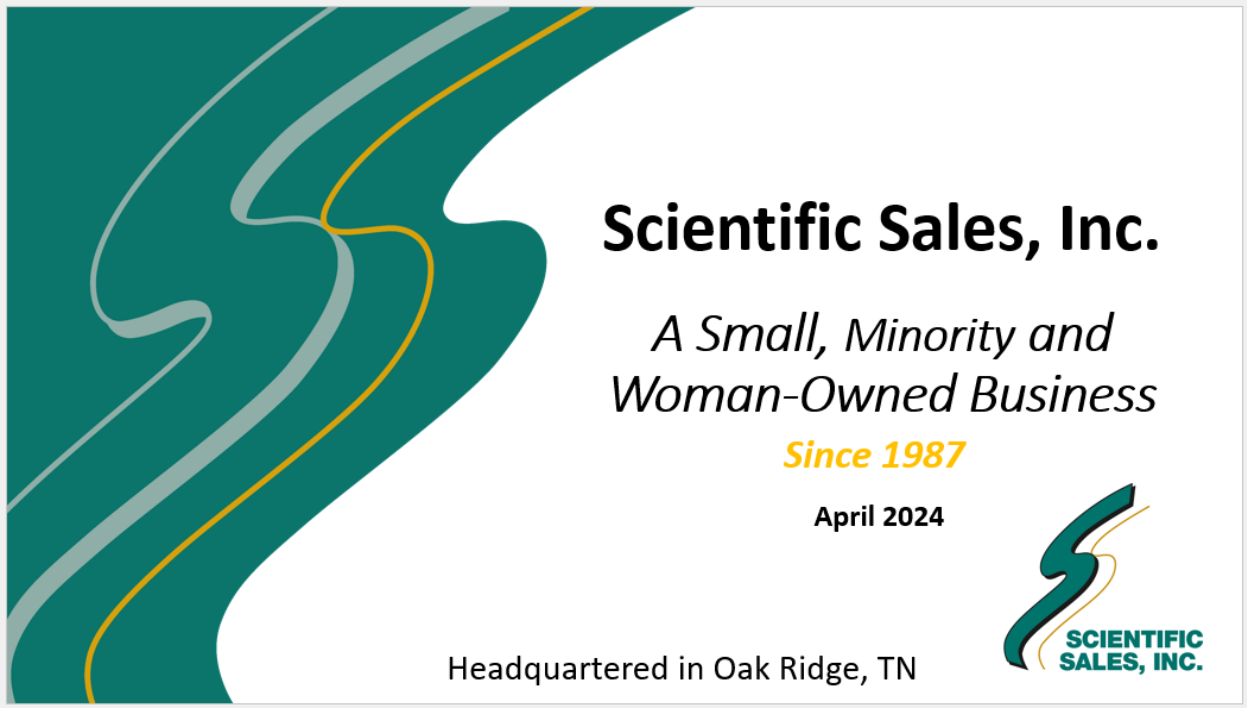
GVS-RPB Respiratory Protection Solutions, Michigan, USA

Mr. Jeremy KENIMER



Scientific Sales, Inc., Oak Ridge, Tennessee, USA

Ms. Cynthia BULLARD



Day 2: BHSC Business Meeting

Led by Josef SOBIERAJ & Chris DORN, BHSC Vice Chairs

Business Meeting Minutes compiled by Jack BENNETT, BHSC Recording Secretary

AGENDA – BHSC 2024 Spring Business Meeting

24 April 2024
13:45-14:30 Eastern Daylight Time

BHSC Business meeting is being held on site and may use Webinar
Per the BHSC By-Laws, a quorum is ten members or 20% of active membership, whichever is greater. This will apply to the voting session. The non-voting session will not require a quorum.

Agenda (Items 1-5 are in the voting session; remainder are in non-voting session)

1. Approval of this agenda - there were 16 in person attendees and 9 virtual attendees, which constituted a quorum. The agenda was reviewed, and Chris Dorn made a motion to approve, which was seconded by Kul Garg. The agenda was approved by acclimation.

2. By-Laws Revision – Jack Bennett reported that there were 20 votes for the approval on the addition of the FLiBe subcommittee. There were 19 votes in favor of approving the other minor changes. The text of the FLiBe addition is listed below, and the rest of the revisions were reviewed onscreen. The by Laws revisions are approved, and Jack will send Julie Fowler a clean copy to post on the BHSC website.

   f. FLiBe for the Advancement of Fission and Fusion

   The FLiBe Subcommittee exists to engage private industry, government agencies, and academic universities on the safe and responsible handling of lithium beryllium fluoride (FLiBe) for use across a broad range and scale of fission and fusion energy technologies. The subcommittee acts as a clearinghouse of information to share and establish best practices and worker protection models for the reduction of occupational exposure to soluble forms of beryllium, control of beryllium migration from designated beryllium work areas, and the prevention of beryllium sensitization and chronic beryllium disease.

   The scope of the subcommittee applies to all uses of FLiBe, from laboratory-scale research efforts to FLiBe production and purification systems, to the implementation of FLiBe for prototypes and energy-producing machines. The Subcommittee Chair will submit quarterly reports of activities and progress to the First Vice Chair. The Subcommittee also reports on desired research topics tied to the establishment of best practices, beryllium worker protection models, and exposures and risks of beryllium-related activities to the Research Needs Subcommittee.

3. Election of Officers
    - Report of Nominating Committee (D. Field)
        i. There are no nominations, however we need to think about the next chair because the current chair will have served two terms. We are looking for a volunteer with strong leadership skills. Dan also reviewed the current vacancies, which are chair and co-chair of Risk Communication, co-chair for Tech Practices, chair and co-chair of Research.
        ii. Greg Heldt has been acting as chair of the ad-hoc FLiBe Subcommittee. The BHSC Chair asked him to become chair of the approved Subcommittee, and the board unanimously assented. Additionally, Meghan Devine volunteered to serve as co-chair and the chair and board approved.

4. Other new business requiring a vote today - None

5. Chairman's Brief Report (R. Chretien)
    - Review of activities since Fall 2023
        i. Planning for 2024 Spring meeting
        ii. Establishment of FLiBe subcommittee
        iii. Established agreement with Golden Nugget in support of upcoming symposium
        iv. Initiated discussion of drafting second edition to ***A Practitioner's Guide to Beryllium Hazard Management. This topic was also covered in one of the Technical Sessions.***
    - Succession planning was covered in the Report of the Nominating Committee above.
    - Discussion about the focus of the upcoming symposium. Will be tracks, which the Subcommittee chairs will develop and recruit speakers.

6. Status of Funds (D. Jensen)
    - Funds available
        i. PayPal - $6,625.70
        ii. Wells Fargo- $5,369.31
    b. Projects/debits –
        i. The $2,500 first deposit for symposium has already been paid, the second deposit of $6,907 will be due 9/10/24.
        ii. Tere will be a speaker honorarium of $200 for Roy Smith to talk at the reception on Tuesday evening and
        iii. A reimbursement of $196.19 to Dan Jensen for the refreshments for this meeting.
        iv. Jack will look on Amazon for the cost of the badges for this meeting and for the fall meeting, which will be approximately $80.

7. Membership Report (J. Fowler)
    - There are 57 paid members. The BHSC thanks our members for maintaining their annual dues. Dues are relied upon to maintain our webpage and pay for other efforts supporting the BHSC mission.

8. Web Site Report (R. Chretien) –
    - Improvements to website beyond expectations, Julie &April Brown did a great job!! The changes will make us look good to potential members. (Remove from future agendas).

9. Plans for 2024 Spring Meeting (C. Dorn & J. Sobieraj)
    - We signed the contract and paid the 1st deposit. We need a minimum of 35 attendees. There will be more details after subcommittee breakout.

10. Subcommittee Reports
    - **Risk Communication- no activity**
    - **Research Needs –** no activity
    - **Technical Standards/Practices/Measures** – Is getting ready to work on the Practitioner's Guide, and the project getting back on track.
        i. Report after Breakout: The group needs to figure out path forward for solicitation of membership to participate in the update to the Guide, based on their interest in certain topics and updating it based on current literature. They discussed having monthly meetings to keep moving forward. One idea was to develop relationships with Voluntary Consensus Standard Boards. They plan on meeting with Dan Field and Mike Brisson to capture any lessons learned from the prior edition. After the process gets going, they will look for gaps in sections that need updating and do additional outreach.
    - **Medical/Epidemiological –** Met once per quarter, mostly going over the Registry dashboard. They are looking for new topics to work on.
        i. Report after Breakout: They discussed lots of ideas on new topics of interest and could also ask the membership for ideas as well. Some ideas included: a best practices guide for retesting, how frequently to test, resource sharing, new tests for Be Sensitivity and how that intersects with the FDA Lab Developed Test requirements, maybe develop a White Paper. There were also discussions about the challenges of following people and the three borderlines issue.
    - **Meetings and Symposia** – Defer to Breakout report –
        i. Report after Breakout: The Subcommittee will be sending out an informational email next week, The Symposium will occur 10/28 to 30, with an afternoon session on Monday. Tuesday and Wednesday will be full days. The venue will be the Golden Nugget, and as reported above, we paid the first deposit. The venue will be the Golden Nugget in Las Vegas. The Symposium will be in-person only, however, presenters can be virtual. There will be Early Bird pricing ($495 before 9/10) and after that it will be $595. There will be two proposed Keynotes, the first being a senior executive from NNSS and the second will be from the Bureau of Reclamation. The committee is investigating a tour of the Hoover Dam. There will be tracks developed by subcommittees, who will get 4 to 5 speakers. One track will be a ½ day on the Practitioners Guide and implementation guide for 10 CFR 850.
    - **Sampling and Analysis** – meeting every other month and discuss any concerns\changes in sampling and analytical methods, we recently shared a list of methods for Be analysis.
        i. Report after breakout: There were discussions about methods and sampling, AWE shared what they do, Jack volunteered to share his ammonium bifluoride

SOP with AWE. Kul will ask Mike for the list of methods from his presentation. The group also discussed the importance of knowing if BeO is in the sample so that an appropriate discussion could be performed. Since FLiBe is becoming more commonplace, the group wondered if it can cause analytical challenges, since the proposed Action Limits may require a large volume of air to be collected, there was discussion about using appropriate sampling pumps.(e.g. hi vol pumps.

- **FLiBe-** Is planning to have its first separate meeting in May and will start to define its scope but needs to get a good email list together to let people know about its existence.
    i. Breakout report: The group talked about topics from Gregs presentation. Greg announced that Meghan Devine volunteered to serve as co-chair (see additional discussion above).

11. New Business (not requiring a vote)
    - Still need some new committee members, so if you know someone, please ask them to contact us.

12. Adjournment – Chris Dorn made a motion to adjourn, which was seconded by Greg Heldt and was approved by acclamation. The meeting adjourned at 2:17 PM.

Appendices

BHSC 2024 Spring Meeting Participants List

Below is a listing of the organizations that were represented at the meeting. For access to the complete BHSC 2024 Spring Meeting Participant List, please see a copy of the full Meeting Minutes.

Organization	**Country**
Oak Ridge Associated Universities (ORAU)	USA
Y-12 National Security Complex	USA
National Nuclear Security Administration (NNSA)	USA
US Dept of Energy (DOE)	USA
Karlsruhe Beryllium Handling Facility (KBHF)	Germany
Oak Ridge National Lab (ORNL)	USA
Safer Environment Ltd.	UK
NNSA Production Office	USA
Cameco Fuel Manufacturing	Canada
US Army Corps of Engineers	USA
Commonwealth Fusion Systems (CFS)	USA
Lawrence Livermore National Lab (LLNL)	USA
Electric Power Research Institute (EPRI)	USA
Xcimer Energy Corp.	USA
AIHA Lab Accreditation Programs	USA
Merrick & Company	USA
Bhabha Atomic Research Centre (BARC)	India
Edgewater Technical Associates	USA
CERN (Centre for Nuclear Research)	Switzerland
Advanced Research Corp. (ARC)	USA
US Dept of Energy, Office of Environmental Management	USA
General Dynamics Missions Systems	USA
Savannah River National Lab (SRNL)	USA
Kyoto Fusioneering America Ltd.	USA
eSpin Technologies Inc.	USA
Materion Brush Inc.	USA
UCOR LLC	USA
Abilene Christian University	USA
BWXT Technologies & Nuclear Ops	USA
UK Atomic Weapons Establishment (AWE)	UK
US Dept of Energy ORAU/ORISE	USA
Los Alamos National Lab (LANL)	USA
GEG Consulting, LLC	USA
Kairos Power LLC	USA
General Atomics	USA

Organization	**Country**
Kansas City National Security Complex	USA
Idaho National Lab (INL)	USA
Massachusetts Institute of Technology (MIT)	USA
Pantex Plant	USA
Nevada National Security Site	USA
ORISE Beryllium Lab	USA
Tennessee (TN) Dept. of Environment and Conservation	USA
GVS-RPB	USA
ALS Environmental	USA
Consolidated Nuclear Security LLC	USA
SGS North America	USA
Scientific Sales Inc.	USA
Argonne National Lab (ANL)	USA
Ames Lab	USA
Brookhaven National Lab (BNL)	USA
Pacific Northwest National Lab (PNNL)	USA
Terranear PMC	USA
Envirostat	USA
EEOICPA Advocacy	USA
Hanford Site	USA
Be4FUSION LLC	USA

Meeting & Venue Photos

Below is a sampling of some of the photos that were taken of the in-person meeting. For access to all BHSC 2024 Spring Meeting photos, please see a copy of the complete Meeting Minutes.

Opening remarks kicked off the 2024 Spring Meeting. From left to right: BHSC Vice Chair, Josef SOBIERAJ, Jan WEST, Y-12 Deputy Site Manager, Mary Helen HITSON, Deputy Manager of the NNSA Y-12 Field Office, and Roland CHRETIEN, BHSC Chair. The speakers delivered their welcomes to more than 70 in-person attendees at the Wamp Auditorium in the Y-12 New Hope Center and another 50-60 participants online. Photo credits: Y-12 Photographer (first three) and Chris DORN, Be4FUSION (fourth, far right).

In-Person Participants at the BHSC 2024 Spring Meeting gathered in front of the New Hope Center, where the Meeting was held on Tuesday, 23 April 2024. Photo credit: Y-12 Photographer.

Participants look on as Dr. Ashley GOLDEN, Senior Director of ORISE Health Studies, led off the technical agenda with a History of DOE's Beryllium Medical Surveillance Programs. Photo credits: Y-12 Photographer.