

## SAFETY ANALYSIS WORKING GROUP

### ANNUAL REPORT TO THE DIRECTORS FOR 2003

#### I. Purpose

##### 1. Promote excellence in the DOE-M&O Safety Analysis Programs by:

- Promoting, coordinating, and facilitating the exchange of successful safety analysis programs, practices, procedures and lessons learned.
- Promoting training on safety analysis through workshops, subgroups and seminars.

#### II. Membership

The SAWG management is shown in Table 1. The SAWG Steering committee is shown in Table 2.

**Table 1: Safety Analysis and Subgroup Chairs**

<u>Safety Analysis Working Group Management</u>	<u>Subgroup Chairs</u>
Chair, Carl B. Smith Corporate Manager, ESH&Q BNFL, Inc.	ACCIDENT ANALYSIS, Kevin O’Kula Westinghouse Safety Management Solutions
Vice Chair, David G. Renfro Team Leader, Nuclear/Facility Safety UT-Battelle, LLC	CHEMICAL SAFETY, JC Lau Technical Staff Member Los Alamos National Laboratory
Sponsoring Director, Pamela Horning Director of Engineering & Technology BWXT Y-12	CONTROLS SELECTION (inactive), James A. McCormick, Engineer Westinghouse Safety Management Solutions
DOE Sponsor, Richard Englehart Office of Nuclear Safety Policy/Standards US Department of Energy	UNREVIEWED SAFETY QUESTIONS DETERMINATION, (inactive) Robert "Bob" Edwards Westinghouse Safety Management Solutions
Project Coordinator, Ligy Johnson BNFL, Inc.	TRAINING, John Rice Principle Technical Manager Epsilon Systems Solutions
	SAFETY BASIS, Paula Ostby Bechtel BWXT Idaho, LLC

**Table 2: Steering Committee Members**

Tulanda Brown Fluor Fernald Corp.	Willis W. Bixby Duratek, Inc. Columbia
Jerry Bueck Los Alamos National Lab, Los Alamos, NM	Kevin Carroll BWXT Y-12, Oak Ridge, TN
Stephen Cereghino Yucca Mountain Project, Las Vegas, NV	Adam B. Cohen Argonne National Laboratory East, Argonne, IL

## EFCOG SAWG Annual Report

William "Bill" L. Cowley CH2M Hill Hanford Group, Richland, WA	W. K. (Mickie) Crowley BWXT Y-12, Oak Ridge, TN
Bob Edwards WSMS, Aiken, SC	Dr. Richard W. Englehart DOE HQ GTN / EH-53, Germantown, MD
Aaron "Art" A. Francis Bechtel Nevada / NTS, Las Vegas, NV	Floyd Galegar BWXT – Pantex, Amarillo, TX
John Geis RFETS, Golden, CO	Jerry Hansen Savannah River Site, Aiken, SC
Mike Hitchler WSMS, Aiken, SC	Tammy L. Hobbes INEEL/ BWXT, Idaho Falls, ID
Eugene Hochhalter INEEL/BWXT, Idaho Falls, ID	Kirkland L. Jones DynMcDermott Petroleum Optns Co., New Orleans, LA
Ronald King Argonne National Laboratory West, Idaho Falls, ID	JC Laul Los Alamos National Laboratory, Los Alamos, NM
Ron Lehrschall Bechtel Hanford, Inc., Richland, WA	Michael D. Madison Duratek, Inc., Columbia
James McCormick Westinghouse Waste Isolation Division, Carlsbad, NM	Jim McCormick WSMS, Oak Ridge, TN
Patrice McEahern Kaiser Hill, RFETS, Golden, CO	Kevin O'Kula WSMS, Aiken, SC
Paula Ostby BBWI INEEL, Idaho Falls, ID	Gerald Paulson Los Alamos National Laboratory, Los Alamos, NM
Dave Renfro Oak Ridge National Laboratory, Oak Ridge, TN	John W. Rice Epsilon Systems Solutions, Idaho Falls, ID
R. Chris Robinson BWXT Y-12, Oak Ridge, TN	David "Dave" J. Seidel Los Alamos National Laboratory, Los Alamos, NM
Carl Smith BNFL Inc., Denver, CO	Robert Smoter Pacific Northwest National Laboratory, Richland, WA
Art Stithem CH2M HILL Hanford Group, Inc., Richland, WA	Andrew Vincent WSRC (Westinghouse Savannah River), Aiken, SC
Dann C. Ward Sandia National Laboratories, Albuquerque, NM	Bruce A. Wilson Bechtel Jacobs Company LLC, Oak Ridge, TN
Howard Wong Lawrence Livermore National Lab, Livermore, CA	Jeff Woody Atlas Consulting

### III. Status

#### A. Annual Safety Analysis Workshop

One of the most significant SAWG activities each year is hosting the annual Safety Analysis Workshop. The workshop provides training, technical presentations, and panel discussions as it encourages interaction among the entire DOE community. The workshop is unique in that it is the only national forum of its type, bringing together most of the significant policy makers, line managers, analysts, trainers, reviewers and approvers of DOE safety basis-related activities, applications, and documentation. Attachment 1 contains the agenda, speakers and subjects, training sessions and panel discussions. The 13th Annual Safety Analysis Workshop was held in Salt Lake City in June 2003

and was sponsored by the Idaho National Engineering and Environmental Laboratory (INEEL) contractor Bechtel BWXT Idaho, LLC and the DOE Idaho Operations Office.

Support was also coordinated with Epsilon and the University of Utah. The conference was almost cancelled because of limited budgets throughout the complex but at the last minute received enough support to be held. There were approximately 160 participants from the DOE, contractors, and DNFSB. The conference was reported to be highly beneficial and provided an outstanding forum for information exchange. The conference continued to provide high value to the participants by allowing a way to resolve compliance issues and enhance applied safety. The conference was supported with exhibits from ABS Consulting, Epsilon System Solutions, EXCEL Services, and the INEEL. Poster exhibits were provided by the INEEL and Omicron.

Beverly Cook, EH-1, once again showed her support of the SAWG by presenting a Keynote speech supporting the conference focus of "Safety Analysis' Ultimate End Product: Getting Work Done Safely". Two other invited speakers provided insight to safety analysis. Dr. Kathryn McCarthy discussed fusion reactors and Helen Rycraft provided a brief on the Rio Safety Culture and Safety Analysis Convention.

It is important to note that the SAWG Chair is selected at the end of the Annual Safety Analysis Workshop, during the SAWG Steering Committee Meeting. At this meeting, Tammy Hobbes, INEEL, relinquished the Chair to Carl Smith, BNFL Inc. Initiatives were established for the coming year that extends to the next Annual Workshop.

## **B. Objectives**

Five EFCOG SAWG Objectives were selected by the Steering Committee at the meeting on June 25<sup>th</sup>, 2003, during the Annual Workshop. These objectives are focused on improving performance across the DOE complex. Also, the deliverables from these efforts will include and highlight "Best Practices". Please note that these objectives are subject to some modification as a result of information gathered during the course of work. These efforts are well underway:

### **1. Standardization of DSA Requirements across PSOs (Carl Smith)**

Collect and review guidance and directions from Program Secretarial Offices to field organizations concerning preparation of Documented Safety Analysis. The collected information will be summarized in a "White Paper" that provides suggestions for DSA preparation, review and approval. A status report on this effort will be provided at the January 2004 Safety Basis Workshop.

### **2. Closure/Decontamination & Decommissioning DSA Methodology (Jeff Woody and Jerry Hansen)**

Document a set of examples, lessons learned, best practices, and issues, related to the following topics:

- Experience and issues with the use of DOE STD-1120 and 29CFR1910.120 as a DSA.
- Experience and issues with Facility Hazard Category (FHC) down-grade,
- Use and planning for recovery pans, discoveries that increase FHC or necessitate addition of safety related controls,
- Integration of criticality safety into facility disposition and environmental restoration.
- Use of Administrative safety controls and planning for TSR recovery criteria in closure activities,
- Management of change, discoveries, and inventory in closure activities, including non-nuclear FHC.

### **3. Administrative Controls Standardized Guidance (Andrew Vincent)**

A comprehensive discussion of the issues was held at the January 2003 Safety Basis Workshop. Summary results were documented by the SAWG DOE customer, Dick Englehart, for use in responding to the DNFSB. A second session is planned for the Safety Basis Workshop to be held in January 2004 in order to assist DOE with finalization of the draft Standard on Administrative Controls, SAFT-91, to be submitted to the DNFSB.

### **4. Guidance for Criticality Safety Evaluations (Kevin Carroll)**

Prepare document that provides recommendations for improving the nuclear criticality safety (NCS) description in Documented Safety Analysis (DSA) reports to meet 10 CFR 830 requirements. This will include a discussion on the ANSI 8 Series and DOE STD-3009-94 and may result in issuance of a DOE-EH interpretative guidance for near term use. Long term codification would be in a DOE Standard such as STD-3007-93 or STD-3009-94, at the discretion of DOE. A "how to" training module on NCS inclusion in DSAs would be created. Results of this effort was provided to the NCS Community at the November 2003 ANS conference. Draft documents will be reviewed at the January 2004 Safety Basis Workshop in order to finalize recommendations to DOE EH-1, Bev Cook.

### **5. Current DOE Chemical Hazard Characterization Practices (J. C. Laul)**

Collect information on current DOE chemical hazard characterization practices from multiple DOE sites to compare similarities and differences and identify missing or undeveloped information. This is a Phase I effort focused on fact finding and was completed in October 2003. The Phase II report will focus on best practices and/or provide recommendations for improvement. These reports are being prepared as a joint effort between the DOE Chemical Safety Topical Committee and EFCOG.

These reports will help DOE sites develop improved safety programs in a more consistent, cost-effective manner and will provide visible improvement to getting work done safely. Best practices will be provided to the EFCOG Best Practices web-site and/or to the DOE SELLS Lessons Learned website.

One additional initiative is carried forward from support being provided to DOE on DNFSB 2002-1, Software QA, and is discussed in the Accident Analysis subgroup status.

The five initiatives above will be continued into 2004 as discussed above with planned completion by the SAWG Annual Workshop scheduled for the first week in May 2004.

#### **IV. Subgroups' Status**

##### **A. Accident Analysis (Summary only, see Attachment 2 for details)**

Chapters 1, 7, and 8 of the DOE Accident Analysis Guidebook were posted by the DOE in 2003 under <http://www.directives.doe.gov> as DOE G 421.1-X, Accident Analysis Guidebook for Interim Use and Comment, for review and comment.

At DOE request, the chair of the Accident Analysis Subgroup, based on conversations with contractors and consultants, provided a consensus recommendation on additional chapters for the Guidebook in priority order for DOE consideration:

<b>Chapter</b>	<b>Subject</b>
9	Environmental Dispersion
10	Radiological Consequence
11	Chemical Consequence
6	Engineering Physics
2	Safety Analysis Process
3	Hazard Identification and Evaluation Methods
4	Accident Analysis Methods
5	Other Accident Analysis Applications

Also, since much will be happening on the SQA front over the next year or so with the Safety Analysis Toolbox computer codes, the SQA process can be incorporated into Chapter 12 ("Computer Modeling QA"), and for that reason, it is recommended this chapter be saved for last.

The Department of Energy has begun a series of Software Quality Assurance (SQA) actions identified in the Implementation Plan responding to DNFSB Recommendation 2002-1, *Quality Assurance for Safety-Related Software at the Department of Energy Defense Nuclear Facilities*. Commitment 4.2.1 addresses safety-related software and the concept of toolbox codes, and in particular, 4.2.1.5 specifies, "Conduct a survey of design codes currently in use to

determine if any should be included as part of the toolbox codes". Design software in this context is taken to mean software for ensuring the proper design and analysis of safety SSCs.

The design code survey was performed during October to December of 2003, with most DOE safety contractors providing input. A report discussing the survey and containing recommendations on including safety-related design software was completed as an interim level document and is available for review from the Central Registry for DOE "Toolbox" Codes, <http://tis.eh.doe.gov/techstds/toolsframe.html>. Volume I is the main report on the survey and recommendations, and Volume II is a compilation of the inputs received from DOE Field Offices and the safety contractors.

In addition to the request to review DOE user guidance reports for the six designated toolbox codes, a Software Quality Assurance (SQA) plan and criteria document is also available for review. The plan and criteria document identifies the approach to be taken and the primary SQA criteria against which the designated toolbox codes will be assessed.

The six toolbox codes are MACCS2, ALOHA, CFAST, GENII, MELCOR, and EPIcode.

## **B. Chemical Safety**

Co-hosted with DOE the 2003 Chemical Management Workshop in Washington, DC November 4-6, 2003. The workshop was also conveyed via videoconference to DOE Operational and Field Offices across the complex.

The Chair of the Chemical Safety Subgroup, gave a presentation at the Washington DC 2003 Workshop on "Current Chemical Safety Analysis Practices" and Suggested Recommendations (Phase II).

J. C. Laul completed the Phase I report on "Current Chemical Hazard Characterization Practices in the DOE Complex". The report encompassed 19 DOE contractors from 16 DOE sites and involved 39 participants from DOE-HQ, NNSA, field offices and contractors from the various DOE sites. This report has been noted to be useful and is available on DOE-HQ website ([www.eh.doe.gov/web/Chem\\_safety](http://www.eh.doe.gov/web/Chem_safety)) and EFCOG website ([www.efcog.org/publication/publications/wg\\_pubs.htm](http://www.efcog.org/publication/publications/wg_pubs.htm)).

Phase II of the above report on "Recommendations or Best Practices of Chemical Safety Analysis Practices" under preparation. Phase II activity involves participants from DOE-HQ, NNSA, field office, and DOE contractors from different DOE sites.

Dr. John E. Mansfield, member of the DNFSB, suggested that EFCOG/DOE look into consequences of chemical releases into the environment. EFCOG/DOE suggested that SAWG/Chemical Safety Subgroup should take this action. SAWG approved this action item for the coming year.

The Chemical Safety Subgroup is investigating the QA and validation aspects of the Chemical Dispersion Models such as ALOHA and EPICode under various identical conditions to verify if both models yield similar results.

**C. Controls Selection**

This subgroup has been inactive and will remain inactive unless short-term actions are needed to address specific subjects, as it has done in the past.

**D. Training**

The SAWG Training Subgroup has been basically inactive as a Subgroup for the last year. However, the Subgroup Chair provided support to the INEEL and LLNL in organizing the training offered at the SAWG Annual Workshops. Also, discussions have been held with Idaho State University personnel relative to establishing a program to grant college credit for safety analysis training courses.

In the past, despite significant efforts by the current chair and several past Training Subgroup Chairs, interest in the Training Subgroup has been limited generally to 3 or 4 people. At several points in the past, it has been recommended to the Steering Committee that the function of the Training Subgroup, primarily the Chair, be limited to supporting training at the SAWG Annual Workshops. Another effort is underway to try to rejuvenate the Training Subgroup by attempting to encourage participation by more training instructors and by DOE personnel and by trying to promote a college education program for safety analysts. Whether or not these efforts will be successful is yet to be determined. If these efforts do succeed, then a subgroup meeting will be held at the SAWG Annual Workshop to reorganize and refocus the Subgroup.

**E. Un-reviewed safety Questions Determination**

This subgroup has been inactive and will remain inactive unless short-term actions are needed to address specific subjects, as it has done in the past.

**F. Safety Basis Subgroup**

Hosted the 28-29 January 2003 Safety Basis Workshop in Albuquerque, NM to develop strategies for addressing DNFSB Recommendation 2002-3, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls*, and use of administrative controls in DSAs, hazard categorization, development of preliminary documented safety analyses (PDSA), and safety basis development for disposition activities.

Planned the 27-28 January 2004 Safety Basis Workshop in Albuquerque to discuss the status of the response to DNFSB 2002-3, on administrative controls, and the actions required by the implementation plan prepared by DOE-HQ EH, the clarification of criticality safety integration into safety basis documentation, and the status of Software QA initiatives, and to evaluate and determine specific

revisions to DOE-STD-1120, *Integration of Environment, Safety, and Health into Facility Disposition Activities*.

Continuous dialogue has been held with DOE field and HQ personnel, and participation of DOE personnel on both the SB Subgroup and SAWG Steering Committee facilitate informal DOE requests for review and comment.

**V. Lessons Learned**

The challenge, as always, is to be able to enlist the help of volunteers to perform the work of the Working Group and Subgroups.

**VI. Recommendations**

This working group should continue.

## ACCIDENT ANALYSIS SUBGROUP REPORT

### I. Purpose

The purpose of the Energy Facility Contractors Group (EFCOG) Accident Analysis Subgroup (AAS), part of the Safety Analysis Working Group (SAWG), is to provide software and methodology recommendations and guidance, and promote consistency in the performance of accident analyses supporting safety documentation for Department of Energy (DOE) facilities. Our major stakeholders include DOE and DOE contractor safety analysts, regulatory staff, independent review, and oversight personnel. Activities and deliverables of the AAS are conducted to promote safety analyses at individual DOE sites that are conservative, appropriate for the hazard level of the facility, and cost effective, while meeting DOE and other applicable regulatory standards. Additionally, the AAS seeks to develop technically defensible, workable approaches for addressing concerns of the Defense Nuclear Facilities Safety Board (DNFSB), and meeting DOE standards and directives.

### II. Accomplishments for CY 2003

#### A. Software Quality Assurance Products

A significant number of the Accident Analysis deliverables supported DOE and DOE contractors in meeting commitments to the Defense Nuclear Facilities Safety Board (DNFSB), specifically, to resolve issues identified in Recommendation 2002-1, *Quality Assurance for Safety-Related Software*. Recommendation 2002-1 identified a number of quality assurance issues for software used in the Department of Energy (DOE) facilities for analyzing hazards, and designing and operating controls that prevent or mitigate potential accidents. The development and maintenance of a collection, or “toolbox,” of high-use, Software Quality Assurance (SQA)-compliant safety analysis codes is one of the major commitments contained in the *Implementation Plan for Recommendation 2002-1* (March 2003). Ultimately, the DOE safety analysis toolbox will contain a set of appropriately quality-assured, configuration-controlled, safety analysis codes, maintained for DOE-broad safety basis applications.

The Department of Energy has designated six computer codes for toolbox consideration, including:

<u>Topic Area</u>	<u>Computer Code</u>
Fire Source Term:	CFAST
Leak Path Factor:	MELCOR
Chemical Release/Dispersion and Consequence:	ALOHA, EPIcode
Radiological Dispersion and Consequence:	MACCS2, GENII.

The AAS deliverables provided during 2003 supporting this project are:

**1. Software Quality Assurance Plan and Criteria for the Designated Toolbox Software** – The appropriate Software Quality Assurance criteria, and a plan for

applying the criteria to evaluate the designated toolbox codes for safety analysis applications were documented. The interim report for stakeholder comment was completed in November 2003, helping meet Commitment 4.2.1.2.

**2. Gap Analysis for the Designated Toolbox Software - Using the SQA qualification criteria** established under Commitment 4.2.1.2 and input from the code owners, the SQA deficiencies and the actions required to bring MACCS2, ALOHA, and EPIcode into compliance were documented in three reports. The reports were completed for review in November 2003, as part of Commitment 4.2.1.3.

**3. Guidance Reports for the Designated Toolbox Software** - These reports guide DOE analysts in the qualified use of these "toolbox" codes to support safety analysis consistent with 10 CFR 830, Subpart B Safety Basis Documentation. These guidance reports contain information on: (1) applicability; (2) appropriate regimes, recommended configurations, and conditions to avoid; (3) valid ranges of input parameters consistent with code capability and DOE safety basis applications; (4) default input values for site-independent parameters; and (5) citations of identified SQA documentation. Code-specific guidance reports were completed for peer review in October 2003, meeting the Commitment 4.2.1.4 schedule.

**4. Survey of Design Software for Toolbox Consideration** – A survey of computer codes, including commercially available and proprietary codes, used at the DOE sites for nuclear facility or non-nuclear high hazard facility design was performed over the October – December 2003 time frame. Design computer codes that have widespread use in DOE safety applications, and meet appropriate qualification standards were identified in the areas of: (1) civil/structural/geotechnical; (2) mechanical; (3) HVAC; (4) electrical system; (5) fire protection; and (6) instrumentation and control. An interim document was completed in December 2003 that evaluated the options for designating these computer codes as "toolbox" codes and placing them in the Central Registry. This document helped meet Commitment 4.2.1.5.

All deliverables described above have been made available through the DOE Central Registry website for SQA of safety-related software, available at: <http://tis.eh.doe.gov/techstds/toolsframe.html>.

## **B. Accident Analysis Guidebook**

**AAS provided review of three chapters from the Draft DOE G 421.1-X, Accident Analysis Guidebook (AAG).** Comments were provided on Chapters 1 (Introduction), 7 (Source Term Analysis), and 8 (Leak Path Factor Calculation) during the May to July review period. The Guidebook is being finalized through EH-22 (Dick Englehart, point of contact).

### **C. Accident Analysis Training**

Training was provided to DOE and DOE contractors in source term analysis, and chemical and radiological dispersion / consequence analysis. The Accident Analysis Subgroup conducted training courses in accident and consequence analysis, as part of the Thirteenth Annual SAWG Workshop in Salt Lake City, UT. Curricula, training materials, and class presentations were made to over sixty participants during the June Workshop at no cost to participants. Courses included:

- Leak Path Factor Analysis
- Chemical Dispersion and Consequence Assessment
- Radiological Dispersion and Consequence Assessment
- HGSYSTEM
- Radiological Safety Analysis Code (RSAC-6) for WINDOWS®
- Introduction to Plutonium Metallurgy.

### **D. Strategic Planning between ANS and EFCOG SAWG**

Strategic planning between the SAWG and its counterpart in the American Nuclear Society (ANS), the Nuclear Installation Safety Division (NISD), was continued in 2003. The Accident Analysis Subgroup developed plans during CY 2003 for a Washington-based embedded topical meeting on *Operating Nuclear Facility Safety*, to the Winter Meeting of ANS, to be held November 14 - 18, 2004. The topical has been accepted by ANS.

The meeting reflects the understanding that the “proving grounds” for improving safety while performing effectively can no longer afford to be limited to the immediate plant or facility, but draws upon experience from similar operations in nuclear facilities worldwide. Reactor, high-level waste, laboratory, fuel fabrication, decommission and decontamination (closure) projects, nuclear material processing, transportation processes and operations, and software experiences are included in the scope of the topical. The emphasis is on operating and operational nuclear facility safety, common areas for improvement, and sharing of innovative approaches for achieving and maintaining robust safety while maintaining performance expectations. The embedded meeting’s focus will discuss similarities and differences shall be explored, with review of the benefits identified through integrated safety management systems, risk-informed approaches, and other models for safety.

Bev Cook (DOE/EH-1) has tentatively agreed to be an Honorary Chair to this topical. It is expected that 20 to 30 papers will be given by DOE safety analysis and regulatory program personnel.