ICNC 2015

35 Years of International Cooperation in Nuclear Criticality Safety

Place: **Omni Charlotte Hotel**

Charlotte, North Carolina, USA

Dates: **September 13-17, 2015**

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Robert Busch (Univ. New Mexico)

Assistant General Chair:

Sandi Larson (Nuclear Safety Associates)

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Technical Tracks

1. **Development of Standards and Assessment Methodology,**
   As nuclear criticality safety has developed, the fundamental principles that are the foundation of our profession have always been codified in our standards. Standards have evolved and expanded as the nuclear safety discipline has grown. With this growth, the methodologies used to analyze and ensure safe operations have evolved. These methods have expanded starting with experiments, then handbooks and guides leading into detailed computer codes and models. These information sources are used to address many areas like fuel fabrication, storage, reprocessing, transportation and decommissioning. As we continue to move forward, new challenges will arise including fabrication and management of advanced reactor fuels, integration of risk informed methods in safety analyses, and advanced approaches to address calculation and measurement uncertainties. The integration of these challenges into safety disciplines will require new standards and assessment methodologies that incorporate a graded approach.

2. **Operational Practices**
   The advances in calculation codes, safety analysis methodologies and nuclear data are of no value if the safety controls are not usable and robust. The practical considerations for criticality safety goes back to the adage, "Make it easy to do it right and hard to do it wrong." The selection of the control method must be based on an understanding of the process variability and upset conditions. This information comes from interaction with the operators and understanding the lessons learned from previous incidents and accidents. The effectiveness of the controls involves from operator training, human factors assessments, criticality audits and inspections.

3. **Criticality Codes and Nuclear Data**
   Criticality codes have become an indispensable tool for NCS practitioners. The advances in the codes and more reliance on them make the accuracy of the nuclear data paramount. The need for better data drives the need for more experiments since it is the source of the data. Accurately defining the range of applicability of an analysis based on calculations requires an intimate knowledge of the capability and limitations of both the codes and the data.

November 1, 2014	Website open for submission of 400 word summaries
January 31, 2015	Electronic submission of 400 word summaries
February 28, 2015	Notification to authors
May 15, 2015	Submission of full papers
June 30, 2015	Final Notification to authors
July 15, 2015	Final Papers Due

4. **Criticality Experiments**
In the early years of the nuclear industry critical experiments were the only source of data. As such, many experiments were performed. Today, there are ongoing efforts to re-evaluate and make this data more widely available and to better define the uncertainties associated with these benchmark experiments. New experiments are driven by gaps in the nuclear data and by needs of the industry to address planned operations. Lessons learned from the reanalysis of existing criticality experiments are vital to planning useful and cost-effective experiments for the future.

5. **Uncertainty and Sensitivity Analysis**
One of the newer areas of criticality safety is uncertainty and sensitivity analysis. These methodologies utilize modern computational capabilities to assess the impact of uncertainties in the nuclear data on a calculated parameter, like k_{eff}. These techniques can provide qualitative assessments of similarities in experiments and manufacturing systems, assess regimes with little experimental data and enhance the design of new experiments.

6. **Analysis of Criticality Accidents and Incidents**
The objective of our profession is to ensure a criticality accident never occurs. Understanding the properties and behavior of accidents is an essential element to meeting that objective. The study of the past accidents provides insight into upset conditions and failure modes as well as the physics of systems where a criticality accident is possible. Understanding the physics is important in the placement of CAAS detectors and planning for emergency response. By combining our understanding of what has happened and using models that account for neutronics and material behaviors, more realism can be introduced into the assessment of the likelihood of a criticality accident and to developing effective controls.

7. **Criticality Safety in Used Fuel Management**
Many issues arise from the challenges of economically and safely handling, storing, shipping and disposing of spent nuclear fuel. Some of the basic issues revolve around know the composition of the fuel and the ability to adequately calculate k_{eff} of these fuels. Practical implementation of a burnup credit approach requires validation of the range of applicability by confirming key attributes of used fuel such as enrichment and burnup. Along with these are the regulatory and political aspects that always exist.

8. **Storage, Transport, and Disposal of Fissile Material**
As with used fuel, the storage, transport and disposal of fissile material that are not used fuel have many challenges. The materials are in various forms from unencapsulated material, fresh fuel, feed material and waste. Understanding the compositions and behaviors of these widely varying materials can challenge the ability of the analyst and the analysis tools. The storage of unencapsulated HEU is much different than shipment of process waste for disposal. There are multiple approaches and techniques that can employed to establish the safety of these materials in the storage, transport and disposal.

9. **Professional Development Issues**
Essential to a strong safety culture is the need to maintain a competent and capable professional staff. With the limited number of new graduates, retirement of senior staff members and the loss of staff to other professions, there is a constant struggle to maintain adequate staffing to support the needs of today and ensure a strong tomorrow. Education, training and professional fulfillment of existing staff as well as positive action to establish a pipeline for attracting new talent into the criticality safety profession are key attributes of a strong safety culture.