Overview of the NCSP Nuclear Data Program

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Background / History

- Defense Nuclear Facilities Safety Board (DNFSB) Recommendations 93-2 and 97-2:
  - 97-2 (5/19/1997): Need for improved criticality safety practices and programs to alleviate potential adverse impacts on safety and productivity of DOE operations.
- 97-2 encompassed ongoing DOE activities of 93-2 while broadening scope to address important cross-cutting safety activities needed to ensure NCS throughout the Complex.
- DOE Implementation Plan for Board Recommendation 93-2 and 97-2 resulted in establishment of the US Nuclear Criticality Safety Program (NCSP)
NCSP Organization and Overview

• Mission
  - Provide sustainable expert leadership, direction and the technical infrastructure necessary to develop, maintain and disseminate the essential technical tools, training and data required to support safe, efficient fissionable material operations within the Department of Energy.

• Vision
  - Continually improving, adaptable and transparent program that communicates and collaborates globally to incorporate technology, practices and programs to be responsive to the essential technical needs of those responsible for developing, implementing and maintaining nuclear criticality safety.
NCSP Technical Program Elements

- **Analytical Methods (AM)** – 15% of budget ($4.02M)
  - Maintain and improve the Production Codes and Methods for Criticality Safety Engineers (MCNP/SCALE, NJOY/AMPX)

- **Information Preservation and Dissemination (IPD)** – 4% of budget ($1.07M)
  - Protects Valuable Analyses and Information Related to Criticality Safety (includes ICSBEP)

- **Integral Experiments (IE)** – 52% of budget ($13.94M)
  - Critical and Subcritical Experiments at the Critical Experiments Facility (CEF) at the Device Assembly Facility (DAF) in Nevada and Sandia National Laboratory Pulse Reactor Facility – provides integral tests of codes and data

- **Nuclear Data (ND)** – 13% of budget ($3.48M)
  - Perform Measurements of Basic Nuclear (Neutron) Physics Cross-Sections and Generate New Evaluated Cross-Section Libraries and Covariance Data for Use in Production Criticality Safety Codes

- **Training and Education (TE)** – 6% of budget ($1.61M)
  - Web-based training modules and 1- & 2-week Hands-On Criticality Safety courses for Criticality Safety Engineers, Line Management, and Oversight Personnel

- **Technical Support (TS)** – 10% of budget ($2.68M)
  - Managerial and technical support

FY2019 NCSP Budget: $26.8 million
Current NCSP Work Sites

FY2019 NCSP Budget: $26.8 million
Nuclear Data Measurements & Evaluation Work for NCSP

- **Objective**: Provide measured and evaluated thermal, resonance, unresolved resonance, and fast region cross-section data to address the priority NCSP nuclear data needs

- **Vision**: Addresses multiple Nuclear Data 5- and 10-year goals and attributes identified in the NCSP Vision

- **Final product**: Rigorous ENDF/B evaluations produced from cross section measurements and analyses.

- Measurement work effort focused on NCSP priorities by NCSP Nuclear Data Advisory Group (NDAG)

- NCSP 5-year plan provides a listing of Nuclear Data measurement and evaluation priorities for the program
NCSP Nuclear Data Program

Nuclear Data Gaps/Needs

Integral Measurements (Critical Experiments)

Differential Nuclear Data Measurements

Publish Critical Benchmark (ICSBEP Handbook)

Measurement Data Processing (SAMMY)

Nuclear Data Testing

Generate ENDF Libraries & new Cross Sections (AMPX)

Nuclear Criticality Safety Applications

Publish Critical Benchmark (ICSBEP Handbook)
NCSP Integral Experiments

- NCSP integral measurements are performed at
  - Sandia National Laboratories (SNL) and
  - National Criticality Experiments Research Center (NCERC), currently operated by Los Alamos National Laboratory
    - NCERC is located at the Nevada National Security Site (NNSS) inside the Device Assembly Facility (DAF)

- Types of experiments that can be performed
  - Subcritical
    - Rocky Flats shells, BeRP ball, Np-237 sphere, TACS shells, etc.
  - Critical/Delayed Supercritical
    - NCERC: Planet, Comet, Godiva IV, Flattop
    - Sandia: Sandia Pulse Reactor critical assembly (2 fuel types, currently)
  - Prompt Supercritical
    - NCERC: Godiva IV (< 300 deg. C pulse)
NCSP Critical Assemblies

Sandia National Laboratory

NCERC – Np-237 Sphere
NCERC – BeRP Ball
NCERC – Godiva IV
NCERC – TACS
NCERC – Flattop
SNL – BUCCX – U(4.31)/Fission Product Experiments
SNL – 7uPCX – U(6.9) UO₂ rods

NCERC/DAF

NCERC – Comet
NCERC – Planet
NCERC – Flattop
NCSP Differential Experiments

• NCSP integral measurements are performed at
  – JRC-Geel GELINA Facility (Geel, Belgium)
  – RPI LINAC (Troy, NY)

• Types of experiments that are performed
  – Total cross section/Transmission measurements
  – Capture measurements

Photos referenced from:
http://www.linac.rpi.edu/public_html/accelerator.html
NCSP Nuclear Data Budget – by site and by year
NCSP Nuclear Data Budget – 2005-Present
Questions