Nuclear Criticality Safety OSTI Repository, LFE Database, and the NDA Program

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U.S. DEPARTMENT OF ENERGY

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Summary of FY24 IPD and NDA Tasks

- Information Preservation and Dissemination
  - IPD3 – NCS Repository with OSTI.GOV
    - Budget - $70K
  - IPD4 – Nuclear Criticality Safety Learning from Experience Database
    - Budget - $50K

Learning from Experience (LfE) Database

- NCSP Technical Support
  - Non-Destructive Assay Program
    - Budget $80K
    - D. Bowen, Acting Program Manager
    - Supports the NDA Program Mission and Vision Document

IPD3 – OSTI Task

Task Name	ORNL IPD3
Collaborators	OSTI.gov
Task Title	Nuclear Criticality Safety Repository
Proposal Submitted	FY22, ongoing
Task Budget (FY24)	$70K
Task Description	Create a front-end and document repository at OSTI.gov to archive all NCSP and, possibly, documents related to Nuclear Criticality Safety in the community for easy access. ORNL will work with OSTI.gov on the development of the front-end and metadata needed to ensure NCS document searches are accurate and efficient. In the long-term, ORNL will work with LLNL to begin to archive legacy NCS reports and other documents that may be important to the NCS community.
FY24 Milestones	All 4 Quarters ○ Provide a status report about progress on the development of the NCSP repository at OSTI.gov in the NCSP Quarterly Progress Reports. Quarter 1 – None Quarter 2 – None Quarter 3 – None Quarter 4 – None

- Summary of work completed
  - Added metadata to improve OSTI searches for NCS and NCSP related records in OSTI.gov
  - LLNL bibliography work was completed in late FY2023, and some work was completed in FY2024
    - >19K records examined; 13.5K records found in the OSTI repository (metadata enhanced)
    - Remaining records were mostly classified docs, conference proceedings, logbooks or technical reports not cleared for external release
    - Can be found via requests at ORNL or LLNL
  - NCSP deliverables were archived and metadata added to records at the end of each quarter
  - At the FY2024 BEM the NCSP Manager and team decided to cease further work
    - DOE technical documents cleared for unlimited distribution must be linked to or sent to OSTI (not a perfect process)
    - Due to the success of this task, there is a possibility that work may continue in the future

IPD3 – OSTI Task – Curation Records for FY2024

FY2024 Quarter 1				
Product Type	Existing Curated	New Curated	Totals	Cumulative
Tech Reports	2	1	3	832
Conference Products	508	48	556	2747
Accepted Manuscripts	3	1	4	116
Patents	0	0	0	1
Books	0	0	0	1
Total	513	50	563	3697

FY2024 Quarter 2				
Product Type	Existing Curated	New Curated	Totals	Cumulative
Tech Reports	3	0	3	835
Conference Products	105	0	105	2852
Accepted Manuscripts	1	0	1	117
Patents	0	0	0	1
Books	0	0	0	1
Total	109	0	109	3806

FY2024 Quarter 3				
Product Type	Existing Curated	New Curated	Totals	Cumulative
Tech Reports	1	1	2	837
Conference Products	63	70	133	2981
Accepted Manuscripts	57	2	59	175
Patents	0	0	0	1
Books	0	0	0	1
Total	121	73	194	3995

FY2024 Quarter 4				
Product Type	Existing Curated	New Curated	Totals	Cumulative
Tech Reports	225	7	232	1069
Conference Products	31	30	61	3042
Accepted Manuscripts	463	2	465	640
Patents	0	0	0	1
Books	0	0	0	1
Total	719	39	758	4753

IPD4 – LFE Database Task

Task Name	ORNL IPD4
Collaborators	IRSN (IRSN-IPD2)
Task Title	Nuclear Criticality Safety - Learning From Experience (LFE) Database
Proposal Submitted	FY22-25
Task Budget (FY24)	$50K
Task Description	The Nuclear Criticality Safety Program (NCSP) is a multi-lab collaboration dating back to the mid-1990's and a repository of NCSP documents has been hosted by LLNL for some time (website at https://ncsp.llnl.gov/). LLNL intends to continue hosting the website content to support NCSP execution; however, the NCSP website is not intended to serve as a document repository long-term. The LLNL website is subject to stringent security requirements and the use of the website as a document repository is not an efficient use of resources. A significant number of NCSP reports and deliverables end up at the DOE Office of Scientific and Technical Information (OSTI). OSTI is a specialized repository for this document collection. All documents in the collection are meant to be unlimited in distribution and publicly releasable; however, not all NCSP documentation have been sent to OSTI and still reside at the NCSP sites.
FY24 Milestones	All 4 Quarters o Provide a status report about progress on the development of the NCSP LFE database working with international collaborators. Quarter 1 – None Quarter 2 – None Quarter 3 – None Quarter 4 – None

- Collaborators include:
  - Oak Ridge National Laboratory (ORNL)
  - Lawrence Livermore National Laboratory (LLNL)
  - UK National Nuclear Laboratory (NNL)
  - UK Working Party on Criticality (WPC)
  - Institut de Radioprotection et de Sûreté Nucléaire (IRSN)
  - Urenco UK (UUK)
  - TÜV SÜD

- LFE database conceptually designed with input from UK Working Party of Nuclear Criticality Safety, ORNL, and IRSN
- Pam Williams (LLNL) was consulted for ideas to implement the LFE database conceptual design on the NCSP website
- The LFE team developed and implemented a communications strategy to solicit database event input
  - ANS Panel session conducted at 2023 ANS Winter Meeting; 2024 ANS Annual Meeting
  - Presentations conducted at DOE-EM CoP workshop in February, WP-NCS/ISO TC85/SC5/WG8 meeting in September
  - EFCOG monthly meetings with the NCS community
- Database entries are slowing coming in now that people are aware

IPD4 – LFE Database Task

Database Fields:

Content WILL NOT be shown in database	Contact name
	Contact email/ phone number
	Organization
	Country
	Release number [or] Is information acceptable for release? (Y/N)
	Optional information
Content WILL be shown in database	Facility type
	Description of event
	Criticality safety parameter affected
	Immediate action(s) taken
	Method of resolution
	Apparent cause(s)
	Root cause
	Lessons learnt
	Type of operation
	Keyword(s)

- Information shared is meant to be source ambiguous – no finger pointing
  - Just sharing lessons-learned
- We need entries to share with the community
  - NCS related deviations that have good lessons learned to share
  - Could assist sites trying to recover from events that occur
- NCSP website provides information about the database and a downloadable form to populate the database fields
- NCSP resources available to assist those who want to contribute to the database

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NCSP Home | Program Management | Integral Experiments | Nuclear Data | Analytical Methods | Information Preservation | Training & Education | Nondestructive Assay Program

Home / Focus Areas: Information Preservation & Dissemination / Learning from Experience (LfE) Database

Learning from Experience (LfE) Database

Information Preservation

- Federal Regulations, Codes, Policies, Orders, Standards, Handbooks, and Guides
- Foreign Trip Reports
- Handbooks and Key References Guides
- ICSBEP Handbook Request
- ICSBEP History
- **Learning from Experience (LfE) Database**
- National and International Consensus Standards Guides

Introduction

The database is to record Learning from Experience (LfE) relevant to the criticality safety discipline. The goal of the database is to highlight experiences at other sites that might be applicable to the readers site/facilities (i.e., to help the reader answer the valuable questions of “is the event or learning relevant to my site/facility?” and “have I considered the possible events?”). Entries should include sufficient information to enable a reader to understand its relevance to their site/facilities. The hope is that we can share experience and not relive history over and over. In addition, the LfE database may provide valuable lessons-learned for sites dealing with similar situations.

View LfE database

Event-Entry Form Process Guide

Process for Preparing an Event Entry

- Download/complete the "Event entry form template" with the information below (see "Preparing an Event Entry for the LfE database").
- Have your completed document reviewed locally for release.
- Once the local release is approved click "LfE Question and/or Submit an Event" button.
  - Attach Event Entry form to the email.
  - Submit you entry to the LfE team for review, lfe-team@llnl.gov.
- Once your entry has been reviewed, it will be added to the LfE database and you will be notified.

View SAMPLE event entry

Event entry form template download | LfE question / submit an event

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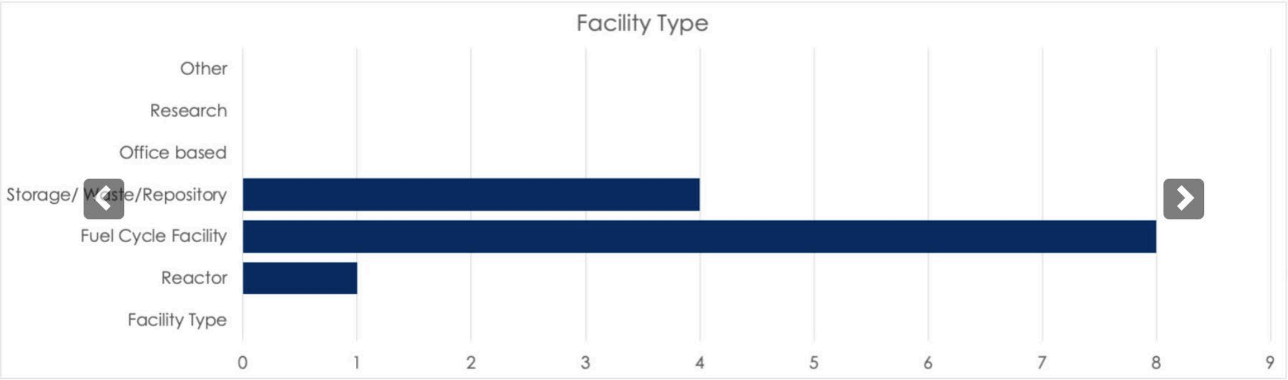
NCSP Home | Program Management | Integral Experiments | Nuclear Data | Analytical Methods | Information Preservation | Training & Education | Nondestructive Assay Program

LfE Database

Click on left/right arrow to view data.



10 **entries per page**

Search:

LFE ID	Facility Type	Description of Event	Criticality Safety Parameters Affected	Immediate Actions Taken	Method of Resolution	Apparent Cause(s)	Root Cause	Lessons Learnt	Type of Operation	Keyword(s)
013	Fuel Cycle Facility	During an inspection, when asked about the fisile content of a Mobile Filtration Unit (MFU), the plant manager was not certain about the quantity.	Mass	A safety case was created to support the MFU.	Although isolated and not in operational use, the organisation did not have a safety case for the MFU. As a result of the error a safety case was created.	Human Error	Uncertain Fissile content in Mobile Filtration Unit (MFU)	None given but lessons on ensuring items on plant have a safety case	Operations	MFU, safety case, undertain mass
012	Reactor	A duty holder derived safety limits using random distributions of fuels rods in moderator. Ths came to light after the plant was running.	Other	The plant was shutdown until the dutyholder produced an adequate safety case.	This safety case needed to address (a) the criticality code had not been validated (b) normal operations were assessed using a probabilistic approach.	Human Error	Use of unvalidated criticality safety assessment method.	None given but lessons on use of a validated code and adequate safety cases.	Operations	Unvalidated code, probabilistic

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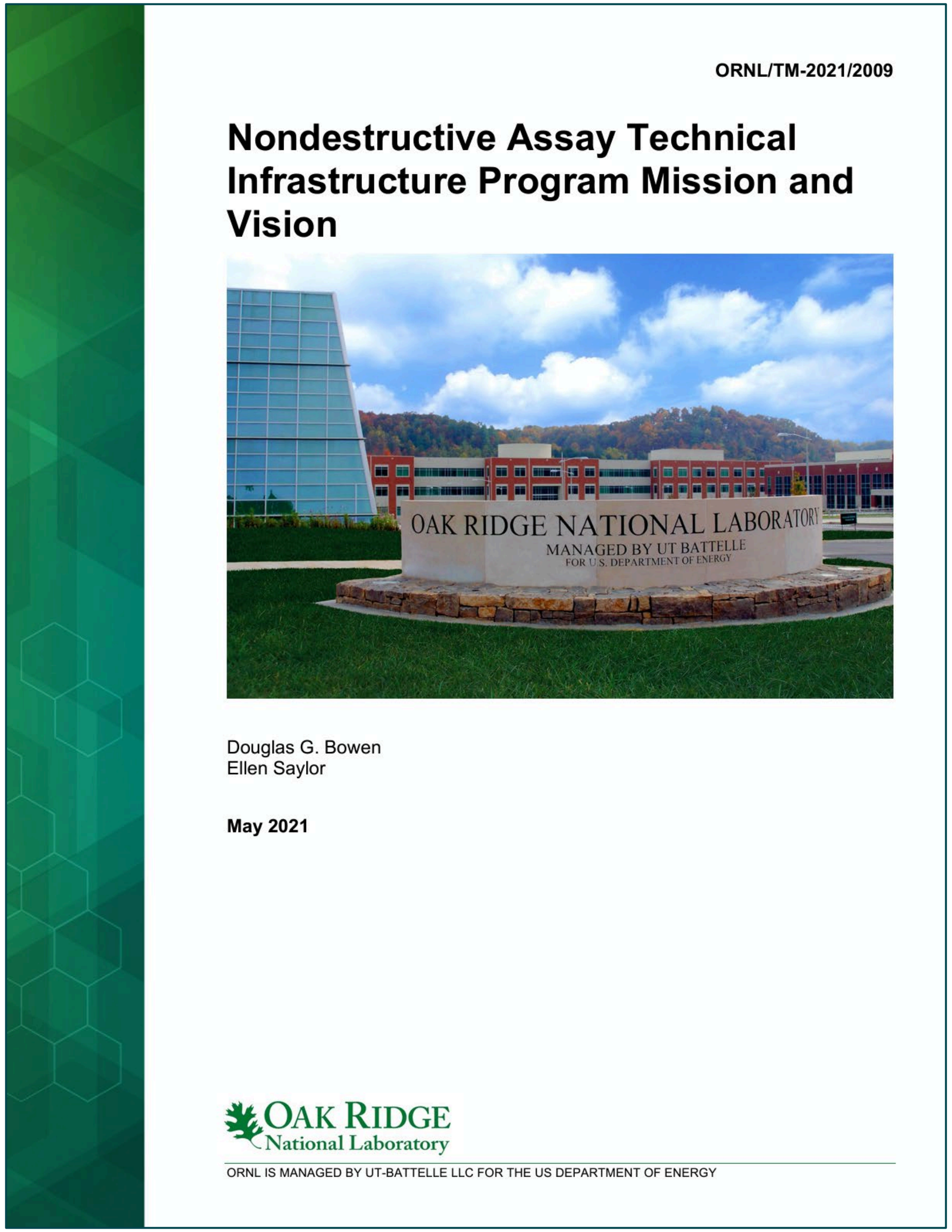
NDA Program – NDA Task

Task Name	ORNL TS13
Collaborators	None
Task Title	ORNL – NDA Technical Support Group and NDA Technical Infrastructure Project
Proposal Submitted	Ongoing
Task Budget (FY24)	$80K
Task Description	This task involves the creation of an NDA program Mission and Vision document and 5-year plan to initiate a new federal program to resolve criticality safety issues related to fissionable material holdup and other issues related to NDA technology for NCS purposes. A DOE standard, development of ANSI/ANS-8.28 standard for NDA NCS administrative practices, and support for the NDA Technical Support Group (TSG). Sites involved currently are ORNL, SRS, and Y-12. LLNL is currently helping with NDA website development. ORNL will work with NNSA NA-ESH-21 staff to help lead this task.
FY24 Milestones	All 4 Quarters ○ Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities in the NCSP Quarterly Progress Reports. Quarter 1 – None Quarter 2 – None Quarter 3 – None Quarter 4 – None

- Funding was limited in FY2024
- Focus was on supporting the following work from the NDA program Mission and Vision
  - Staffing, Personnel, and Training (SP&T)
- Two NDA hold-up measurement courses were held for 24 students in FY2024
- ORNL supported final work to publish ANSI/ANS-8.28-2024 in accordance with the DOE implementation plan for DNFSB Recommendation 2007-1
  - Published in March 2024


ORNL/TM-2021/2009

Nondestructive Assay Technical Infrastructure Program Mission and Vision

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May 2021

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This mission and vision is applicable for eight technical program elements:

1. Hardware/Software Development
2. Algorithm Development and Nuclear Data
3. Uncertainty Quantification
4. Nuclear Materials
5. Staffing, Personnel, and Training
6. Data Management
7. Requirement and Standards
8. Information Preservation and Dissemination

- This is a result of multiple NDA workshops at ORNL working with members of the NDA Technical Support Group and end-users of NDA technology

ORNL/TM-2021/2009

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Nondestructive Assay Holdup Measurements Training for Nuclear Criticality Safety

To Be Offered: ***January 21-24, 2025***
Location: Safeguards Laboratory at Oak Ridge National Laboratory
Duration: 4 days, 8AM-5PM ET
POC: Robert Bean beanrs@ornl.gov

Target Audience

Individuals that perform, oversee, or manage nondestructive assay (NDA) holdup measurements of uranium materials. This course is open to Department of Energy employees, government contractors, universities, and members of private industry who are US citizens.

Course Objectives

The primary objective of this training course is to provide participants with knowledge and experience with NDA instrumentation and techniques used to assay special nuclear material (SNM) holdup to support Nuclear Criticality Safety. Informative lectures are supplemented with laboratory sessions to optimize hands-on training experience in holdup measurement techniques. A low student-to-instructor ratio permits a more conducive learning environment.

Instructional Scope

The scope of this course covers NDA basics of using in-field instruments to measure holdup deposits that may have Nuclear Criticality Safety concerns. Laboratory exercises emphasize measurement procedures using calibrated gamma-ray instrumentation on simulated SNM deposits in arrays of pipes and ducts that emulate hardware in operational facilities. Calibration, shielding, attenuation, and geometry effects on measurement techniques are also covered, as well as discussions on the sources of uncertainty in the final calculated ^{235}U mass. Hands-on laboratory experiments are supplemented with instructional lectures on topics related to holdup measurements.

Prerequisites: Previous experience with radiation measurement equipment and familiarity with fundamental physics and mathematical concepts in nuclear radiation strongly suggested

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Questions