



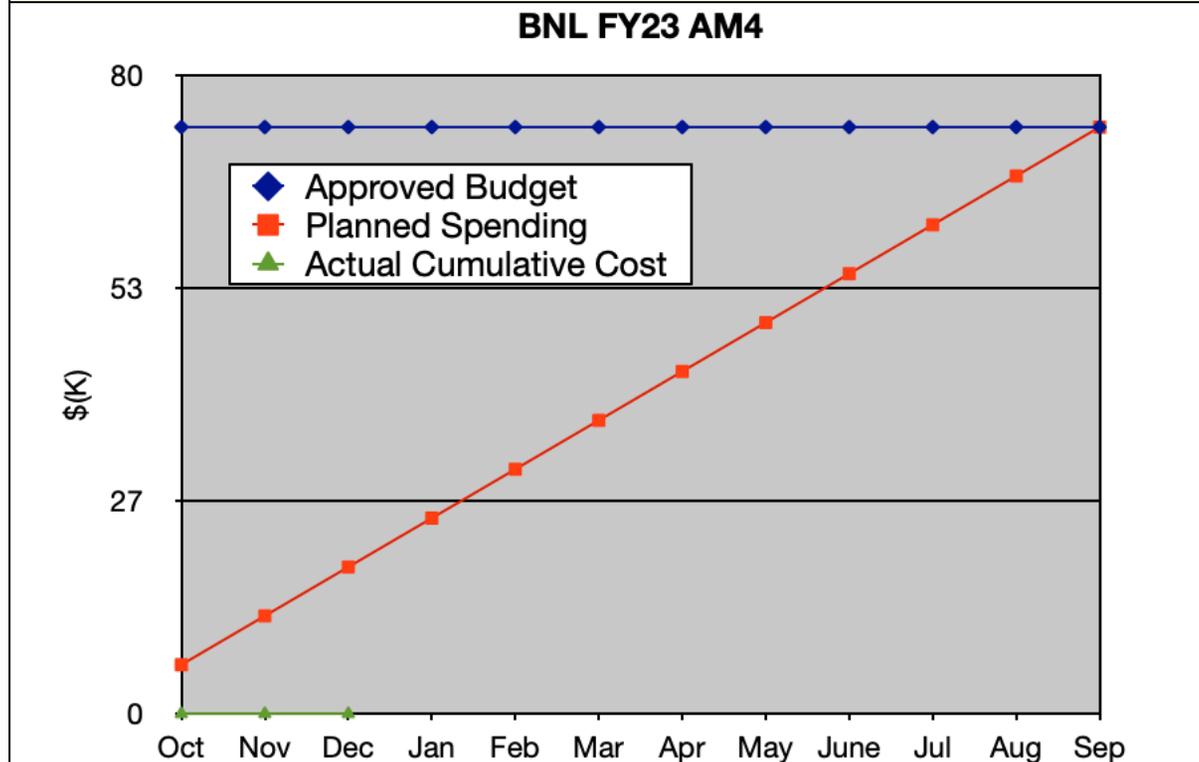
# **NUCLEAR CRITICALITY SAFETY PROGRAM (NCSP)**

**FY2023 1<sup>st</sup> QUARTER REPORTS**

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM4 <b>M&amp;O Contractor Name:</b> BNL <b>Point of Contact Name:</b> Gustavo Nobre <b>Point of Contact Phone:</b> 631-344-5205	<b>Reference:</b> DP0909010 <b>Date of Report:</b> 20 January, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$ 3,524
  2. Approved FY 2023 Budget = \$ 70,000
  3. Total FY 2023 Budget w/Carryover: \$73,524
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$0
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$0
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$0
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$0
  8. Projected carryover into FY 2024 = \$3,676
- NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete	On Schedule	Behind Schedule	Missed Milestone
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		The work has not started yet.

## NCSP Quarterly Progress Report (FY-2023 Q1)

<b>Q2</b>	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		
<b>Q3</b>	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		
<b>Q4</b>	Provide a status report on generating a draft document defining the TNSL code or software interface in NCSP Quarterly Progress Report. (AM4)		

### ACCOMPLISHMENTS

Progress has been made in the efforts to define a probability distribution function (PDF) and to develop a numerical technique to smooth the theoretical PDF generated with the code FUDGE. Focus is now to process and analyze the previous developments.

### PUBLICATIONS

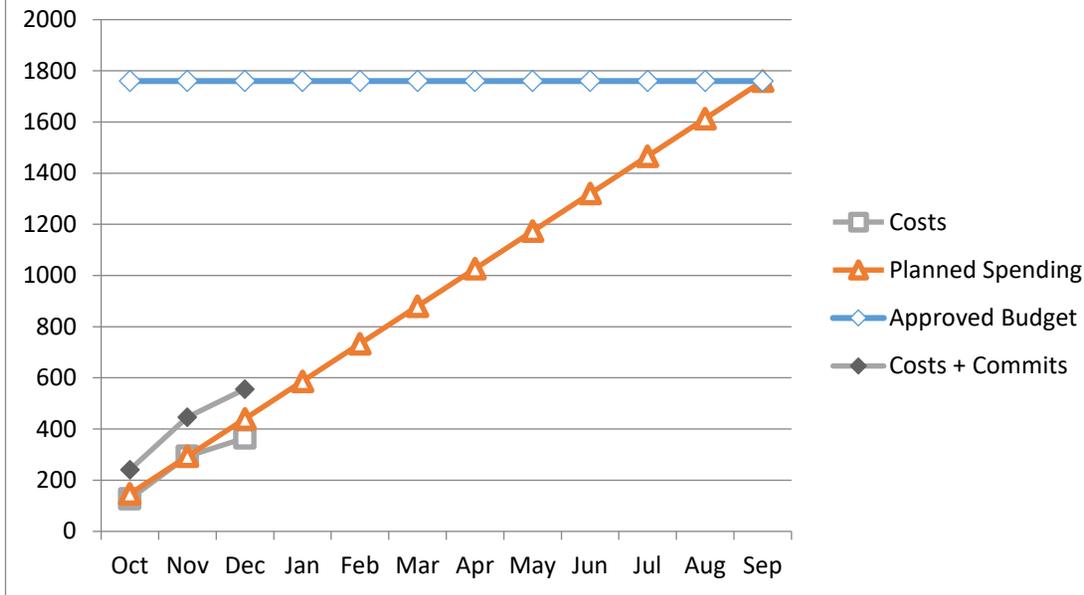
Any publications created during the quarter should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov).

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	N/A		
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM1, 2, 3, 5, 7 <b>M&amp;O Contractor Name:</b> LANL <b>Point of Contact Name:</b> Joetta Goda/Bob Little/Jen Alwin <b>Point of Contact Phone:</b> 505-667-2812/505-665-3487/505-667-7252	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$ 260,000
  2. Approved FY 2023 Budget = \$ 1,500,000
  3. Total FY 2023 Budget w/Carryover = \$ 1,760,000
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$ 364,894  
(plus \$191,414 commits= \$556,308)
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete	On Schedule	Behind Schedule	Missed Milestone
----------	-------------	-----------------	------------------

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on MCNP6 user support activities (AM1)		
Q1	Provide a status report on LANL participation in US and International analytical methods collaborations (AM1)		
Q1	Provide a status report on ENDF/B-VIII.1 processing and testing activities (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report on summer intern work activities (AM1)		
Q1	Provide a status report on MCNP6 Criticality training course activities (AM1)		
Q1	Provide a status report on NJOY maintenance and user support activities (AM2)		
Q1	Provide a status report on LANL participation in US and International analytical methods collaborations (AM2)		
Q1	Provide a status report on ACETk photonuclear and photoatomic ACE support table (AM2)		
Q1	Provide a status report on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 activities (AM3)		
Q1	Provide a status report on LANL participation in US and International analytical methods collaborations (AM5)		
Q2	Provide a status report on MCNP6 user support activities (AM1)		
Q2	Provide a status report on LANL participation in US and International analytical methods collaborations (AM1)		
Q2	Provide a status report on ENDF/B-VIII.1 processing and testing activities (AM1)		
Q2	Provide a status report on MCNP6 and Whisper progress activities (AM1)		
Q2	Provide a status report on NJOY maintenance and user support activities (AM2)		
Q2	Provide a status report on LANL participation in US and International analytical methods collaborations (AM2)		
Q2	Provide a status report on ACETk photonuclear and photoatomic ACE support table (AM2)		
Q2	Complete the ACETk photonuclear and photoatomic ACE support tables, both specifications and interface (AM2)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide a status report on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 activities (AM3)		
Q2	Provide a status report on LANL participation in US and International analytical methods collaborations (AM5)		
Q3	Provide a status report on MCNP6 user support activities (AM1)		
Q3	Provide a status report on LANL participation in US and International analytical methods collaborations (AM1)		
Q3	Provide a status report on ENDF/B-VIII.1 processing and testing activities (AM1)		
Q3	Provide MCNP6 Criticality training course (AM1)		
Q3	Merge additional benchmark input files into the Los Alamos Benchmark Suite (LABS) targeting new additions to ICSBEP and remaining input files from Whisper-1.1 library (AM1)		
Q3	Develop and test MCNP_PSTUDY revision (AM1)		
Q3	Provide a status report on NJOY maintenance and user support activities (AM2)		
Q3	Provide a status report on LANL participation in US and International analytical methods collaborations (AM2)		
Q3	Provide a status report on ACETk photonuclear and phototoxic ACE support table (AM2)		
Q3	Provide a status report on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 activities (AM3)		
Q3	Provide a status report on LANL participation in US and International analytical methods collaborations (AM5)		
Q4	Provide a status report on MCNP6 user support activities (AM1)		
Q4	Provide a status report on LANL participation in US and International analytical methods collaborations (AM1)		
Q4	Provide a status report on ENDF/B-VIII.1 processing and testing activities (AM1)		
Q4	Process and test ENDF/B-VIII.1 candidate evaluations and provide a documented assessment (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Contingent upon successful processing, integrate and test ENDF/B-VIII.0-based covariance data library for Whisper-1.2 (AM1)		
Q4	Obtain approval to open-source the Los Alamos Benchmark Suite (LABS) (AM1)		
Q4	Issue an MCNP V&V report, expanded to include LABS releases (AM1)		
Q4	Provide a status report on NJOY maintenance and user support activities (AM2)		
Q4	Provide a status report on LANL participation in US and International analytical methods collaborations (AM2)		
Q4	Provide a status report on ACETk photonuclear and photoatomic ACE support table (AM2)		
Q4	Demonstrate initial capabilities of “scion” processing component, which will perform tasks including integration, linearization, and interpretation of distribution data. (AM2)		
Q4	Provide a status report on Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6 activities (AM3)		
Q4	Provide data files and report for h-h2o and graphite on-the-fly S(alpha,beta) temperature effects. (AM3)		
Q4	Provide a status report on LANL participation in US and International analytical methods collaborations (AM5)		
Q4	Issue final report on all LANL results related to the ICSBEP Benchmark Comparison Study (AM5)		

### ACCOMPLISHMENTS

- AM1 - MCNP® Maintenance and Support, Uncertainty Analysis Development, and Modernization
  - **Education (AM1, TE4)**
    - Two online and one in-person MCNP6 classes with 82 students: See separate summary of MCNP classes.
    - Completed “Provide MCNP6 Criticality training course” at Y-12, Nov. 7-10, 2022.
    - Hosted the 2022 MCNP User Symposium, Oct. 17-21, 2022.
      - See the several presentations in the Publications, Reports, and Presentations section.
    - M. Rising was invited and presented as a panelist at the American Nuclear Society (ANS) Winter Meeting and Nuclear Technology Expo to discuss experiences with virtual training.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Mentorship of year-round graduate research assistant jointly between XCP-3 and XCP-7.
- Research mentorship of two UNM graduate students working on plutonium solution density predictive capabilities
- **R&D Work (AM1)**
  - International analytical methods collaborations/participation: Attended the mid-year OECD/NEA WPNCs SG11 meeting on bias and correlated data
    - Held virtually Dec. 1, 2022.
    - Final review of all submitted results. LANL (M. Rising and B. Riedel) submitted results to this SG11 for inclusion in the study.
    - Discussion focused on plans and preparations for an ICNC 2023 submission and the SG11 final report to be submitted to the OECD/NEA at the conclusion of the SG11 activities in 2023.
  - 2022 summer student, G. Siemers, presentation included in FY22 Q4 report (LA-UR-22-29622).
  - Region-dependent sensitivity-uncertainty data for NCS validation. A journal article submission is in progress (UNM).
  - MCNP6.3 code is frozen and has been made available to internal LANL users.
    - The final code package is completed.
    - Code documentation is complete. The MCNP6.3 Build Guide, V&V Report, and Release Notes will be made available on the website.
    - All V&V benchmarks have been processed through the final production release versions of the MCNP6.3 code. The NCSP V&V report detailing all of the MCNP6.3 calculations is under construction.
  - The Whisper open-source release is pending LANL Feynman Center for Innovation (FCI) approval. FCI has raised some concerns on licensing Whisper as open-source after having been released alongside MCNP6 through RSICC. We are iterating with FCI to find the best path forward; once approved the code will be made available on GitHub. Due to the delay from FCI in processing the open-source release request, the Whisper-1.1 code is distributed with MCNP6.3.
- **MCNP Support and Maintenance**
  - Hosted the 2022 MCNP User Symposium.
  - Support MCNP6 users. MCNP Forum, website, email, direct interactions, etc.
  - MCNP public website re-designed and updated online. More improvements to come.
  - Finalized the MCNP6.3.0 build guide, verification and validation report, and release notes. See publications, reports, and presentations below.
  - Updating V&V testing framework for consistency, extensibility, and automation.
  - Consolidating and archiving past V&V results in repository
  - Adding recent subcritical multiplication benchmarks to V&V testing framework. A study on the verification and computational cost of MCNP6.3 features for subcritical multiplication benchmarks is planned to be a part of an ICNC 2023 paper submission.
  - Completed running and comparing V&V tests with and without MCNP6.3 features (Doppler Broadening Rejection Correction, Automated Acceleration and Convergence Testing). The NCSP V&V report with these results is being drafted. A portion of the report is planned to be a part of an ICNC 2023 paper submission.
- **MCNP Data (AM1)**
  - ENDF/B-VIII.0 Covariance Library
    - Work continues on the development of a processed covariance library.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Started converting and testing the NJOY-processed ENDF/B-VIII.0 covariance data into the ACE format for Whisper to use. As these data are processed, they will begin to be tested within Whisper. Some Python-based tooling around Whisper is being developed to support this effort.
- AM2 - NJOY Development and Maintenance, Uncertainty Analysis Development, and Modernization
  - **NJOY**
    - Draft paper on ENDFtk is nearing completion. A new release of NJOY is ready to go (pending one more review), incorporating changes regarding photonuclear processing and an issue in PURR's Bondarenko cross section output.
    - Working to update NJOY21 to use the latest version of NJOY2016. NJOY21 is very far behind NJOY2016 at this point, and the user community has requested this fix this and to prevent it from happening again. Test suite doesn't fully run in NJOY21 due to input checking, working to fix this.
  - **ACEtk**
    - Photonuclear support in ACEtk is in good shape, at or near fully functional.
    - International collaboration: Travel to Vienna for the IAEA's Nuclear Data Processing collaboration meeting the week after Thanksgiving. The focus of this year's work was mostly on photonuclear processing, although discussions about NJOY and its peers writ large was a large focus. Side discussions and work, which the unusual hybrid schedule for this meeting (only a few hours per day) really encouraged, was an advantage.
    - Other relevant collaboration: Co-chairing a WANDA session in February called "Processing and Preservation". This is really two mini-sessions, a half session called "The Future of Nuclear Data Processing."
    - Nuclear data team attended CSEWG, gave updates on NJOY and photonuclear processing. Participated in discussion surrounding Pu-239.
  - **Covariances** (FY22 deliverable):
    - Communication between collaborators early in the year, with expectations for work to increase in future in projects involving UQ/covariance.
  - **GNDS** (FY22 deliverable):
    - Built a 2.0 specification from the ground up rather than relying on the published specification based on the contents of the 557 incident neutron files in ENDF/B-VIII.0 that were translated to GNDS 2.0 by LLNL. This approach allowed ability to get around the un-workable problems in the specs, such as circular dependencies and broken links. With these new specs, generated a GNDS-2.0-compliant interface, to begin testing shortly. This needs to be extended beyond incident neutron files, but this is a big step.
- AM3 - Development of an Adaptive-in-temperature Method for fast on-the-fly Sampling of Thermal Neutron Scattering Data in MCNP6
  - Additional material treatment has been added to the Python code, which has been developed to allow the automation of OTF data creation including the generation of cumulative distribution functions (CFS) of beta and alpha at different temperatures, and regression fitting of data over temperature ranges. New materials include porous graphite at 10% and 30% porosity, beryllium and oxygen in beryllium oxide.
  - New basis functions have been implemented into the temperature fitting routine that provides greater fitting accuracy at higher temperatures.
  - A modular framework has been developed in the new Python code to facilitate the addition of new materials beyond light water (lwtr) and crystalline graphite.
  - Execution of the verification paradigm has begun with promising results showing the temperature fit coefficients accurately representing the sampling space. The newly generated OTF data is generally in agreement with the established thermal data generated through NJOY.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- AM5 - Proposed Benchmark Intercomparison Study
  - Worked on review of several benchmarks and training of staff for benchmark review.

### PUBLICATIONS

Any publications that have

- Completed your institution’s review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Jennifer L. Alwin, Jerawan Armstrong, Simon R. Bolding, Alexander R. Clark, Chelsea D’Angelo, Micky R. Dzur, Robert A. (Art) Forster III, Avery S. Grieve, Esteban Gonzalez, Wim Haeck, Colin Josey, Karen C. Kelley, Joel A. Kulesza, M. Robert MacQuigg, Vedant Mehta, Michael E. Rising, Div Sharma, Joshua B. Spencer, Holly Trellue, and James R. Tutt, “A list of 2022 MCNP User Symposium Abstracts from XCP-3,” Los Alamos Report ( <b>LA-UR-22-30534</b> ).
Q1	Colin Josey, Avery S. Grieve, and Michael E. Rising, “Results and Responses for the 2022 User Forum Survey,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30614</b> ).
Q1	Alexander R. Clark, Michael E. Rising, Colin Josey, and Joel A. Kulesza, “Verification and validation testing and tools: comparison between MCNP code versions and nuclear data libraries,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30692</b> ).
Q1	Alexander R. Clark, “Easy_PERT: a Python tool for writing PERT cards and parsing PERT card results,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30831</b> ).
Q1	Michael E. Rising, “Multigroup Cross-section Generation in MCNP6.3,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30839</b> ).
Q1	Michael E. Rising, “MCNP6.3: A Year in Review,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30768</b> ).
Q1	Michael E. Rising and Simon R. Bolding, “Coincident Capture through Post-processing PTRAC,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30927</b> ).
Q1	Colin Josey, Avery S. Grieve, and Michael E. Rising, “MCNP6.3 Code and Nuclear Data Installation Guide,” presented at the 2022 MCNP User Symposium ( <b>LA-UR-22-30884</b> , Rev.1).
Q1	Robert C. Little, Michael E. Rising, Jennifer L. Alwin, Rian M. Bahran, Travis J. Grove, Alexander R. Clark, Jesson D. Hutchinson, M. Robert MacQuigg, Alexander T. McSpaden, Isaac J. Michaud, Bobbi Riedel, Travis A. Smith, and Nicholas W. Thompson, “Nuclear data covariances are critical input to determine upper sub-critical limits and to design experiments to increase it,” presented at the Nuclear Data Uncertainty Quantification Working Meeting (NDUQWM) ( <b>LA-UR-22-31233</b> ).
Q1	Nicholas W. Thompson, Jesson D. Hutchinson, Jennifer L. Alwin, Alexander R. Clark, Theresa E. Cutler, Michael J. Grosskopf, Wim Haeck, Michal W. Herman, Noah A. Kleedtke, Juliann R. Lamproe, Robert C. Little, Issac J. Michaud, Denise Neudecker, Michael E. Rising, Travis A. Smith, and Scott A. Vander Wiel, “Neutron Leakage Spectra Sensitivities for ICSBEP Benchmarks,” presented at the American Nuclear Society (ANS) Winter Meeting and Nuclear Technology Expo ( <b>LA-UR-22-32047</b> ).

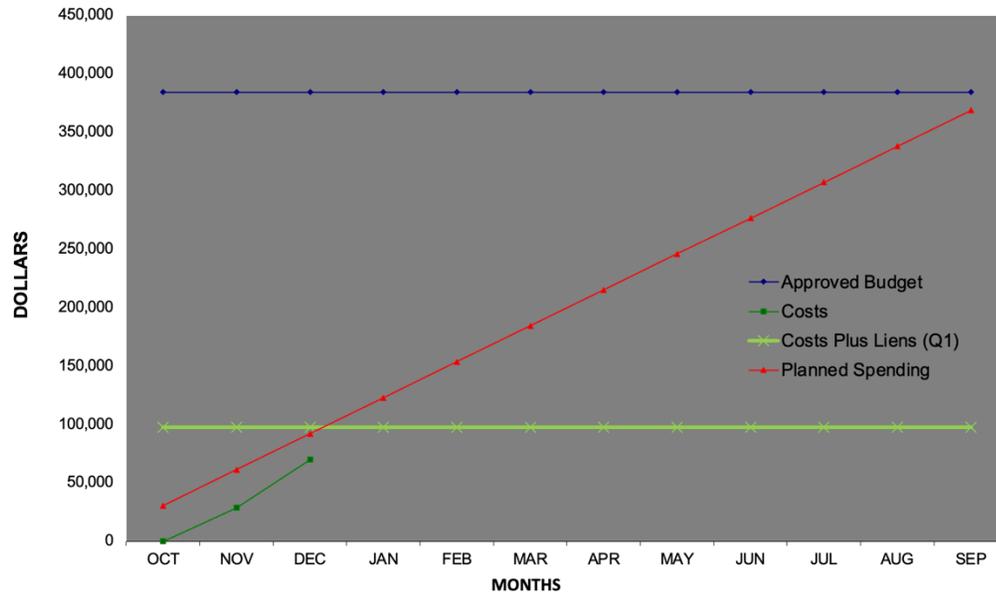
## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Jeffrey S. Bull, Colin Josey, Joel A. Kulesza, and Michael E. Rising, "MCNP® Code Version 6.3.0 Build Guide," Los Alamos Report ( <b>LA-UR-22-32851</b> , Rev. 1).
Q1	Colin Josey, Alexander R. Clark, Joel A. Kulesza, Eric J. Pearson, and Michael E. Rising, "MCNP® Code Version 6.3.0 Verification & Validation Testing," Los Alamos Report ( <b>LA-UR-22-32951</b> , Rev. 1).
Q1	Michael E. Rising, Jerawan C. Armstrong, Simon R. Bolding, Forrest B. Brown, Jeffrey S. Bull, Timothy P. Burke, Alexander R. Clark, David A. Dixon, Robert A. (Art) Forster III, Jesse F. Giron, Avery S. Grieve, H. Grady Hughes, Colin J. Josey, Joel A. Kulesza, Roger L. Martz, Austin P. McCartney, Gregg W. McKinney, Scott W. Mosher, Eric J. Pearson, Michael E. Rising, Clell J. (CJ) Solomon Jr., Sriram Swaminarayan, Jeremy E. Sweezy, Stephen C. Wilson, and Anthony J. Zukaitis," Los Alamos Report ( <b>LA-UR-22-33103_R1</b> ).
Q1	Tara Robertson, Jennifer Alwin, Christopher Perfetti, Rachael Bulso, "Application of an Empirical Density Law via Python for Aqueous Plutonium Nitrate Systems in MCNP6", Los Alamos Report ( <b>LA-UR-22-32993</b> ).
Q1	Riley Bulso, Jennifer Alwin, Christopher Perfetti, Tara Robertson, Kelly Aldrich, Theresa Cutler, David Kimball, James Bunsen, Laura Worl, "Application of an Empirical Density Law via Python for Aqueous Plutonium Chloride Systems in MCNP6", Los Alamos Report ( <b>LA-UR-22-20040</b> ).
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM2, 3, 4, 5 <b>M&amp;O Contractor Name:</b> LLNL <b>Point of Contact Name:</b> Catherine Percher <b>Point of Contact Phone:</b> (925) 579-4226	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$190,317
  2. Approved FY 2023 Budget = \$194,000
  3. Total FY23 budget w/Carryover = \$384,317
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$70,063
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$ 15,520
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
---	---	--	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on Multi-Physics methods for simulation of criticality excursions activities (AM2)	<span style="background-color: green; color: white; padding: 2px;"> </span>	
Q1	Provide a status report on slide rule application activities (AM3)	<span style="background-color: green; color: white; padding: 2px;"> </span>	

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report on thermal scattering and self-shielding in GNDS/FUDGE activities. (AM4)		
Q1	Provide a status report on proposed intercomparison study activities. (AM5)		
Q2	Provide a status report on Multi-Physics methods for simulation of criticality excursions activities (AM2)		
Q2	Provide a status report on slide rule application activities (AM3)		
Q2	Provide a status report on thermal scattering and self-shielding in GNDS/FUDGE activities. (AM4)		
Q2	Provide a status report on proposed intercomparison study activities. (AM5)		
Q3	Provide a status report on Multi-Physics methods for simulation of criticality excursions activities (AM2)		
Q3	Provide a status report on slide rule application activities (AM3)		
Q3	Provide a status report on thermal scattering and self-shielding in GNDS/FUDGE activities. (AM4)		
Q3	Provide a status report on proposed intercomparison study activities. (AM5)		
Q4	Provide a status report on Multi-Physics methods for simulation of criticality excursions activities (AM2)		
Q4	Provide a status report on slide rule application activities (AM3)		
Q4	Provide a status report on thermal scattering and self-shielding in GNDS/FUDGE activities. (AM4)		
Q4	Provide a status report on proposed intercomparison study activities. (AM5)		

### ACCOMPLISHMENTS

- AM2 – Multi-Physics Methods for Simulation of Criticality Excursion
  - Project continues under different funding stream trying to match PDV results to Multiphysics Godiva model
- AM3 – Slide Rule Application
  - All LLNL calculations were completed in previous FY and the final report is in preparation by IRSN.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- AM4 - Thermal Scattering and Self-Shielding in GNDS/FUDGE
  - Tested many of the new candidate ENDF-VIII.1 evaluations, including the neutron sub-library and several new TNSL materials such as FLiBe, CaH<sub>2</sub>, several organic molecules, ZrH. The ENDF-to-GNDS translator in FUDGE had to be amended slightly to support these new TNSL evaluations, then the GNDS translations were processed with FUDGE to ensure the processing pipeline works. Some V&V has been done using the LLNL Monte Carlo code Mercury, although the Metis suite contains few benchmarks sensitive to these new evaluations.
  - Caleb Mattoon presented at the CSEWG meeting in November 2022, focusing on future development needs for further improving TNSL support in GNDS.
  - URR processing capabilities in FUDGE: after several bug fixes, we were able to use FUDGE to process nearly all of the ENDF-VIII.0 neutron sub-library. Some evaluations (including Eu and Pa) remain very computationally expensive and timed out using the current FUDGE processing pipeline, so further work is ongoing to speed those up. Some preliminary testing on processed results was performed using Metis and Mercury, but further testing is expected in Q2. An initial attempt was made to generate ACE files with URR probability tables, but so far those files have not been successfully run through MCNP. We hope to resolve that problem in Q2.
- AM5 - Proposed Benchmark Intercomparison Study
  - Published Beta-eff benchmark report, providing published results of 32 Beta-effective benchmarks using three calculational methods in COG for each in both ENDF/B-VIII.0 and JEFF-3.3
  - To date, a total to 3,404 high-precision COG (k-eff) ICSBEP benchmark results, and 21 beta-eff benchmark results, using ENDF/B-VII.1, ENDF/B-VIII.0 and JEFF-3.3 have been provided to Nicolas Leclaire (IRSN) for inclusion in the study as follows:

Pu	U233	MIX	HEU	LEU	SPEC	β-eff
766	193	356	1054	807	10	32

- Shielding benchmarks are in preparation.

## PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Heinrichs, D. et al, "COG Beta-Effective Benchmarks," LLNL-TR-843852, December 20, 2022
	Mattoon, C. "TNSL Support in GNDS 2.0 and Beyond," LLNL-PRES-842271, November 4, 2022
	Mattoon, C. "GNDS v2.0 Release and Future Developments," LLNL-PRES-842271, November 4, 2022
Q2	
Q3	

**NCSP Quarterly Progress Report (FY-2023 Q1)**

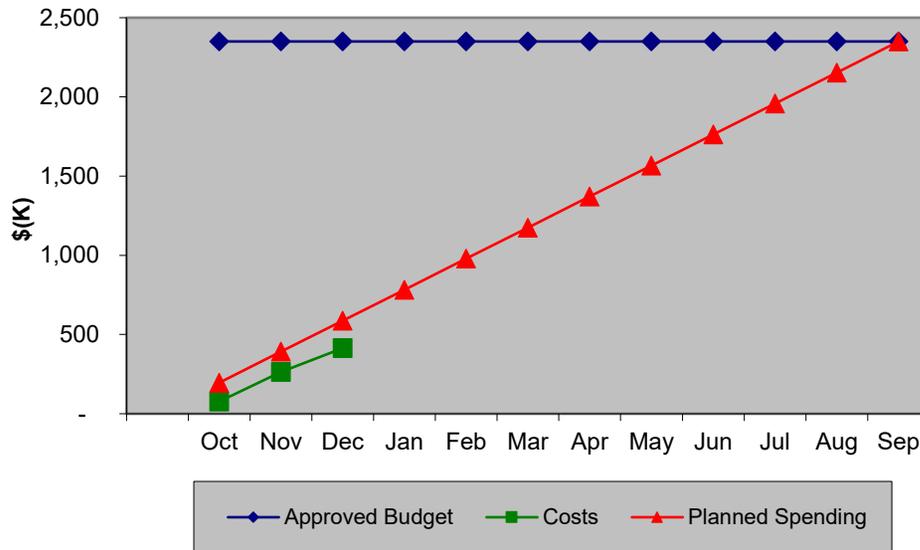
Q4	
----	--

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM1, 2, 3, 6, 10, 17, 18, 19 <b>M&amp;O Contractor Name:</b> ORNL <b>Point of Contact Name:</b> Doug Bowen <b>Point of Contact Phone:</b> (865) 576-0315	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 30, 2023
--	--

## BUDGET

**FY23 Analytical Methods**



1. Carryover into FY 2023 = \$50K
  2. Approved FY 2023 Budget = \$ 2300K
  3. Total FY 2023 Budget w/Carryover = \$2350K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$414K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete	On Schedule	Behind Schedule	Missed Milestone
----------	-------------	-----------------	------------------

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Continue distribution of available and newly packaged software to the NCS community requesters (at no direct cost to them) and provide distribution totals quarterly. (AM1)		
Q1	Provide status on RSICC activities (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide status reports on ORNL participation in US and International Analytical Methods collaborations and provide brief trip summary report to NCSP Manager on items of NCSP interest. (AM2)		
Q1	Provide status on TSUNAMI upgrades. (AM2)		
Q1	Provide status on VADER. (AM2)		
Q1	Provide status on Sampler improvements. (AM2)		
Q1	Provide status on CSAS improvements. (AM2)		
Q1	Provide status on SCALEHELP. (AM2)		
Q1	Provide status on SCALE 7.0 support. (AM2)		
Q1	Provide status on SCALE training (other than stats). (AM2)		
Q1	Publish a quarterly newsletter. (AM2)		Newsletter delayed coinciding with SCALE 6.3 release.
Q1	Provide status on AMPX maintenance and modernization activities (AM3)		
Q1	Provide status on Slide Rule application activities (AM6)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q1	Provide status on VALID activities (AM17)		
Q1	Provide status on determination of appropriate integral parameters for critical experiment activities. (AM18)		
Q1	Provide status on analysis of Sum-of-Fractions for Nuclide Mixtures activities. (AM19)		
Q2	Continue distribution of available and newly packaged software to the NCS community requesters (at no direct cost to them) and provide distribution totals quarterly. (AM1)		
Q2	Provide status on RSICC activities (AM1)		
Q2	Provide status reports on ORNL participation in US and International Analytical Methods collaborations and provide brief trip summary report to NCSP Manager on items of NCSP interest. (AM2)		
Q2	Provide status on TSUNAMI upgrades. (AM2)		
Q2	Provide status on VADER. (AM2)		
Q2	Provide status on Sampler improvements. (AM2)		
Q2	Provide status on MAVRIC improvements. (AM2)		
Q2	Provide status on SCALEHELP. (AM2)		
Q2	Provide status on SCALE 7.0 support. (AM2)		
Q2	Provide status on SCALE training (other than stats). (AM2)		
Q2	Publish a quarterly newsletter. (AM2)		
Q2	Provide status on AMPX maintenance and modernization activities (AM3)		
Q2	Provide status on Slide Rule application activities (AM6)		
Q2	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q2	Provide status on VALID activities (AM17)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide status on determination of appropriate integral parameters for critical experiment (AM18)		
Q2	Provide status on analysis of Sum-of-Fractions for Nuclide Mixtures (AM19)		
Q3	Continue distribution of available and newly packaged software to the NCS community requesters (at no direct cost to them) and provide distribution totals quarterly. (AM1)		
Q3	Provide status on RSICC activities (AM1)		
Q3	Provide status reports on ORNL participation in US and International Analytical Methods collaborations and provide brief trip summary report to NCSP Manager on items of NCSP interest. (AM2)		
Q3	Provide status on TSUNAMI upgrades. (AM2)		
Q3	Provide status on VADER. (AM2)		
Q3	Provide status on Sampler improvements. (AM2)		
Q3	Provide status on MAVRIC improvements. (AM2)		
Q3	Provide status on SCALEHELP. (AM2)		
Q3	Provide status on SCALE 7.0 support. (AM2)		
Q3	Provide status on SCALE training (other than stats). (AM2)		
Q3	Publish a quarterly newsletter. (AM2)		
Q3	Provide status on AMPX maintenance and modernization activities (AM3)		
Q3	Provide status on Slide Rule application activities (AM6)		
Q3	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q3	Provide status on VALID activities (AM17)		
Q3	Provide status on determination of appropriate integral parameters for critical experiment (AM18)		
Q3	Provide status on analysis of Sum-of-Fractions for Nuclide Mixtures (AM19)		
Q4	Continue distribution of available and newly packaged software to the NCS community requesters (at no direct cost to them) and provide distribution totals quarterly. (AM1)		
Q4	Provide status on RSICC activities (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Provide status reports on ORNL participation in US and International Analytical Methods collaborations and provide brief trip summary report to NCSP Manager on items of NCSP interest. (AM2)		
Q4	Provide status on TSUNAMI upgrades. (AM2)		
Q4	Provide status on VADER. (AM2)		
Q4	Provide status on Sampler improvements. (AM2)		
Q4	Provide status on MAVRIC improvements. (AM2)		
Q4	Provide status on SCALEHELP. (AM2)		
Q4	Provide status on SCALE 7.0 support. (AM2)		
Q4	Provide status on SCALE training (other than stats). (AM2)		
Q4	Publish a quarterly newsletter. (AM2)		
Q4	Document AMPX modernization and technical support for SCALE CE, multigroup, and covariance libraries and report status annually to the NCSP Manager. (AM3)		
Q4	Provide status on Slide Rule application activities (AM6)		
Q4	Provide status on proposed benchmark intercomparison study activities (AM10)		
Q4	Provide status on VALID activities (AM17)		
Q4	Provide status on determination of appropriate integral parameters for critical experiment (AM18)		
Q4	Provide status on analysis of Sum-of-Fractions for Nuclide Mixtures (AM19)		

### ACCOMPLISHMENTS

- AM1 - Radiation Safety Information Computational Center (RSICC)
  - Distributed 859 software packages.
  - 186 SCALE, 403 MCNP®, and 1 COG packages distributed.
  - RSICC quarterly report issued.
  - Q1: University Requests: 405 – NCSP Direct Requests: 28

## NCSP Quarterly Progress Report (FY-2023 Q1)

FY2022 University Distributions		
Month	MCNP®	SCALE
October	105	26
November	56	28
December	58	33
January		
February		
March		
April		
May		
June		
July		
August		
September		
Total	219	87

- 
- AM2 - SCALE/KENO/TSUNAMI Maintenance and Support/Cross-Section Generation/Modernization
  - Provide a status report on TSUNAMI upgrades
    - Focusing on scattering sensitivity convergence improvements, some related to under convergence of sources. Some methodology improvements will be pursued in Q2 or Q3. Report comparing SCALE/TSURFER, TSUNAMI, trending, and Whisper methodology is working through review.
  - Provide a status report on VADER
    - Extensive revision of 6.3 manual (now 6.3.1 bound as the first RSICC available maintenance release.)
  - Provide a status report on Sampler improvements
    - New parametric study option finalized which constructs a cubic spline from calculated data points, finds the global min/max, and then performs one final calculation to verify. Useful for searches for maximum keff under moderation conditions or geometry changes.
  - Provide a status report on MAVRIC improvements
    - Focusing on source convergence metrics and keff estimators. Extensive review of MCNP vs Shift vs. KENO keff estimators and their handling of uncertainty, addressing the appearance of higher uncertainty per particle report by Shift.
  - SCALEHELP
    - Minor efforts, upgraded JIRA installation.
  - SCALE 7.0 support

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Additional SCALE 7 related tasks not listed here include minor bug fixes and performance improvements for Shift geometry. The handling of hundreds of thousands of spherical surfaces for pebble beds or random geometry modeled as a collection of spheres has been improved substantially.
- SCALE training (other than stats)
  - SCALE fall training was successfully given in person, for the first time since pre-COVID. Everyone commented on how nice it was to be back in person.
- Publish a quarterly newsletter
  - Newsletter delayed coinciding with 6.3 release.
- AM3 - AMPX Maintenance & Modernization
  - AMPX was released in the open source subset of SCALE, available at <https://code.ornl.gov/scale/code/scale-public>, at the end of FY 2022. Early FY 2023 work involved writing instructions so that users external to ORNL can build and use this public distribution of AMPX.
  - Work on AMPX was presented at the CSEWG meeting in November (Brookhaven National Laboratory). Highlights included the announcement of AMPX's open-source release, continued work on thermal scattering, continued support of the GNDS nuclear data format, and the introduction of photonuclear library processing (sponsored by a partnership between NNSA and NioWAVE).
  - Doro Wiarda attended and presented AMPX development highlights at the IAEA nuclear data processing meeting.
  - Multigroup libraries with a 10-eV thermal cutoff were prepared and included in the SCALE data libraries.
- AM6 – Slide Rule Application
  - We are still waiting for guidance from IRSN on this task as they are leading it. I sent an email to Matthieu Duluc in October to ask for a status and next steps, but he did not answer during Q1.
- AM10 – Proposed Benchmark Intercomparison Study
  - No work was performed in Q1 on AM-10. Q2 should see a limited amount of work responding to previous IRSN questions.
- AM17 – Expansion of the Verified, Archived, Library of Inputs and Data (VALID)
  - Limited work was performed on AM-17 in Q1 due to limited availability of qualified staff. Work has started on introducing new staff to the VALID process and work which will lead to qualification is on-going with one newly hired staff member. Q2 should see progress with this staff member and may see work to qualify a second new staff member start. Work started in FY22 may also result in qualifications for new staff in Q2 or Q3.
- AM18 – Determination of Appropriate Integral Parameters for Critical Experiment
  - The determination of the bias and bias uncertainty in the prediction of ck cut-off criteria, will be performed considering various data sets drawn from the VALID library
  - Python scripts were developed and checked based on results delivered from AM-20 task.
  - The initial assessment was for the LCT benchmarks in the VALID suite, compared against all the available benchmark data in VALID. The results indicated that this method could be used to identify appropriate cutoffs.
  - Expanded to PST applications; results currently being reviewed
- AM19 – Analysis of Sum-of-Fractions for Nuclide Mixtures

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Teams meetings were held during this time to discuss results of the validation efforts on the mass limits for mixtures of nuclides. The validation results from ORNL have been used to develop mass curves for mixtures of the main three fissile material ( $^{233}\text{U}$ ,  $^{235}\text{U}$ , and  $^{239}\text{Pu}$ ) with transuranic actinides by PNNL.
- PNNL is currently working on a draft report given the results from the validation portion of the project supplied by ORNL. This working draft report has been sent to ORNL so that the validation/sensitivity portion of the report can be added and reviewed.
- Discussions were held to determine presentation material concerning the project at the annual TPR meeting for February.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Jordan McDonnell, BK Jeon, Kang Seog Kim, Dorothea Wiarda, Jesse Brown, Chris Chapman, Andrew Holcomb, "AMPX," CSWEG, Upton, NY, Nov 2022.
	William B.J. Marshall, Travis Greene, Alex Shaw, "Updated Gadolinium Validation in SCALE 6.3.0 using ENDF/B-VIII.0 Data," CSWEG, Upton, NY, Nov 2022.
	Alex Shaw, William B.J. Marshall, "Analysis of SCALE Criticality and Sensitivity Calculations for Reflected HEU Cylinders," Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), 666-674 (June 2022).
	Mathieu Dupont, "Evaluation of Oak Ridge National Laboratory Health Physics Research Reactor Operation Data for Critical Benchmark Creation," Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), 725-734 (June 2022)
	William B.J. Marshall, Alex Lang, "Multigroup Examination of Nickel-Reflected HEU System," Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), 784-791 (June 2022)
	William B.J. Marshall, Travis Greene, "Performance of the Initial Implementation of the Shift Monte Carlo Code in SCALE 6.3," Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), 754-763 (June 2022)
	Travis Greene, William B.J. Marshall, Justin Clarity, "Impact of Increased Latent Generations on Sensitivity Calculations with SCALE," Nuclear Criticality Safety Division Topical Meeting (NCSD 2022), 744-753 (June 2022)
	Travis Greene, William B.J. Marshall, Justin Clarity, "Impact of Increased Latent Generations on Sensitivity Calculations with SCALE," submitted to 2022 American Nuclear Society Annual Meeting, June 2022.
	Alex Lang, William B.J. Marshall, "Multigroup Examination of Nickel-Reflected HEU System," submitted to 2022 American Nuclear Society Annual Meeting, June 2022.
Q2	

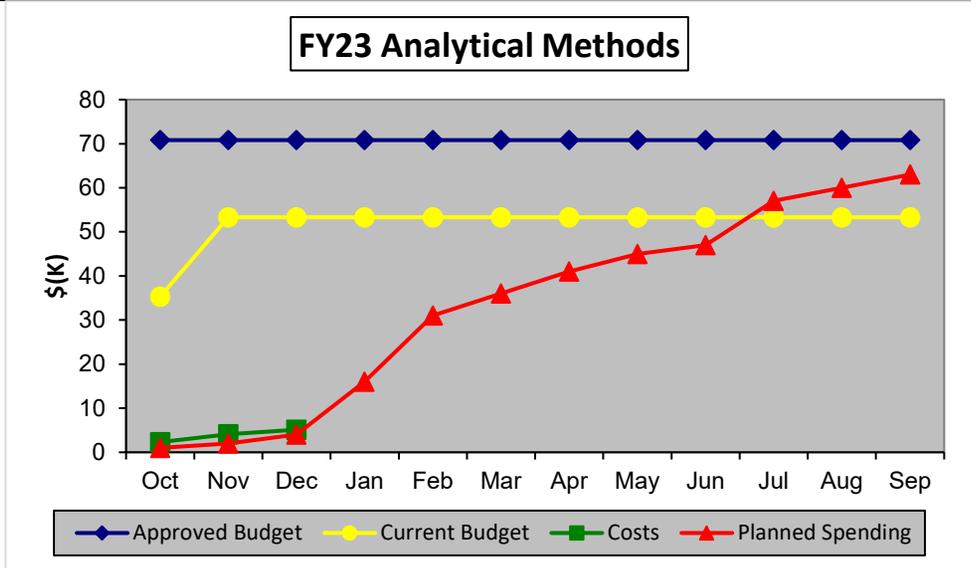
**NCSP Quarterly Progress Report (FY-2023 Q1)**

Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM1 <b>M&amp;O Contractor Name:</b> PNNL <b>Point of Contact Name:</b> Travis Zipperer <b>Point of Contact Phone:</b> (206) 428-3474	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$35,313
  2. Approved FY 2023 Budget = \$40,000 (\$35,500)
  3. Total FY2023 Budget w/Carryover = \$ 75,313 (\$70,813)
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$5,118
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$12,323 (\$7,813)
- NOTE:** Include commitments as part of spending
- Values in () account for the 5% reduction.**

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status of Sum-of-Fractions analysis for nuclide mixtures (AM1)	<span style="background-color: blue; color: white; padding: 2px;"> </span>	
Q2	Provide a status of Sum-of-Fractions analysis for nuclide mixtures (AM1)		
Q3	Provide a status of Sum-of-Fractions analysis for nuclide mixtures (AM1)		
Q4	Provide a status of Sum-of-Fractions analysis for nuclide mixtures (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- AM1 – Analysis of Sum-of-Fractions for Nuclide Mixtures
  - Q1: Constructed case matrix for water and polyethylene reflected systems (around 1900 cases each); calculations to commence in Q2
  - Q1: Met with ORNL staff in December to discuss collaboration on the NCSP Technical Program Review Presentation and ICNC 2023 publications.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

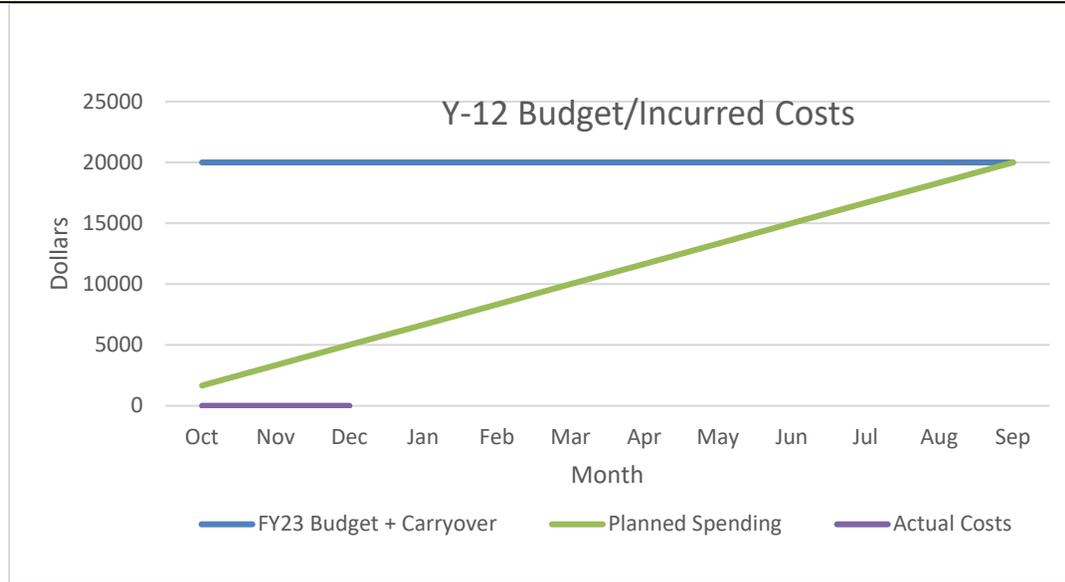
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> AM1 <b>M&amp;O Contractor Name:</b> Y12 <b>Point of Contact Name:</b> Kevin Reynolds <b>Point of Contact Phone:</b> (865) 241-9067	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 23, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$0.00
  2. Approved FY 2023 Budget = \$20,000.00
  3. Total FY 2023 Budget w/Carryover = \$20,000.00
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$0.00
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

STATUS (copy color code and paste below in 'STATUS' field)			
Complete	<span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule	<span style="background-color: green; color: white; padding: 2px;"> </span>
		Behind Schedule	<span style="background-color: yellow; color: black; padding: 2px;"> </span>
		Missed Milestone	<span style="background-color: red; color: white; padding: 2px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide status on Y12-AM1 activities in NCSP Quarterly Progress Reports. (AM1)	<span style="background-color: green; color: white; padding: 2px;"> </span>	No activity this quarter to report.
Q2	Provide status on Y12-AM1 activities in NCSP Quarterly Progress Reports. (AM1)		
Q3	Provide status on Y12-AM1 activities in NCSP Quarterly Progress Reports. (AM1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Provide status on Y12-AM1 activities in NCSP Quarterly Progress Reports. (AM1)		
<b>ACCOMPLISHMENTS</b>			
<ul style="list-style-type: none"> <li>• AM1 – Proposed Benchmark Intercomparison Study             <ul style="list-style-type: none"> <li>○</li> </ul> </li> </ul>			
<b>PUBLICATIONS</b>			
<p>Any publications that have</p> <ul style="list-style-type: none"> <li>• Completed your institution’s review cycle during the quarter</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>• Are publicly releasable</li> </ul> <p>Should be submitted to Marsha Henley, <a href="mailto:henleym@ornl.gov">henleym@ornl.gov</a> with your quarterly report.</p>			
<b>Quarter</b>	<b>Publication Reference</b> Example: Author, "Title", LA-UR-18-27731, October 1, 2019		
Q1			
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> NIPD3 <b>M&amp;O Contractor Name:</b> LANL <b>Point of Contact Name:</b> Joetta Goda/Bob Little <b>Point of Contact Phone:</b> 505-667-2812/505-665-3487	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
--	--

## BUDGET

	1. Carryover into FY 2023 = \$ 0 2. Approved FY 2023 Budget = \$ 100,000 3. Total FY23 Budget w/Carryover = \$100,000																
	<table border="1" style="margin-left: 20px;"> <tr> <td>Q1</td> <td>\$22,391.60</td> <td>\$0</td> <td>\$22,392</td> </tr> <tr> <td>Q2</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td>Q3</td> <td></td> <td></td> <td>\$0</td> </tr> <tr> <td>Q4</td> <td></td> <td></td> <td>\$0</td> </tr> </table>	Q1	\$22,391.60	\$0	\$22,392	Q2			\$0	Q3			\$0	Q4			\$0
Q1	\$22,391.60	\$0	\$22,392														
Q2			\$0														
Q3			\$0														
Q4			\$0														
	4. 5. Projected carryover into FY 2024 = \$																
	<b>NOTE:</b> Include commitments as part of spending  New WBS for LANL; will be set up now that CR is over. For Q1, amount included in IE1.																

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete	On Schedule	Behind Schedule	Missed Milestone
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on IT support activities at NNSS (IPD3)		
Q2	Provide a status report on IT support activities at NNSS (IPD3)		
Q3	Provide a status report on IT support activities at NNSS (IPD3)		
Q4	Provide a status report on IT support activities at NNSS (IPD3)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- IPD3 – IT support at NNSS
  - Maintaining networks, security upgrades, installing printer drivers, troubleshooting Entrust issues.

### PUBLICATIONS

Any publications that have

- Completed your institution’s review cycle during the quarter  
AND
- Are publicly releasable

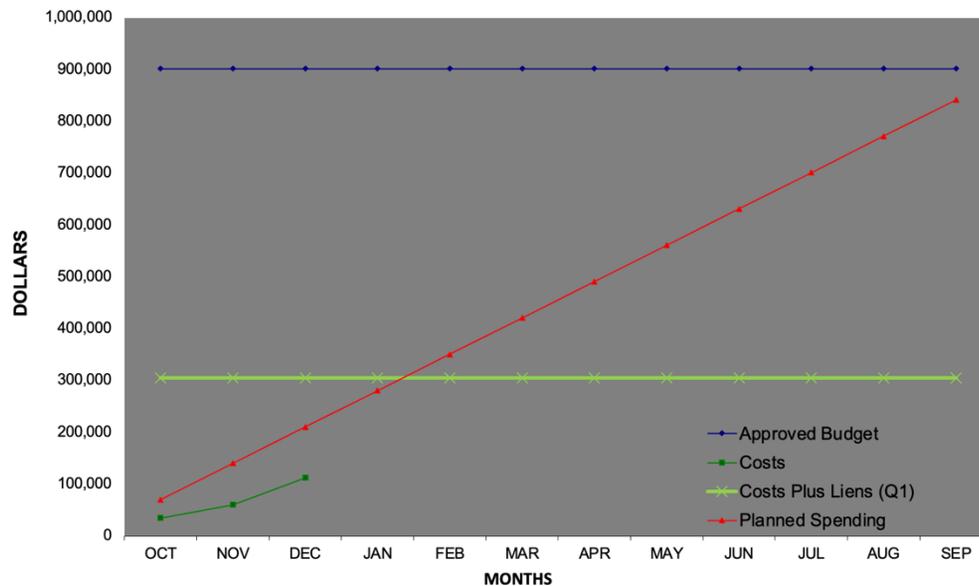
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> IPD1, 2, 5, 6 <b>M&amp;O Contractor Name:</b> LLNL <b>Point of Contact Name:</b> Catherine Percher <b>Point of Contact Phone:</b> (925) 579-4226	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$151,559
  2. Approved FY 2023 Budget = \$750,000
  3. Total FY23 Budget w/Carryover = \$901,559
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$112,918
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$60,000
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete 	On Schedule 	Behind Schedule 	Missed Milestone 
--	---	---	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IPD1)		
Q1	Provide status reports on LLNL participation in US and International IPD collaborations (including ICSBEP). (IPD1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Maintain, operate, and modernize the NCSP website, databases, and provide user assistance as required. (IPD2)		
Q1	Provide a status report on IT support at NNSS (IPD5)		
Q1	Provide a status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q2	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IPD1)		
Q2	Provide status reports on LLNL participation in US and International IPD collaborations (including ICSBEP). (IPD1)		
Q2	Maintain, operate, and modernize the NCSP website, databases, and provide user assistance as required. (IPD2)		
Q2	Provide a status report on IT support at NNSS (IPD5)		
Q2	Provide a status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q3	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IPD1)		
Q3	Provide status reports on LLNL participation in US and International IPD collaborations (including ICSBEP). (IPD1)		
Q3	Maintain, operate, and modernize the NCSP website, databases, and provide user assistance as required. (IPD2)		
Q3	Provide a status report on IT support at NNSS (IPD5)		
Q3	Provide a status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		
Q4	Manage all aspects of the DOE NCSP participation in the ICSBEP as required to ensure the finalizing and publishing ICSBEP evaluations per IE schedule. (IPD1)		
Q4	Provide status reports on LLNL participation in US and International IPD collaborations (including ICSBEP). (IPD1)		
Q4	Maintain, operate, and modernize the NCSP website, databases, and provide user assistance as required. (IPD2)		
Q4	Provide a status report on IT support at NNSS (IPD5)		
Q4	Provide a status report on benchmark evaluation of LLNL 'Pulsed Spheres' (IPD6)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- IPD1 - Conduct ICSBEP for Benchmarks of the 5-Year Plan and publish annual revision to the Handbook
  - The 2021 Edition of the handbook was (finally!) published in October 2022
  - Five new and one legacy NCSP evaluations are in preparation for the 2023 ICSBEP meeting:
    - (1) ALARM-REAC-SST-SHIELD-001, Neutron Fluence and Element 57 Dose Responses to a Bare and Steel-Reflected Pulse of the ORNL HPRR (ORNL)
    - (2) IER305, 7uPCX fuel with Mo sleeves (SNL)
    - (3) IER480, Pu ZPPR benchmark optimized for Polyethylene and Lucite thermal scattering, (LLNL)
    - (4) IER488, HEU Critical and Subcritical Measurements (LANL)
    - (5) Chlorine Worth Study (LANL)
  - An additional evaluation of Libby Johnson U(5) metal rod arrays in water by Robert McBroom (ORO) and a LANL/JAEA collaboration experiment of Fast-Spectrum Critical Assemblies with a Pb-HEU Core Surrounded by a Copper Reflector are also in preparation for the 2023 ICSBEP meeting
- IPD2 - Maintain the NCSP Website and Systems
  - Updated documents, links, calendars, taskings, newsletters, photos/portraits, created art for updated banners
  - Created 2023 Annual TPR page and Cvent registration site
  - Maintained lists of email subscribers for various “group” emails used by NCSP management
  - Added and updated foreign trip reports
  - Maintained list of available T&E courses and created waitlist for all NCSP T&E courses
  - Migrated NCSP Primer to NCSP site (this is live)
    - Web team developer to work with consultant to make some adjustments
- IPD5 - IT Support at NNSS
  - Provided ISSM/ISSO and System Administrator support for Nevada IT including required weekly NTS-SLAN/NCERC system updates, monthly “authenticated” scans for NCERC network devices, and system upgrades as required. Created and renewed NTS-SLAN accounts throughout the quarter.
  - NTS-SLAN SharePoint site creation for user account creation/tracking (On-going)
  - NCERC equipment inspection – IER 466
  - Performed equipment inspections for NCERC classes (IER 564)
  - Deployed new printer to NCERC control room 310 (IER 466)
  - Annual update to NTS-SLAN MOU with other LANL classified networks
  - Responded to NTS-SLAN Data Call for DOE request
  - Expanded LANL network to Bldg. 6-911 in support of NCERC request (IER 466)
  - Performing inspection of new NCERC Control Room equipment; testing of functionality (on-going)
  - Discussing upcoming data acquisition requirements for upcoming NCERC class
  - Completed annual property inventory review for LANL
  - Completed annual CNSS Self-Assessment for NTS-SLAN

## NCSP Quarterly Progress Report (FY-2023 Q1)

- IPD6 - Benchmark Evaluation of LLNL 'Pulsed Spheres'
  - Attended virtual SINBAD task force meeting to review Pulsed Sphere benchmark draft
  - New postdoc, Aaron Tamashiro, working on second target benchmark with assistance from Soon Kim, recently retired but under contract through Delphi

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> IPD3, 4, 5 <b>M&amp;O Contractor Name:</b> ORNL <b>Point of Contact Name:</b> Doug Bowen <b>Point of Contact Phone:</b> (865) 576-0315	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 30, 2023
--	--

## BUDGET

Month	Approved Budget (\$K)	Costs (\$K)	Planned Spending (\$K)
Oct	200	10	20
Nov	200	15	35
Dec	200	30	50
Jan	200		65
Feb	200		80
Mar	200		95
Apr	200		110
May	200		125
Jun	200		140
Jul	200		155
Aug	200		170
Sep	200		185

1. Carryover into FY 2023 = \$ 161K
2. Approved FY 2023 Budget = \$40K
3. Total Approved FY 2023 Budget w/Carryover = \$201K
4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$24K
5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
8. Projected carryover into FY 2024 = \$

**NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete <span style="background-color: blue; color: white; padding: 2px 5px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px 5px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px 5px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px 5px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on the development of the NCSP repository at OSTI.gov. (IPD3)	<span style="background-color: blue; color: white; padding: 2px 5px;"> </span>	
Q1	Provide a status report on the development of the NCSP LFE database (IPD4)	<span style="background-color: blue; color: white; padding: 2px 5px;"> </span>	

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report about the progress on the HPRR benchmark. (IPD5)		
Q2	Provide a status report on the development of the NCSP repository at OSTI.gov. (IPD3)		
Q2	Provide a status report on the development of the NCSP LFE database (IPD4)		
Q2	Provide a status report about the progress on the HPRR benchmark (IPD5)		
Q3	Provide a status report on the development of the NCSP repository at OSTI.gov. (IPD3)		
Q3	Provide a status report on the development of the NCSP LFE database (IPD4)		
Q3	Provide a status report about the progress on the HPRR benchmark (IPD5)		
Q4	Provide a status report on the development of the NCSP repository at OSTI.gov. (IPD3)		
Q4	Provide a status report on the development of the NCSP LFE database (IPD4)		
Q4	Provide a status report about the progress on the HPRR benchmark (IPD5)		

### ACCOMPLISHMENTS

- IPD3 – Nuclear Criticality Safety Repository
  - Curation for FY22 Q4 and FY21 Q3 – Q4 records has been completed, pending those reported with outstanding issues or questions. The NCSP curation team searched over 7,000 entries in “Seventy-Five Years of Nuclear Criticality Safety Documents – A Bibliography” (LLNL-TR-760080) to determine availability in OSTI.GOV. Currently, 436 NCSP records are fully curated and searchable at OSTI.GOV and 7,000 of the 10,000 records from the NCSP-provided spreadsheet have been reviewed to determine if already in OSTI’s collection.
  - In 2019, OSTI introduced a search for figure and table images included in accepted manuscripts. This allows users to search for and retrieve documents as usual, but the associated images are also retrieved, and can be viewed with the corresponding document or in a separate tab for images only. Images within accepted manuscripts in this collection will be curated, including caption text, and will become searchable at OSTI.GOV after the current designated embargo period of 12 months.

## NCSP Quarterly Progress Report (FY-2023 Q1)

	Product Type	Existing Curated	New Curated	Totals	Cumulative
	Tech Reports	29	17	46	62
	Conference Products	23	161	184	343
	Accepted Manuscripts	11	20	31	31
	<b>Totals</b>	<b>63</b>	<b>198</b>	<b>261</b>	<b>436</b>
<ul style="list-style-type: none"> <li>○ Per customer direction, team members are prioritizing curation of the most recent records. Record curation for FY21 is in progress and close to completion. Team members are continuing the search of OSTI.GOV's collection for existing records for bibliographic entries in "Seventy-Five Years of Nuclear Criticality Safety Documents – A Bibliography" (LLNL-TR-760080).</li> <li>● IPD4 – Learning from Experience (LFE) database <ul style="list-style-type: none"> <li>○ Work in Q1 was limited to moving this task from PNNL to ORNL and hiring a subcontractor to support the work. Andy Prichard will support this task with Doug Bowen. Website support will be required at some point from LLNL to implement this event database on the IPD page on the NCSP website. A request was made for NNSA to move funds from PNNL to ORNL to fund this project. Funds have not yet been received. Numerous telecons have been held between the UK Working Party for Nuclear Criticality Safety, the UK National Nuclear Laboratory, and with IRSN to conceptualize the implementation of this database in the US. Most of this work was completed in FY22 (before this was a funded NCSP task) and in FY23Q1.</li> </ul> </li> <li>● IPD5 – Oak Ridge Health Physics Research Reactor CAAS Benchmark Evaluation <ul style="list-style-type: none"> <li>○ The evaluation is still being updated. The evaluator and the ICSBEP subgroup are debating to include the steel or Lucite shields responses in the evaluation. An abstract for the ICNC 2023 conference in October 2023 has been drafted.</li> </ul> </li> </ul>					

## PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

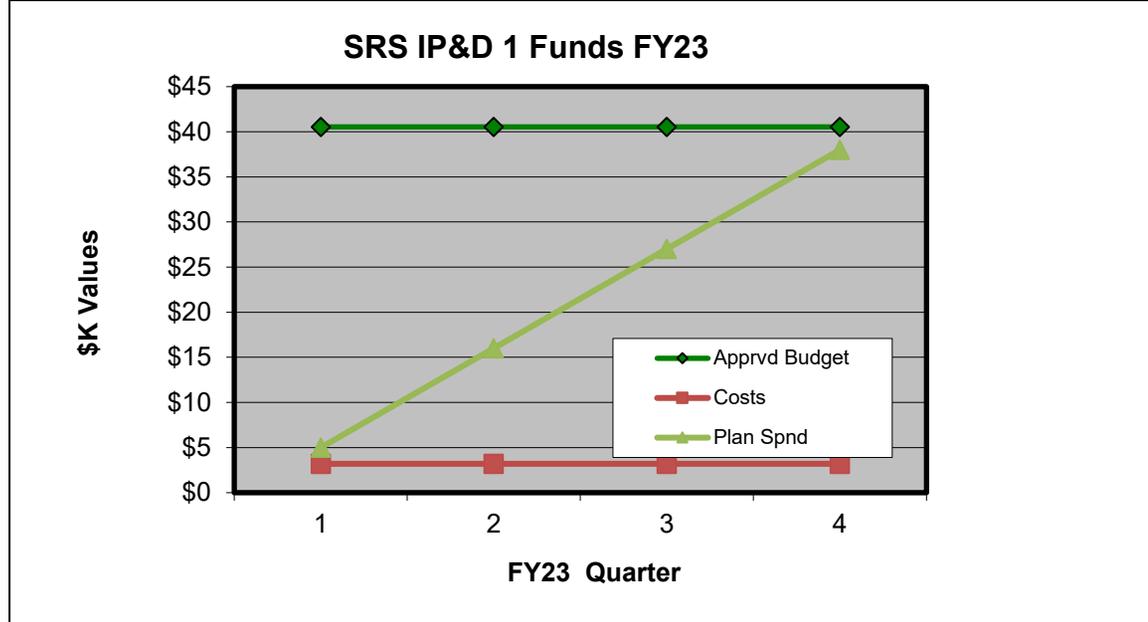
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	None
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> IPD1 <b>M&amp;O Contractor Name:</b> SRNS <b>Point of Contact Name:</b> David Erickson <b>Point of Contact Phone:</b> 803-557-9445	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$ 40.5K
  2. Approved FY 2023 Budget = \$0K
  3. Total FY 2023 Budget w/Carryover = \$40.5K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$3.2K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$TBD
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
---	---	--	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on progress with CritView. (IPD1)	<span style="background-color: green; color: white; padding: 2px;"> </span>	More time has become available, so progress is being made.
Q1	NCSP Approved Scope for FY23. (IPD1)	<span style="background-color: blue; color: white; padding: 2px;"> </span>	Scope for FY22/FY23 has been approved
Q2	Provide status reports on progress with CritView. (IPD1)		
Q2	TBD based on Approved Scope. (IPD1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

<b>Q3</b>	Provide status reports on progress with CritView. (IPD1)		
<b>Q3</b>	TBD based on Approved Scope. (IPD1)		
<b>Q4</b>	Provide status reports on progress with CritView. (IPD1)		
<b>Q4</b>	Provide updated CritView database for user testing. (IPD1)		

### ACCOMPLISHMENTS

- IPD1 – ARH-600 Reissue (CritView)
  -

### PUBLICATIONS

Any publications that have

- Completed your institution’s review cycle during the quarter  
AND
- Are publicly releasable

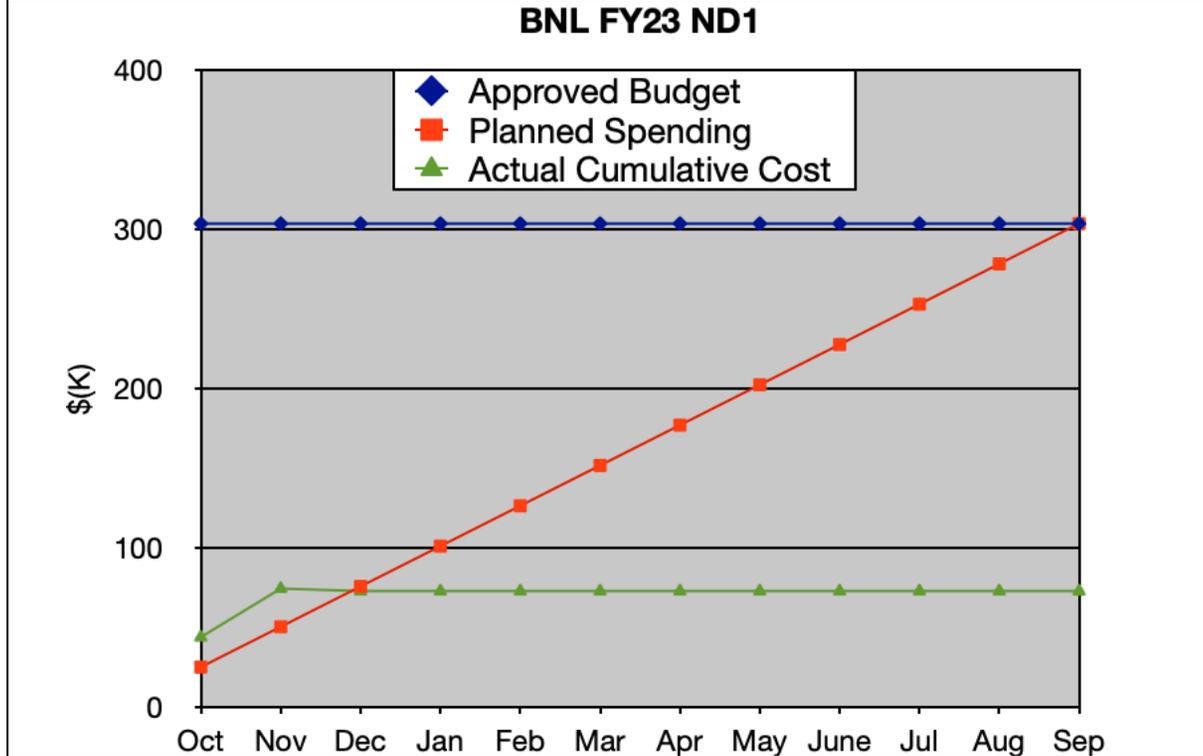
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

<b>Quarter</b>	<b>Publication Reference</b>
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> ND1 <b>M&amp;O Contractor Name:</b> BNL <b>Point of Contact Name:</b> Gustavo Nobre <b>Point of Contact Phone:</b> 631-344-5205	<b>Reference:</b> DP0909010 <b>Date of Report:</b> 20 January, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$ 13,754
  2. Approved FY 2023 Budget = \$ 290,000
  3. Total FY 2023 Budget w/Carryover = \$303,754
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$73,063
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$0
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$0
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$0
- Projected carryover into FY 2024 = \$20,000 **NOTE:**  
Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="color: blue;">■</span>	On Schedule <span style="color: green;">■</span>	Behind Schedule <span style="color: yellow;">■</span>	Missed Milestone <span style="color: red;">■</span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required. Provide status reports	<span style="color: yellow;">■</span>	ADVANCE build reports simplified and condensed using Markdown format. Build reports are now generated on a per-commit basis to any ENDF development branch. The build reports contain information only on the changeset of a

## NCSP Quarterly Progress Report (FY-2023 Q1)

	on all nuclear data activities in the NCSP Quarterly Progress Reports. (ND1)		given commit. We are in final testing and should deploy in Q2.
Q1	If mandated by CSEWG, release new ENDF library. (ND1)		Released many versions of a preliminary ENDF/B-VIII.1-Beta0 for testing within the community. In parallel, refined and continued the review process aiming for a more comprehensive Beta1 release in the next quarter.
Q2	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required. Provide status reports on all nuclear data activities in the NCSP Quarterly Progress Reports. (ND1)		
Q2	If mandated by CSEWG, release new ENDF library. (ND1)		
Q3	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required. Provide status reports on all nuclear data activities in the NCSP Quarterly Progress Reports. (ND1)		
Q3	If mandated by CSEWG, release new ENDF library. (ND1)		
Q4	Maintain and upgrade ADVANCE code system by performing data verification of new NCSP evaluations and performing quality assurance on the data as required. Provide status reports on all nuclear data activities in the NCSP Quarterly Progress Reports. (ND1)		
Q4	If mandated by CSEWG, release new ENDF library. (ND1)		.

## ACCOMPLISHMENTS

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Released multiple ENDF/B-VIII.1 “Beta0” releases due to multiple versions of 239Pu evaluations being considered. These releases considered only the neutron sublibrary and materials related to the INDEN collaboration.
- Organized 2022 CSEWG Meeting
- Coordinated path forward for 239Pu, deciding for a combined file in Beta1
- Coordinated and established a monthly meeting for the CSEWG Executive Committee
- Prepared Beta1 which is in the Make-it-happen list
- Finally uploaded and distributed the minutes for the 2021 CSEWG Meeting

## PUBLICATIONS

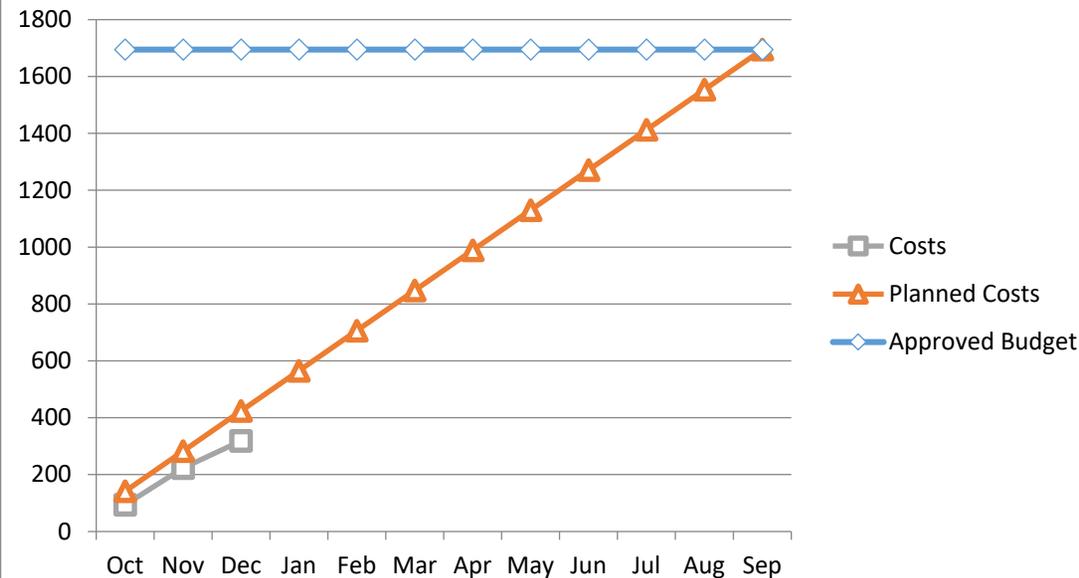
Any publications created during the quarter should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov).

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1	Minutes for the 2021 CSEWG Meeting - BNL-223530-2022-INRE	Yes	
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> ND1, 2, 2a, 2b <b>M&amp;O Contractor Name:</b> LANL <b>Point of Contact Name:</b> Joetta Goda/ Jen Alwin <b>Point of Contact Phone:</b> 505-667-2812/505-667-7252	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$ 145,000
  2. Approved FY 2023 Budget = \$ 1,550,000
  3. Total FY23 Budget w/Carryover = \$ 1,695,000
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$ 318,227 (\$0 commits)
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	On Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: green; vertical-align: middle;"></span>	Behind Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: yellow; vertical-align: middle;"></span>	Missed Milestone <span style="display: inline-block; width: 20px; height: 15px; background-color: red; vertical-align: middle;"></span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on LANL participation in US and International Nuclear Data collaborations. (ND1)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	
Q1	Conduct CSEWG Evaluation and Covariance sessions. (ND1)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	
Q1	Report data testing results with ENDF/B-VIII.0 and additional beta release cross sections at CSEWG. (ND1)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report on Nuclear Data activities at LANSCE (ND2)		
Q1	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2a)		
Q1	Provide status report on Unresolved and Fast Measurements of Uranium-233 (n,gamma) (ND2b)		
Q2	Provide a status report on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q2	Provide a status report on Nuclear Data activities at LANSCE (ND2)		
Q2	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2a)		
Q2	Provide status report on Unresolved and Fast Measurements of Uranium-233 (n,gamma) (ND2b)		
Q3	Provide a status report on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q3	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2a)		
Q3	Provide a status report on Nuclear Data activities at LANSCE (ND2)		
Q3	Provide status report on Unresolved and Fast Measurements of Uranium-233 (n,gamma) (ND2b)		
Q4	Provide a status report on LANL participation in US and International Nuclear Data collaborations. (ND1)		
Q4	Deliver nuclear data evaluations as indicated in Appendix B of the Five-Year plan. (ND1)		
Q4	Provide a status report on Nuclear Data activities at LANSCE (ND2)		
Q4	Provide status report on Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium-240 (ND2a)		
Q4	Obtain final experimental results for Pu-240 PFNS at LANSCE, finalize data analysis, and deliver data to evaluators (ND2a)		
Q4	Provide status report on Unresolved and Fast Measurements of Uranium-233 (n,gamma) (ND2b)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Finalize acquisition of U-233 thick target capture data, finalize data analysis, and deliver data to evaluators (ND2b)		
<b>ACCOMPLISHMENTS</b>			
<ul style="list-style-type: none"> <li>• ND1 – Nuclear Data Evaluation and Testing <ul style="list-style-type: none"> <li>○ U-238 “Finalize prompt fission neutron spectra based on LANSCE Chi-Nu Data” (DUE FY23 Q4): We received the final Chi-Nu U-238 PFNS data for the evaluation in December. Started on modeling, and experimental data collection.</li> <li>○ Pu-238, Pu-240, Pu-241, Pu-242 “Attempt a consistent nu-bar evaluation supported by a model code to provide better evaluated nu-bar for minor Pu-isotopes” (DUE FY23 Q4 with task starting in FY22): Started modeling the Pu-238-Pu-242 nu-bars consistently with first results and already close to getting sensitivities! Updated CGMF to include parameter sets and ran baseline calculations for 238-242Pu(n,f) with CGMF.</li> <li>○ Conducted CSEWG Evaluation and Covariance Sessions.</li> <li>○ Presented validation work at CSEWG that contributes to NCSP FY 22 tasks. The work was paid for by JAUN (ASC-PEM), but contributes to NSCP tasks therefore presentation is listed in publications and sent to NCSP, LA-UR-22-31596).</li> <li>○ Reported on data testing with ENDF/B-VIII.0 and beta0.1 beta release with LLNL pulsed spheres (attached presentation LA-UR-22-31317). Currently, in-house beta-testing ongoing for Li-6 and Be-9 nuclear data.</li> <li>○ Formatted U-235/ Pu-239 nu-bar covariances that were obtained last year for ENDF/B-VIII.1 using ENDFtk (python test notebook provided by Gibson). They were counter-checked by two other staff. Report currently being written.</li> <li>○ Initiated processing and testing of two T-2 evaluations: Be-9 and O-16. <ul style="list-style-type: none"> <li>▪ Be-9 is an NCSP-funded evaluation that was recently modified to include the capture channel in the R-matrix analysis. Capture isn’t important for NCSP applications, but this is being driven by recent NCERC measurements on Flattop that indicated the high energy capture in ENDF/B-VIII.0 was much too low. The new evaluation wildly overshoot this measurement, so we’re still iterating.</li> <li>▪ O-16 MF34 has been a known issue. The evaluators acknowledge the problem, and there seems to be a path to get it fixed. The heart of the issue is MF34 requires relative uncertainties but mu-bar is often nearly zero – this is a bad combination.</li> </ul> </li> <li>○ Light Nuclei <ul style="list-style-type: none"> <li>▪ ENDF/B-VIII.1 <ul style="list-style-type: none"> <li>• 6Li: testing the new evaluation (with previously reported inclusion of inelastics) on LLNL pulsed spheres</li> <li>• 9Be: new (n,gamma) capture evaluation (to address recent Wallner measurement); testing on Flattop</li> <li>• 16O: new evaluation work (reduce (n,alpha_n=1,2,3) excited state absorption contributions reduced by factor of 2); working on testing</li> </ul> </li> <li>▪ MF=2 resonance parameters (RML/LRF=7) <ul style="list-style-type: none"> <li>• Formatting completed; working to test the resonance reconstruction <ul style="list-style-type: none"> <li>○ discovered that NJOY does not handle KRM=4; code is being developed to include this capability in NJOY</li> </ul> </li> <li>• Timeline for release of MF=2 is on-schedule for ENDF/B-VIII.1 library release; files will be released with both MF=2 and continuous (MF=3,4,5,6) data</li> </ul> </li> </ul> </li> </ul> </li> </ul>			

## NCSP Quarterly Progress Report (FY-2023 Q1)

- $^{139}\text{La}$ : started the evaluation of the total cross section in the fast energy region ( $>100$  KeV). In the previous evaluation, the optical model parameters have been fitted to available experimental data above 1 MeV, and then between 100 KeV and 1 MeV, the model has been replaced with a line that goes through the data by Divadeenam et al (1968), orange points in Fig 1. However, this data set is not consistent with the model, and it was never published in a peer-reviewed journal. No information is available to assess the quality of the data. Furthermore, if the data are rescaled by 8% down, they agree very well with our model and are more consistent with existing measurements between 100 and 200 KeV. Thus, a new evaluation for the total cross section will be proposed, our candidate being plotted with dashed red line in Fig. 1. In the next quarters we will continue to re-evaluate different channels, and contact our Oak Ridge colleagues to make a smooth connection with their resonance region evaluations.

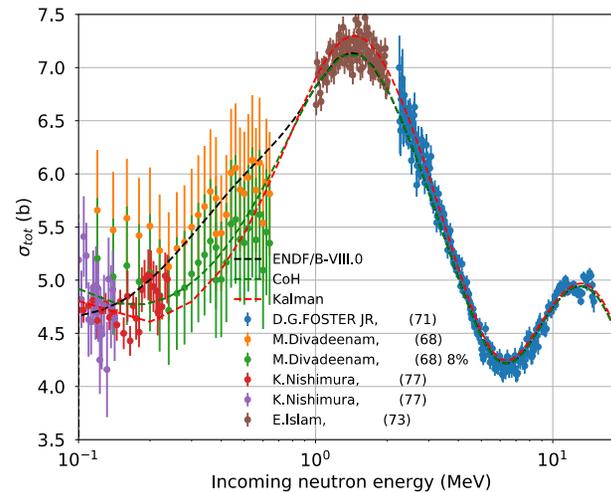


Figure 1: Total cross section for  $(n,^{139}\text{La})$  reaction.

- $^{181}\text{Ta}$ : Preliminary set of diagonal (no cross-reaction correlations) covariances has been formatted and inserted in the ENDF file that has been merged with the ORNL/NNL evaluation covering the resonance region. The unresolved resonance region was declared for self-shielding only, so fast neutron evaluation is used for the cross sections down to the resolved resonance region. This file has been submitted to the NNDC Gitlab.
- Actinides
  - Corrected a few formatting errors in the evaluation files for  $^{234}\text{U}$  and  $^{236}\text{U}$ . In the process we realized that we were overcounting the gamma production, as it was given in the original evaluation in file 13, thus including all the channels. In latest evaluation, we use the

## NCSP Quarterly Progress Report (FY-2023 Q1)

BeOH model to evaluate the gamma multiplicity and spectra for fission and CoH3 to evaluate the gamma production for all the other channels, thus eliminating the need for file 13.

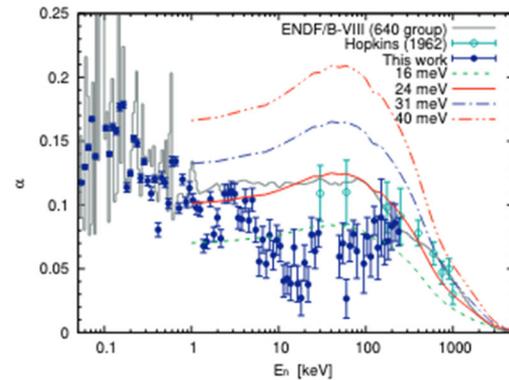
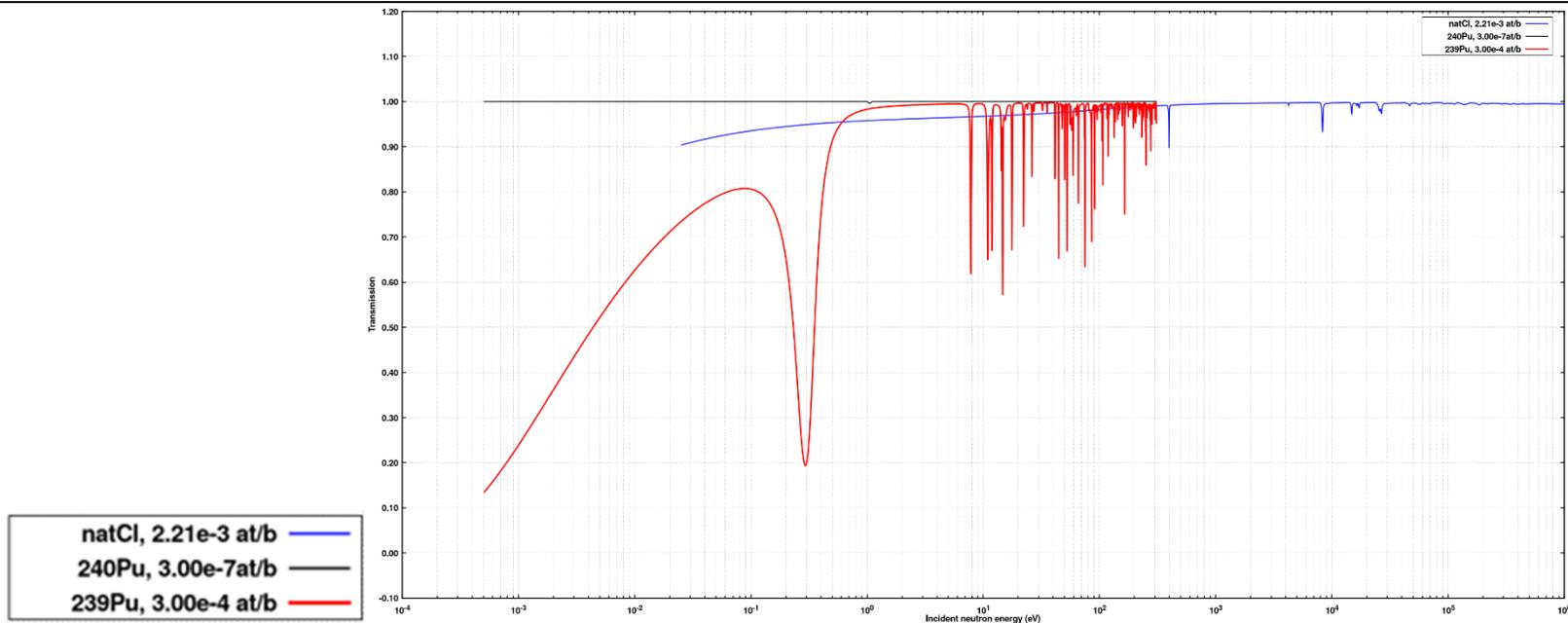


Figure 2: Statistical model calculation for the neutron induced reaction on  $^{233}\text{U}$ . The four curves are for different average gamma-ray width of 16, 20, 24, and 40 meV.

- Used the data taken by LANSCE for the ratio of capture to neutron-induced fission of  $^{233}\text{U}$  to produce an evaluation of  $^{233}\text{U}$ , see Fig. 2. Found that the gamma-ray width is inconsistent with the available experimental data by DANCE and Hopkins. Thus, for consistency with the resonance region, one would need to use a width of 40 meV, which is considerably higher than available data. Analyzing the sensitivity of benchmarks using  $^{233}\text{U}$  to understand how/whether the evaluation can be improved.
- ND2 – Nuclear Data Measurements at LANSCE
  - ND Activities
    - Study of  $^{239}\text{Pu}(n,\text{tot})$  – fabrication of a  $^{239}\text{Pu}$  sample: During the first quarter of the 2023 FY, two studies took place regarding the fabrication of a  $^{239}\text{Pu}$  sample to perform an (n,tot) measurement with the Device for Indirect Capture Experiments for Radionuclides (DICER):
      - a) Sample matrix: The chemical compound  $\text{PuCl}_4$  diluted in 2M DCl was found to be suitable for a transmission measurement, as the following plot indicates. The transmissions through Cl and  $^{240}\text{Pu}$  do not appear to be problematic.

## NCSP Quarterly Progress Report (FY-2023 Q1)



b) Solubility of <sup>239</sup>Pu in DCl: the solubility of <sup>239</sup>Pu in DCl was found to be sufficient to fabricate a suitable liquid <sup>239</sup>Pu sample, to be irradiated at DICER.

- Analyses of the <sup>149</sup>Sm(n,tot), <sup>149</sup>Sm(n,γ) and <sup>143</sup>Nd(n,γ) cross sections at LANSCE: The <sup>149</sup>Sm neutron-induced transmission and capture cross sections measured with the Device for In-direct Capture Experiments on Radionuclides (DICER) and the Detector for Advanced Neutron Capture Experiments (DANCE), and the <sup>143</sup>Nd neutron-induced capture cross section measured with DANCE have been collected and are being analyzed with SAMMY. The work on the resonance analysis will be discussed and presented on the next reports.
- ND2a – Prompt Fission Neutron Spectra (PFNS) Measurement of Plutonium 240
  - The 240Pu(n,f) prompt fission neutron spectra (PFNS) measurements were completed during Q4 of FY22.
  - As mentioned in the FY22 Q4 report, the experiment strategy was somewhat different than for previous PFNS measurements. The LLNL-fabricated PPAC has roughly 20 mg of Pu-240, compared to typical amounts of about 100 mg. This was done consciously to mitigate backgrounds from the α decay of Pu-240. The small sample size made the typical use of a Li-glass array for low-energy PFNS neutrons and a liquid scintillator array for high-energy PFNS neutrons infeasible due to the required beam time. Therefore, we split the liquid scintillator signals into high- and lo-gain inputs on the digital data acquisition to facilitate extension of the data to lower outgoing neutron energies.
  - Thirty-two days of beam time were available for the experiment instead of the roughly 50 desired. However, a preliminary uncertainty analysis of the results obtained led to the conclusion that an additional 60 days would be required to reduce the uncertainty on the

## NCSP Quarterly Progress Report (FY-2023 Q1)

highest precision data points by an additional 1%. This is because the systematic uncertainty of the random-coincidence background dominates the total uncertainty. The determination was made that the experiment was complete with the current amount of data.

- A preliminary analysis of the data leveraging MCNP simulations and experience from previous PFNS measurements was carried out. A more detailed analysis is underway. These first-ever observations will provide valuable information for future evaluators.
- Remaining analysis tasks include:
  - Detailed MCNP parametrizations of the Pu-240 data
  - Analysis of spontaneous fission data for both Li-glass and liquid scintillator data
  - Extension of the liquid scintillator data down to lower outgoing energies of the PFNS
  - Subtraction of the spontaneous fission PFNS background from the in-beam results
  - Minimization of total uncertainty on the random-coincidence background
  - This project is on track to be completed in FY23 as planned.
- ND2b - Unresolved and Fast Measurements of U233 (n, gamma)
  - The result on the  $^{233}\text{U}$  capture to fission cross section ratio for incident neutron energies from 0.7 eV to 250 keV was presented at the 2022 Fall Meeting of the Division of Nuclear Physics of the American Physical Society (DNP-2022) held in New Orleans from the 27th-30th of October 2022, and at the Nuclear Data Week(s) 2022 held at Brookhaven National Laboratory (BNL) from the 31<sup>st</sup> of October to the 11<sup>th</sup> of November 2022.
  - Regular meetings were set with the evaluators during and after the analysis was completed to discuss the calculations and results. The paper "Measurement of the neutron-induced capture to fission cross section ratio in  $^{233}\text{U}$  at LANSCE" is under preparation to be submitted to Physical Review C by January 2023.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	D. Neudecker, A.E. Lovell et al., "Shedding Light on the $^{239}\text{Pu}$ fission source term with new high-precision experiments and advanced fission modeling", for Frontiers of Physics ( <b>LA-UR-22-28832</b> ), January 2023. It is on: <a href="https://doi.org/10.3389/fphy.2022.1056324">https://doi.org/10.3389/fphy.2022.1056324</a>
Q1	D. Neudecker, " $^{239}\text{Pu}$ and $^{235}\text{U}$ PFNS and nu-bar covariances", <b>LA-UR-22-31319</b> , Presented at CSEWG meeting November 2022.
Q1	D. Neudecker, "New nuclear data proposed for the $^{238}\text{U}$ nu-bar, $^{235}\text{U}$ nu-bar and PFNS", <b>LA-UR-22-31314</b> , Presented at CSEWG meeting November 2022.

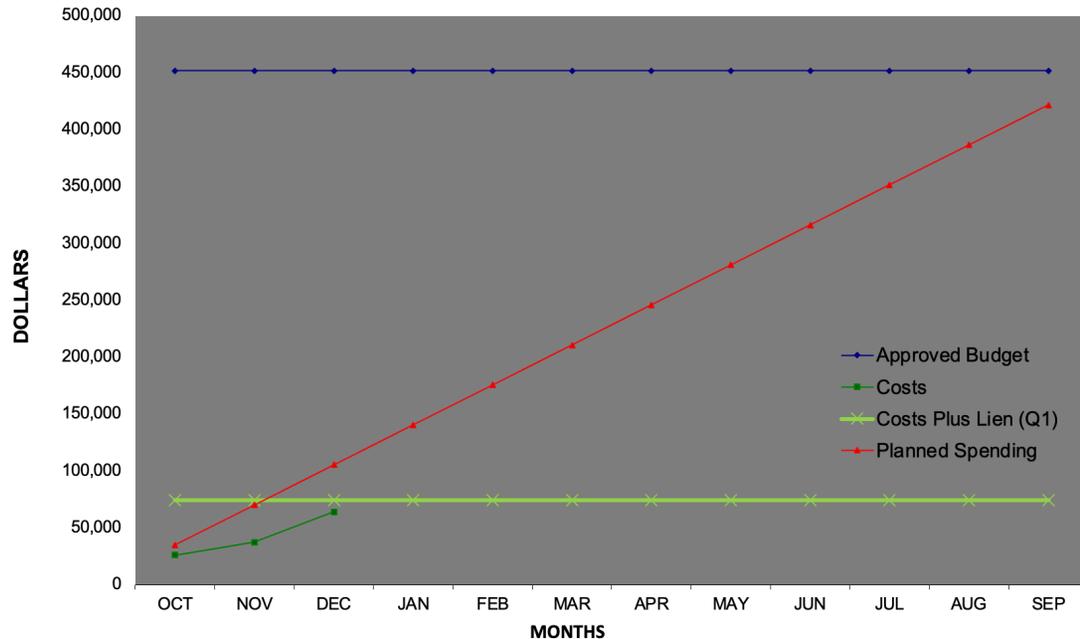
## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	D. Neudecker, "ENDFB/VIII.1beta0 testing with LLNL Pulsed Spheres", <b>LA-UR-22-31317</b> , Presented at CSEWG meeting October 31 2022.
Q1	N. Kleedtke, S. Kahler, W. Haeck, D. Neudecker, "Validation of ENDF/B-VIII.1- $\beta$ 0-based Continuous Energy Data Tables", <b>LA-UR-22-31596</b> , Presented at CSEWG meeting November 2022.
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> ND9, 12 <b>M&amp;O Contractor Name:</b> LLNL <b>Point of Contact Name:</b> Catherine Percher <b>Point of Contact Phone:</b> (925) 579-4226	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$76,734
  2. Approved FY 2023 Budget = \$375,000
  3. Total FY23 Budget w/Carryover = \$421,734
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$64,059
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$30,000
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px 5px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px 5px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px 5px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px 5px;"> </span>
---	---	--	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on Li-Doped Liquid Scintillator Array for Fission Correlations (ND9)	<span style="background-color: green; color: white; padding: 2px 5px;"> </span>	
Q1	Provide a status report on thermal scattering law evaluations and methods development (ND12)	<span style="background-color: green; color: white; padding: 2px 5px;"> </span>	NCSU had to delay work in December because we could not fund the contract due to funding timing.
Q2	Provide a status report on Li-Doped Liquid Scintillator Array for Fission Correlations (ND9)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide a status report on thermal scattering law evaluations and methods development (ND12)		
Q3	Provide a status report on Li-Doped Liquid Scintillator Array for Fission Correlations (ND9)		
Q3	Provide a status report on thermal scattering law evaluations and methods development (ND12)		
Q4	Provide a status report on Li-Doped Liquid Scintillator Array for Fission Correlations (ND9)		
Q4	Provide a status report on thermal scattering law evaluations and methods development (ND12)		

### ACCOMPLISHMENTS

- ND9 – Scoping Study: Li-6 Doped Liquid Scintillator Array for Fission Correlations
  - LLNL looking into feasibility of measuring fission observables in conjunction with an ongoing inelastic scattering detector array project. The detector models developed for that project are being modified to look at detector response to prompt neutron and gammas from fission for actinide targets.
- ND12 – Thermal Scattering Law Evaluations and Methods Development
  - Generation and Benchmarking of Thermal Neutron Scattering Cross Sections in Support of Advanced Nuclear Reactor Concepts**
    - NCSU produced a DOS in support of the TSL evaluation of paraffin (NCSP’s Appendix B material for FY 2022 and 2023). The production of the DOS is based on producing the velocity autocorrelations for both hydrogen and carbon species in the paraffin chain.
    - An ACE package was generated for H in Lucite (at various temperatures) and sent to LLNL for benchmark testing.
    - The review process for the TSL libraries to appear in the beta 1 release of ENDF/VIII.1 has been initiated. Once again, NCSU is the largest contributor of TSL Evaluations to ENDF. The NCSU evaluations are `tsl-AlinAl2O3.endf`, `tsl-Be-metal+Sd.endf`, `tsl-Be-metal.endf`, `tsl-BeinBeO.endf`, `tsl-BeinFLiBe.endf`, `tsl-CainCaH2.endf`, `tsl-CinSiC.endf`, `tsl-CinUC-10P.endf`, `tsl-CinUC-5P.endf`, `tsl-CinUC-HEU.endf`, `tsl-CinUC.endf`, `tsl-FinFLiBe.endf`, `tsl-FinHF.endf`, `tsl-H1inCaH2.endf`, `tsl-H2inCaH2.endf`, `tsl-HinC5O2H8.endf`, `tsl-HinCH2.endf`, `tsl-HinHF.endf`, `tsl-HinParaffinicOil.endf`, `tsl-LiinFLiBe.endf`, `tsl-NinUN.endf`, `tsl-OinAl2O3.endf`, `tsl-OinBeO.endf`, `tsl-OinSiO2-alpha.endf`, `tsl-OinUO2-10P.endf`, `tsl-OinUO2-5P.endf`, `tsl-OinUO2-HEU.endf`, `tsl-OinUO2.endf`, `tsl-SiinSiC.endf`, `tsl-SiinSiO2-alpha.endf`, `tsl-U-metal-10P.endf`, `tsl-U-metal-5P.endf`, `tsl-U-metal-HEU.endf`, `tsl-U-metal.endf`, `tsl-UinUC-10P.endf`, `tsl-UinUC-5P.endf`, `tsl-UinUC-HEU.endf`, `tsl-UinUC.endf`, `tsl-UinUN-10P.endf`, `tsl-UinUN-5P.endf`, `tsl-UinUN-HEU.endf`, `tsl-UinUN.endf`, `tsl-UinUO2-10P.endf`, `tsl-UinUO2-5P.endf`, `tsl-UinUO2-HEU.endf`, `tsl-UinUO2.endf`, `tsl-graphiteSd.endf`, `tsl-reactorgraphite-20P.endf`
  - Development and Implementation of a Modern Doppler Broadening Approach Including Atomic Binding Effects**
    - NCSU continued incorporation and testing of the of the Doppler broadening module into the *FLASSH* code. Additional components are being added to allow users to perform the entire Doppler broadening operation within *FLASSH*. A GUI section in *FALSSH* specific to Doppler broadening is being constructed.
  - Development and Implementation of Machine Learning Methods for Thermal Scattering Law Evaluations**
    - NCSU continued development of NeTS modules for producing the TSL of graphite and beryllium moderators. At this stage 3-D training has been completed. In addition, initial investigation is underway for creating and training of the CDFs that are needed to link the NeTS for a particular material into a neutronic simulation tool such as a Mote Carlo code.

### PUBLICATIONS

## NCSP Quarterly Progress Report (FY-2023 Q1)

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

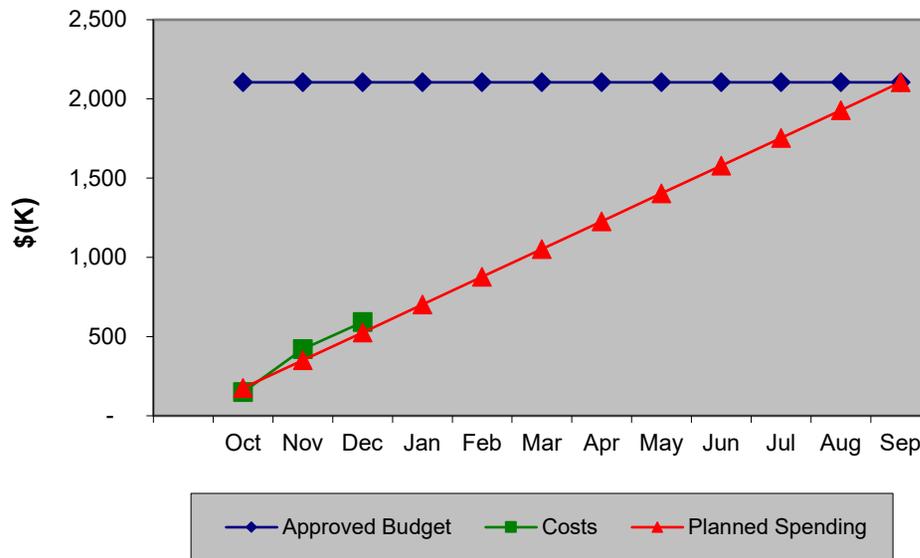
Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Laramee, B.K., N.C. Fleming, and A.I. Hawari, "Implementation of TSL Evaluations Beyond the Incoherent Approximation," Presentation to CSEWG, November 1, 2022
	Fleming, N.C., J. P. W. Crozier, B. K. Laramee, and A. I. Hawari, "TSL Nuclear Fuel Evaluations and Capabilities at NC State University," Presentation to CSEWG, November 1, 2022
	Crozier, J.P.W. and A.I. Hawari, "Neural Thermal Scattering (NeTS) Modules for Graphite & Beryllium," Presentation to CSEWG, November 1, 2022
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> ND1, 2, 3, 4, 6, 9, 11 <b>M&amp;O Contractor Name:</b> ORNL <b>Point of Contact Name:</b> Doug Bowen <b>Point of Contact Phone:</b> (865) 576-0315	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 30, 2023
--	--

## BUDGET

**FY23 Nuclear Data**



1. Carryover into FY 2023 = \$89K
  2. Approved FY 2023 Budget = \$ 2,016K
  3. Total FY 2023 Budget w/Carryover = \$2,105K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$591K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete 	On Schedule 	Behind Schedule 	Missed Milestone 
--	---	---	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on all Nuclear Data measurement activities (ND1)		
Q1	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Complete cross-section measurement deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q1	Provide a status report on all Nuclear Data evaluation and testing activities (ND2)		
Q1	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND2)		
Q1	Complete cross-section evaluation deliverables per the nuclear data schedule in Appendix B (ND2)		
Q1	Provide a status report on all isotopic sample lease activities (ND3)		
Q1	Provide a status report on all thermal neutron scattering measurement and analysis activities (ND4)		
Q1	Provide a status report on all SAMMY nuclear data evaluation code modernization activities (ND6)		
Q1	Provide a status report on evaluation of thermal and resolved resonance ranges of UO2 and PUO2 activities (ND9)		
Q1	Provide a status report on thermal neutron scattering measurements and evaluations for DHS applications at temperature activities (ND11)		
Q2	Provide a status report on all Nuclear Data measurement activities (ND1)		
Q2	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1)		
Q2	Complete cross-section measurement deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide a status report on all Nuclear Data evaluation and testing activities (ND2)		
Q2	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND2)		
Q2	Complete cross-section evaluation deliverables per the nuclear data schedule in Appendix B (ND2)		
Q2	Provide a status report on all isotopic sample lease activities (ND3)		
Q2	Provide a status report on all thermal neutron scattering measurement and analysis activities (ND4)		
Q2	Provide a status report on all SAMMY nuclear data evaluation code modernization activities (ND6)		
Q2	Provide a status report on evaluation of thermal and resolved resonance ranges of UO2 and PUO2 activities (ND9)		
Q2	Provide a status report on thermal neutron scattering measurements and evaluations for DHS applications at temperature activities (ND11)		
Q3	Provide a status report on all Nuclear Data measurement activities (ND1)		
Q3	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1)		
Q3	Complete cross-section measurement deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q3	Provide a status report on all Nuclear Data evaluation and testing activities (ND2)		
Q3	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND2)		
Q3	Complete cross-section evaluation deliverables per the nuclear data schedule in Appendix B (ND2)		
Q3	Provide a status report on all isotopic sample lease activities (ND3)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q3	Provide a status report on all thermal neutron scattering measurement and analysis activities (ND4)		
Q3	Provide a status report on all SAMMY nuclear data evaluation code modernization activities (ND6)		
Q3	Provide a status report on evaluation of thermal and resolved resonance ranges of UO2 and PUO2 activities (ND9)		
Q3	Provide a status report on thermal neutron scattering measurements and evaluations for DHS applications at temperature activities (ND11)		
Q4	Provide a status report on all Nuclear Data measurement activities (ND1)		
Q4	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND1)		
Q4	Complete cross-section measurement deliverables per the nuclear data schedule in Appendix B of the 5 Year Plan (ND1)		
Q4	Provide a status report on all Nuclear Data evaluation and testing activities (ND2)		
Q4	Provide a status report on ORNL participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest (ND2)		
Q4	Complete cross-section evaluation deliverables per the nuclear data schedule in Appendix B (ND2)		
Q4	Provide a status report on all isotopic sample lease activities (ND3)		
Q4	Provide a status report on all thermal neutron scattering measurement and analysis activities (ND4)		
Q4	Provide a status report on all SAMMY nuclear data evaluation code modernization activities (ND6)		
Q4	Provide a status report on evaluation of thermal and resolved resonance ranges of UO2 and PUO2 activities (ND9)		
Q4	Provide a status report on thermal neutron scattering measurements and evaluations for DHS applications at temperature activities (ND11)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- ND1 - Nuclear Data Measurements
  - **Complete cross-section measurement and evaluation deliverables per the nuclear data schedule in Appendix B of the 5-year plan.**
    - Travel to JRC-Geel in November/December 2022, for data sorting of acquired Zr91 data into TOF spectra.
    - **Zr-91** transmission and capture TOF spectra available.
    - **Zr-90** capture data reduction continued.
- ND2 – Nuclear Data Evaluations and Testing
  - **V** capture and transmission data analysis and evaluation for data using various sample thickness continued.
  - The evaluation of **139-La** and the fitting of resonance parameters continued, coordination with LANL about high energy cross section evaluation.
  - **140,142Ce** –Report of the evaluation is in review.
  - Participation in the **35Cl(n,p)** experiment at LANL. A paper on 35Cl(n,p) reaction channel results was accepted and published in Progress of Nuclear Energy.
  - **233U RRR evaluation**: Discussion with LANL about the U233 capture/fission ratio data.
  - Proceeding with the covariance generation for **233,235U, 239Pu** evaluations for testing of the beta ENDF library. This includes covariance generation for both resonance parameters and neutron multiplicities. Due to the large size of the generated ENDF files, the file 32 (resonance parameter covariances) will be processed and provided in file 33 (average covariance cross section).
  - **63,65Cu**: The elastic scattering angular distributions for 63,65Cu are being reviewed before submission to the ENDF/B-VIII.1 library.
  - Assisting in the completion of the **Ta** evaluation (covariance and submission to ENDF repository)
- ND3 - Isotopic Sample Leases to Support ND1 ND Measurements
  - Zr92 is being produced by ORNL Isotopes, anticipated delivery January/February.
  - Zr91 sample has been returned to ORNL isotopes.
- ND4 - Thermal Neutron Total Cross Section Measurements for Improvement of Criticality Calculations and Propagation of Scattering Kernel Uncertainties
  - Analysis finalized and a report is in preparation.
- ND6 – SAMMY Nuclear Data Evaluation Code Modernization
  - Updated the build and instructions of the open version for SAMMY to automatically pull in the correct SCALE version. In addition, the version information (and for pre-beta version the gitlab hash) is now written in the LPT file header. This happens automatically at configure time and will make it easier to for developers and users to communicate the version used if reporting errors.
  - Work continued to modularize the resolution function, mainly focusing on the RSL module. This has been made harder as the adjustable parameters for this resolution function can be input by the user in the block for Doppler broadened parameters as well as in the block for miscellaneous parameters. The updated code is currently in the final review.
  - Work continued in converting the SAMMY manual into LaTeX to allow version control and for easier maintainability.
  - Work started to convert the writing of ENDF files to use AMPX writing routines. This will allow us to use pup'ed as well as normal flagged parameters. The work proved more difficult as SAMMY supports also formats not documented in the ENDF manual. We will keep them for

## NCSP Quarterly Progress Report (FY-2023 Q1)

backward compatibility but will discourage their use. For the URR and RR for ENDF file 2 and file 32 is almost ready for review. Using these new routines will set us up to natively support not only the current ENDF format but also the new GNDS format.

- ND9 – Evaluation of Thermal and Resolved Resonance Ranges of  $\text{UO}_2$  and  $\text{PUO}_2$ 
  - Conducted extensive literary review to determine extant research into not only resonances in epithermal regime, but also resonances in thermal range.
  - Identified several possible methods for implementation into SAMMY and will be decided on next quarter. Explored methods have varying degrees of approximations for certain energy regions, so care is being taken to explicitly quantify the possible impacts.
  - Began work into utilizing effective temperature for low-lying resonance evaluations is underway. This should be the quickest to implement and will allow for comparison against more rigorous methods once those are implemented.
  - Collected Experimental datasets of multiple isotopes with low-energy resonances at various temperatures for eventual use in validating methodology.
- ND11 – Thermal neutron scattering measurements and evaluations for DHS applications at temperature
  - Conducted inelastic thermal neutron scattering measurements at the VISION beamline at SNS for different sample thicknesses of concrete and hydrated cement. Analysis of these data is ongoing.
  - Performed thermal neutron transmission measurements of copper to develop a capability for measurement of transmission of hydrated cement and concrete at the VISION beamline. This is unique, as the ability to perform transmission measurements at VISION has not been fully explored, making this a first-of-its-kind set of measurements. Some difficulties regarding the beam collimators and background characteristics; work is underway to try and correct these issues.
  - Began sample preparation for proposed transmission measurements at RPI.

## PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Chris Chapman, "Thermal Neutron Scattering Research and Development at Oak Ridge National Laboratory", 242nd ECS Meeting, Atlanta, GA, Oct 2022.
	Dorothea Wiarda, Jesse Brown, Goran Arbanas, Marco Pigni, Jordan McDonnell, Chris Chapman, "SAMMY Modernization Efforts," CSWEG, Upton, NY, Nov 2022.

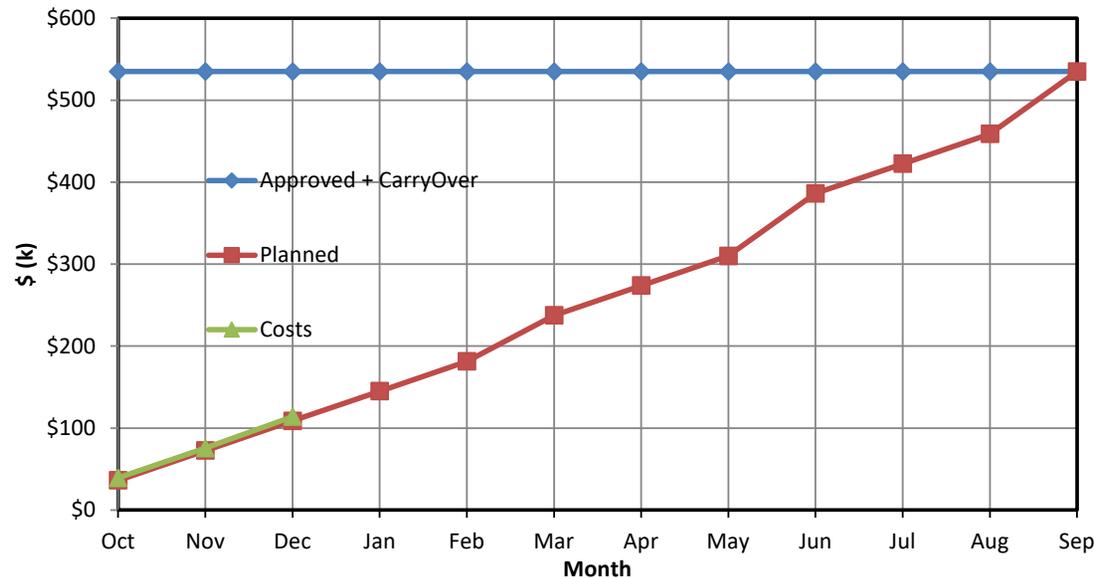
## NCSP Quarterly Progress Report (FY-2023 Q1)

	Chris Chapman, Kemal Ramic, Goran Arbanas, Jesse Brown, Alexander Kolesnikov, Matthew Stone, Luke Daemen, Yongqiang Cheng, Anibal Ramirez Cuesta, Yaron Danon, Dominik Fritz, "Proposed Methodology for Evaluating and Validating TSLs," CSWEG, Upton, NY, Nov 2022.
	Marco Pigni, "On the Uranium and Plutonium Nuclear Data Evaluations," CSWEG, Upton, NY, Nov 2022.
	Jordan McDonnell, Marco Pigni, " Evaluation and Validation of the n+63,65Cu Cross Sections," CSWEG, Upton, NY, Nov 2022.
	Marco Pigni, "Theoretical and calculable dependent variables and their covariance in nuclear data libraries," Nuclear Data Uncertainty Quantification Working Meeting, Virtual Los Alamos, NM, Sep 2022.
	Marco Pigni, Jordan McDonnell, "Brief Update for Evaluation of Neutron Reactions on 63,65Cu," INDEN consultants' meeting, Vienna, Austria, Aug 2022.
	Marco Pigni, R. Capote, "Status of fissile and light nuclei evaluations towards ENDF/B-VIII.1 neutron sub-library release," INDEN consultants' meeting, Vienna, Austria, Aug 2022.
	Klaus Guber, Jesse Brown, Carlos Paradela Dobarro, Stefan Kopecky, Jan Heyse, Peter Schillebeeckx, "ORNL Neutron Cross Section Measurements of 90Zr," Transactions of the American Nuclear Society, Vol 127, 662-665 (Nov 2022).
	Chris Chapman, Dorothea Wiarda, "Proposed Generalized Header File for TSLs," CSWEG, Upton, NY, Nov 2022.
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> ND1, 3 <b>M&amp;O Contractor Name:</b> RPI <b>Point of Contact Name:</b> Yaron Danon <b>Point of Contact Phone:</b> 518-276-4008	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$ 50,000
  2. Approved FY 2023 Budget = \$ 485,000
  3. Total FY 2023 Budget w/Carryover = \$535,000
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$113,888
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$ 0
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete	On Schedule	Behind Schedule	Missed Milestone
----------	-------------	-----------------	------------------

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide status reports on all resonance region nuclear data measurement activities. (ND1)		
Q1	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
Q1	Complete analysis of measurement from previous year (ND1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide status report on all LINAC refurbishment activities (ND3)		
Q1	Complete condition and qualification of one set of high-power Radio frequency (RF) windows to support SOL 1 Accelerator Section site acceptance testing. (ND3)		
Q2	Provide status reports on all resonance region nuclear data measurement activities. (ND1)		
Q2	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
Q2	Provide status report on all LINAC refurbishment activities (ND3)		
Q2	Complete condition and qualification of one set of high-power Radio-frequency (RF) windows to support TPV Accelerator Section site acceptance testing. (ND3)		
Q3	Provide status reports on all resonance region nuclear data measurement activities. (ND1)		
Q3	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
Q3	Complete nuclear data measurements (transmission/capture or scattering) per the nuclear data schedule in Appendix B of the 5 year plan. (ND1)		
Q3	Provide status report on all LINAC refurbishment activities (ND3)		
Q3	Complete SOL #1 Accelerator Section Site acceptance testing. (ND3)		
Q3	Start fabrication of 2nd batch of speed of light structures 2, 3 and 4 (ND3)		
Q4	Provide status reports on all resonance region nuclear data measurement activities. (ND1)		
Q4	Provide status reports on RPI participation in US and International Nuclear Data collaborations, and for		

## NCSP Quarterly Progress Report (FY-2023 Q1)

	foreign travel, provide a brief trip summary report to NCSP Manager on items of NCSP interest. (ND1)		
Q4	Complete measurements data analysis and provide the data to ORNL as needed to support the evaluation effort per the nuclear data schedule in Appendix B of the 5 year plan (ND1)		
Q4	Provide status report on all LINAC refurbishment activities (ND3)		
Q4	Complete delivery of solenoids and quadrupoles components (ND3)		
Q4	Complete TPV Accelerator Section Site acceptance testing. (ND3)		

### ACCOMPLISHMENTS

- **ND1 – Resonance Region Nuclear Data Measurement Capability at RPI**
  - **Fe-54**
    - Developed a suite of critical and non-critical benchmark experiments that can be used to validate Fe evaluations.
    - Started work towards generating a covariance matrix for the transmission experiment.
    - Identified bug in doppler broadening subroutine and replaced with a CREM implementation
  - **URR improvements to SAMMY**
    - Found and corrected bugs in SESH including replacement of Doppler-Broadening routine
    - Completed validation of SESH using to MCNP for thin and thick transmission and capture samples.
  - **Zr evaluation**
    - Zr isotopes pre-evaluation in progress.
      - Completed extensive sensitivity and multi-group cross sections calculated for Zr isotopes in most prominent ICSBEP benchmarks
      - Developed methodology to examine direct contributions to  $\Delta k_{\text{eff}}$  of benchmarks due to specific reaction cross sections across full the energy spectrum
      - Developed Robust and comprehensive post-processing software
  - **Pb evaluation**
    - Completed both RRR and fast energy range for Pb-206 and 208
    - Completed RRR for Pb-207, fast region in progress.
    - Development of covariances for all is in progress.
- **ND3 – RPI/ORNL: LINAC 2020 Nuclear Data Capabilities Maintenance Plan**
  - Completed a high-power test of two RF windows
  - Developed setup for acceleration section RF test in LINAC target room.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Completed setup of a second modulator for on-site acceptance test and additional RF windows testing.

•

### PUBLICATIONS

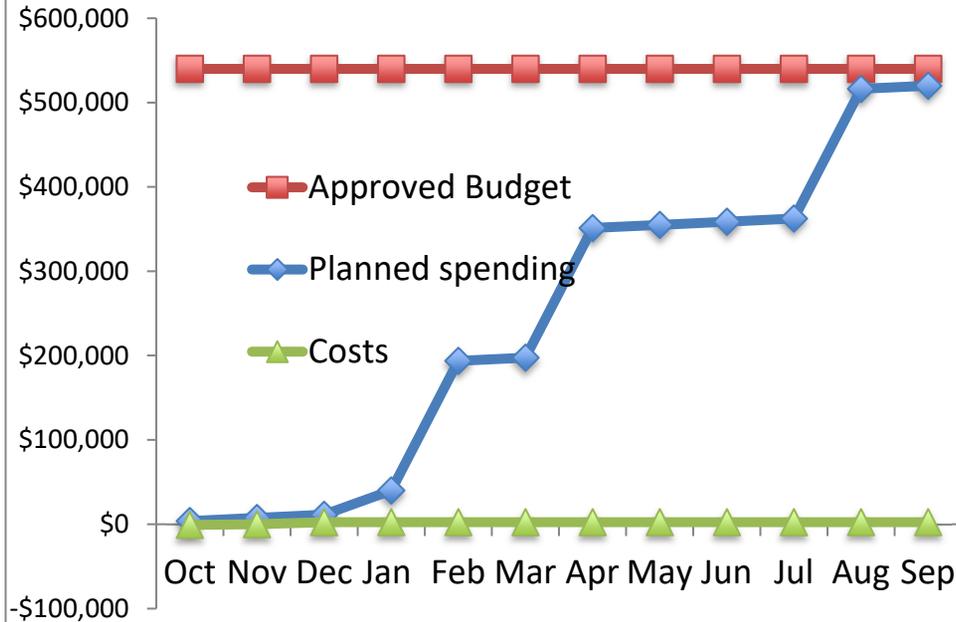
Any publications that have  
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	<ul style="list-style-type: none"> <li>• D. Fritz, Y. Danon, K. Ramic, C. W. Chapman, J. M. Brown, G. Arbanas, M. Rapp, T. H. Trumbull, M. Zerkle, J. Holmes, P. Brain, A. Ney, S. Singh, K. Cook and B. Wang, "Total thermal neutron cross section measurements of hydrogen dense polymers from 0.0005–20 eV", Annals of Nuclear Energy, vol. 183, pp. 109651, 2023, DOI:10.1016/j.anucene.2022.109651.</li> <li>• D. Fritz, Y. Danon, M. Rapp, T. H. Trumbull, M. Zerkle, J. Holmes, C. W. Chapman, G. Arbanas, J. M. Brown, K. Ramic, X. Hu, S. Singh, A. Ney, P. Brain, K. Cook and B. Wang, "Total thermal neutron cross section measurements of yttrium hydride from 0.0005 - 3 eV", Annals of Nuclear Energy, vol. 181, pp. 109475, 2023, DOI:10.1016/j.anucene.2022.109475.</li> <li>• Y. Danon, R. Block, K. Cook, S. Singh, B. Wang, "Overview of Nuclear Data Measurement and Analysis at RPI", CSEWG meeting, November 2022.</li> <li>• P. Brain, Y. Danon, D. Brown, D. Barry, A. Lewis, T. Kawano, "Fast Region Evaluations of Pb-206 and Pb-208", CSEWG meeting, November 2022.</li> <li>• Y. Danon, "RPI - Nuclear Data for structural materials", International Nuclear Data Evaluation Network (INDEN) Evaluated Nuclear Data of the Structural Materials, IAEA, December 6-9, 2022.</li> </ul>
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TE3, 6, 8 <b>M&amp;O Contractor Name:</b> LANL <b>Point of Contact Name:</b> Joetta Goda <b>Point of Contact Phone:</b> 505-667-2812	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$
2. Approved FY 2023 Budget = \$550,000
3. Total FY 2023 Budget w/Carryover = \$

	Spending	Commitments	Total
Q1	\$2,467	\$91,520	\$93,987
Q2			\$0
Q3			\$0
Q4			\$0

8. Projected carryover into FY 2024 = \$

**NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
---	---	--	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on all hands-on criticality safety training activities (TE3)	<span style="background-color: blue; color: white; padding: 2px;"> </span>	
Q1	Provide a status report on the development of a university pipeline for CS professionals (TE6)		
Q1	Provide a status report on all reactivity simulation aids activities (TE8)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide a status report on all hands-on criticality safety training activities (TE3)		
Q2	Provide a status report on the development of a university pipeline for CS professionals (TE6)		
Q2	Provide a status report on all reactivity simulation aids activities (TE8)		
Q3	Provide a status report on all hands-on criticality safety training activities (TE3)		
Q3	Provide a status report on the development of a university pipeline for CS professionals (TE6)		
Q3	Provide a status report on all reactivity simulation aids activities (TE8)		
Q4	Provide a status report on all hands-on criticality safety training activities (TE3)		
Q4	Provide a status report on the development of a university pipeline for CS professionals (TE6)		
Q4	Provide a status report on all reactivity simulation aids activities (TE8)		

### ACCOMPLISHMENTS

- TE3 – Conduct Hands-On Criticality Safety Training Course at NCERC
  - Preparations for January NCSP Class
- TE6 – Development of University Pipeline for Criticality Safety Professionals
  - Commitment is UNM contract
- TE8 – Reactivity Simulation Aids
  - No update

### PUBLICATIONS

Any publications that have

- Completed your institution’s review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

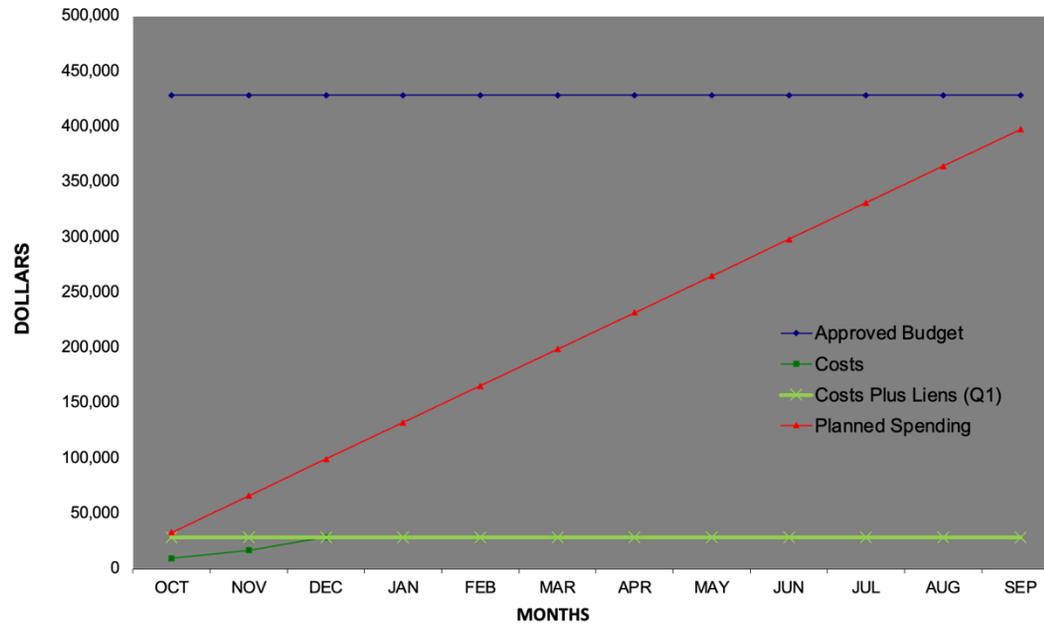
# NCSP Quarterly Progress Report (FY-2023 Q1)

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TE1, 3, 8 <b>M&amp;O Contractor Name:</b> LLNL <b>Point of Contact Name:</b> Catherine Percher <b>Point of Contact Phone:</b> (925) 579-4226	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
--	---

## BUDGET



1. Carryover into FY 2023 = \$38,730
  2. Approved FY 2023 Budget = \$390,000
  3. Total FY23 Budget w/Carryover = \$428,730
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$28,798
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$ 31,200 (8%)
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete 	On Schedule 	Behind Schedule 	Missed Milestone 
--	---	---	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on hands-on training at the DAF (TE1)		
Q1	Provide a status report classroom criticality safety training (TE3)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report on development of university pipeline for CS professionals. (TE8)		
Q2	Provide a status report on hands-on training at the DAF (TE1)		
Q2	Provide a status report classroom criticality safety training (TE3)		
Q2	Provide a status report on development of university pipeline for CS professionals. (TE8)		
Q3	Provide a status report on hands-on training at the DAF (TE1)		
Q3	Provide a status report classroom criticality safety training (TE3)		
Q3	Provide a status report on development of university pipeline for CS professionals. (TE8)		
Q4	Provide a status report on hands-on training at the DAF (TE1)		
Q4	Provide a status report classroom criticality safety training (TE3)		
Q4	Provide a status report on development of university pipeline for CS professionals. (TE8)		

### ACCOMPLISHMENTS

- TE1 – Conduct Hands-on Training at the DAF (TACS)
  - Participated in all T&E telecons
  - Maintained training for DAF access
- TE3 – Classroom Criticality Safety Training
  - Participated in all T&E telecons
- TE8 - Development of University Pipeline for Criticality Safety Professionals
  - Taught UC Berkeley NCS Course in Fall 2022 semester, including providing lectures and mentors for NCSE class project and hands-on approach to critical experiments at the LLNL Inherently Safe Subcritical Assembly

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter

AND

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

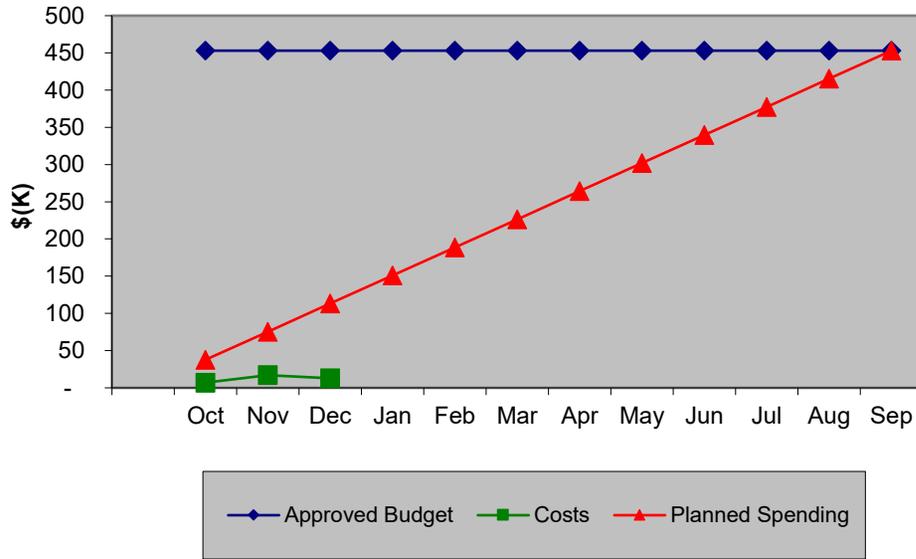
Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	none
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TE1, 11, 14 <b>M&amp;O Contractor Name:</b> ORNL <b>Point of Contact Name:</b> Doug Bowen <b>Point of Contact Phone:</b> (865) 576-0315	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 30, 2023
---	--

## BUDGET

**FY23 Training and Education**



1. Carryover into FY 2023 = \$113K
  2. Approved FY 2023 Budget = \$340K
  3. Total FY 2023 Budget w/Carryover = \$453K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$13K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	On Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: green; vertical-align: middle;"></span>	Behind Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: yellow; vertical-align: middle;"></span>	Missed Milestone <span style="display: inline-block; width: 20px; height: 15px; background-color: red; vertical-align: middle;"></span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on implementation of the NCS training program (TE1)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue;"></span>	
Q1	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue;"></span>	

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q1	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		
Q2	Provide a status report on implementation of the NCS training program (TE1)		
Q2	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		
Q2	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		
Q3	Provide a status report on implementation of the NCS training program (TE1)		
Q3	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		
Q3	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		
Q4	Provide a status report on implementation of the NCS training program (TE1)		
Q4	Provide a status report on revision of LA-12808 Nuclear Criticality Safety Guide. (TE11)		
Q4	Provide a status report on nuclear criticality safety training and pipeline development (TE 14)		

### ACCOMPLISHMENTS

- TE1 - Manage and Provide Instruction for the DOE Nuclear Criticality Safety Training & Education Program
  - Bowen and Henley began coordination for the 2-week hands-on course scheduled for Jan 23-Feb 3, 2023, in early Dec. 2022. This involved working with all the course logistical contacts and instructors. Twenty-eight students are anticipated for the course – 28 in the lecture week and 14 each in the Sandia and NCERC portions of the course. Preparations for the four AWE students from the UK are taking a significant amount of time and Bowen/Henley are working MSTS/NNSS Visitor control, AWE, and others (Nancy Watts, LANL NEN-2) to support their Rad Worker II training at MSTS the week prior to the course and for their access to DAF.
- TE11 - Revision of the LA-12808 Nuclear Criticality Safety Guide
  - On track for an FY23Q4 release; work is in progress.
- TE14 - Nuclear Criticality Safety Training and Pipeline Development
  - Work in this quarter focused on the accumulation of nuclear criticality training material at both Texas A&M University and Georgia Institute of Technology. Completed work.
  - Attend coordination meetings between Oak Ridge National Laboratory, the Office of Criticality Safety, Texas A&M, and Georgia Institute of Technology.

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Compile material from Georgia Institute of Technology consisting of:
  - Lectures
    - Focused on nuclear criticality
    - Background material
  - Assignments
  - Exercises
  - Upload material to share site for project.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

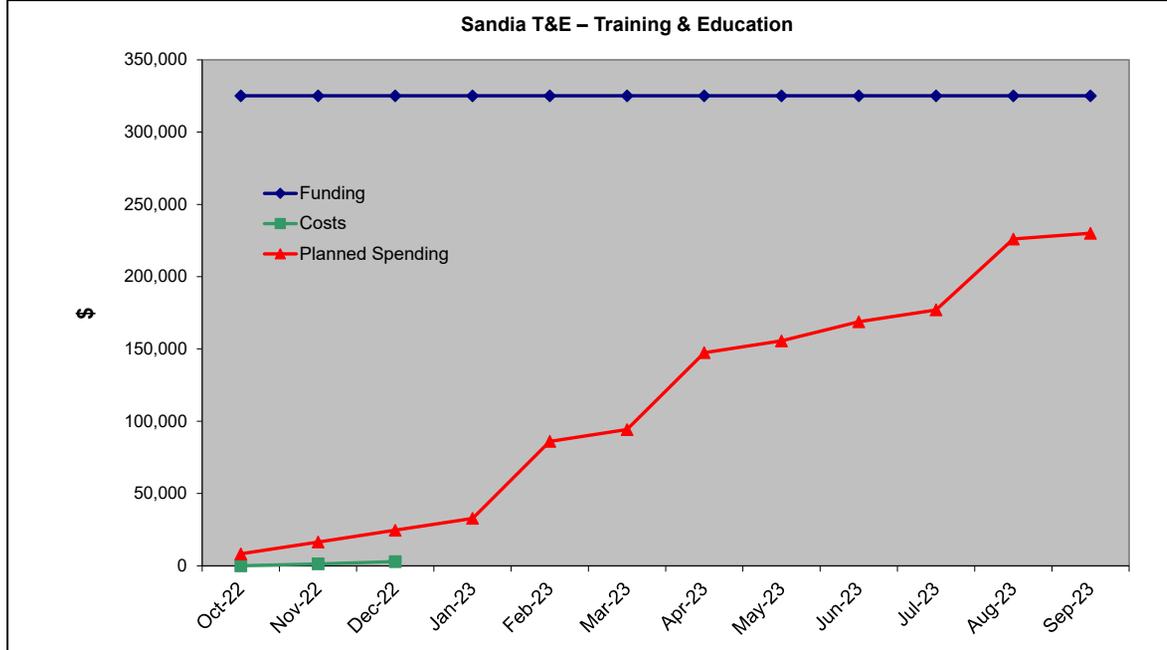
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Mathieu Dupont, "Health Physics Research Reactor Criticality Accident Alarm System Benchmark Overview," Transactions of the 14th International Conference on Radiation Shielding and 21st Topical Meeting of the Radiation Protection and Shielding Division (ICRS 14/RPSD 2022), Vol II, 406-409 (Sep 2022).
	Mathieu Dupont, Alex Lang, Douglas Bowen, "Current Progress of the Final Design of a Subcritical Assembly at the Oak Ridge National Laboratory," Transactions of the American Nuclear Society, Vol 127, 717-720 (Nov 2022).
	Mathieu Dupont, "Health Physics Research Reactor Criticality Accident Alarm System Benchmark Overview," 14th International Conference on Radiation Shielding (ICRS 14/RPSD 2022), Seattle, WA, Sep 2022.
	Alex Lang, Mathieu Dupont, Douglas Bowen, "Subcritical Assembly at ORNL," Oak Ridge, TN, Sep 2022.
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TE1 <b>M&amp;O Contractor Name:</b> Sandia National Laboratories (SNL) <b>Point of Contact Name:</b> Gary A. Harms <b>Point of Contact Phone:</b> (505)845-3244	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
---	---

## BUDGET



1. Carryover into FY 2023 = \$95,119
  2. Approved FY 2023 Budget = \$230,000
  3. Total FY 2023 Budget w/Carryover = \$325,119
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$2,870
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

STATUS (copy color code and paste below in 'STATUS' field)			
Complete	<span style="background-color: blue; width: 20px; height: 15px; display: inline-block;"></span>	On Schedule	<span style="background-color: green; width: 20px; height: 15px; display: inline-block;"></span>
		Behind Schedule	<span style="background-color: yellow; width: 20px; height: 15px; display: inline-block;"></span>
			Missed Milestone <span style="background-color: red; width: 20px; height: 15px; display: inline-block;"></span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the LANL training classes in accordance with the approved schedule. (TE1)	<span style="background-color: blue; width: 20px; height: 15px; display: inline-block;"></span>	
Q2	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module		

## NCSP Quarterly Progress Report (FY-2023 Q1)

	support to the LANL training classes in accordance with the approved schedule. (TE1)		
<b>Q3</b>	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the LANL training classes in accordance with the approved schedule. (TE1)		
<b>Q4</b>	Conduct hands-on training classes at Sandia and provide Human Factors and Equipment Reliability module support to the LANL training classes in accordance with the approved schedule. (TE1)		

### ACCOMPLISHMENTS

- TE1 - Prepare for and Conduct Hands-on Criticality Safety Training at SNL
  - Preparations are underway for a Hands-On criticality safety class for NCS professionals to be presented in January/February.
  - Adjustments made to replace a long-standing instructor that recently retired from SNL and is no longer involved with the Sandia portion of the training courses.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

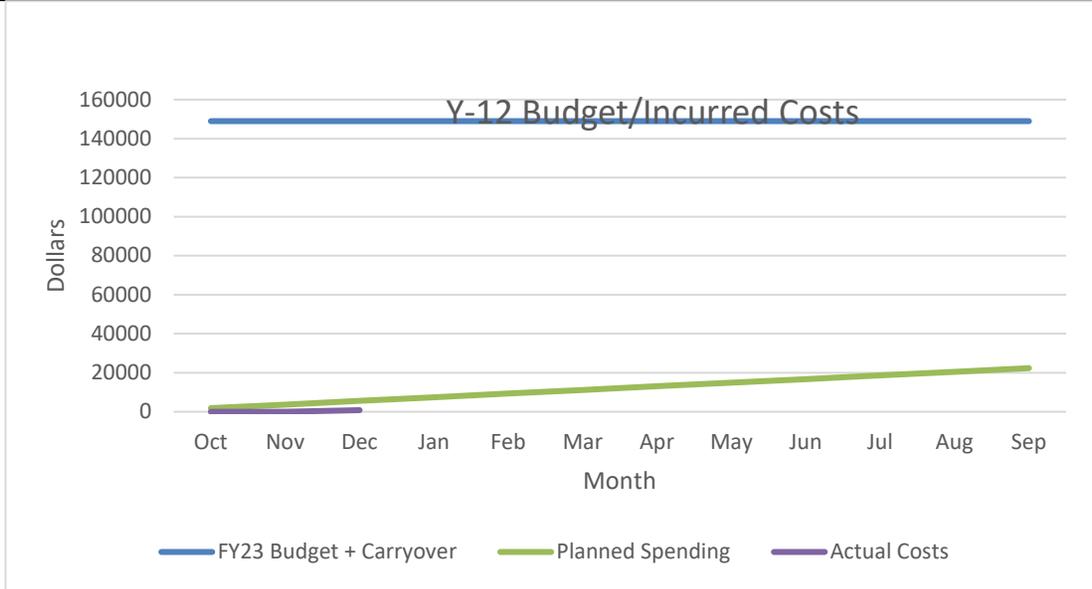
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TE1 <b>M&amp;O Contractor Name:</b> Y12 <b>Point of Contact Name:</b> Kevin Reynolds <b>Point of Contact Phone:</b> (865) 241-9067	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 23, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$ 148,968.58
  2. Approved FY 2023 Budget = \$0.00
  3. Total FY 2023 Budget w/Carryover = \$148,968.58
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$0
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report of Y-12 activities to support the hands-on training courses. (TE1)		No travel
Q2	Provide a status report of Y-12 activities to support the hands-on training courses. (TE1)		
Q3	Provide a status report of Y-12 activities to support the hands-on training courses. (TE1)		
Q4	Provide a status report of Y-12 activities to support the hands-on training courses. (TE1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- TE1 - Conduct Hands-On Criticality Safety Training Course
  -

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

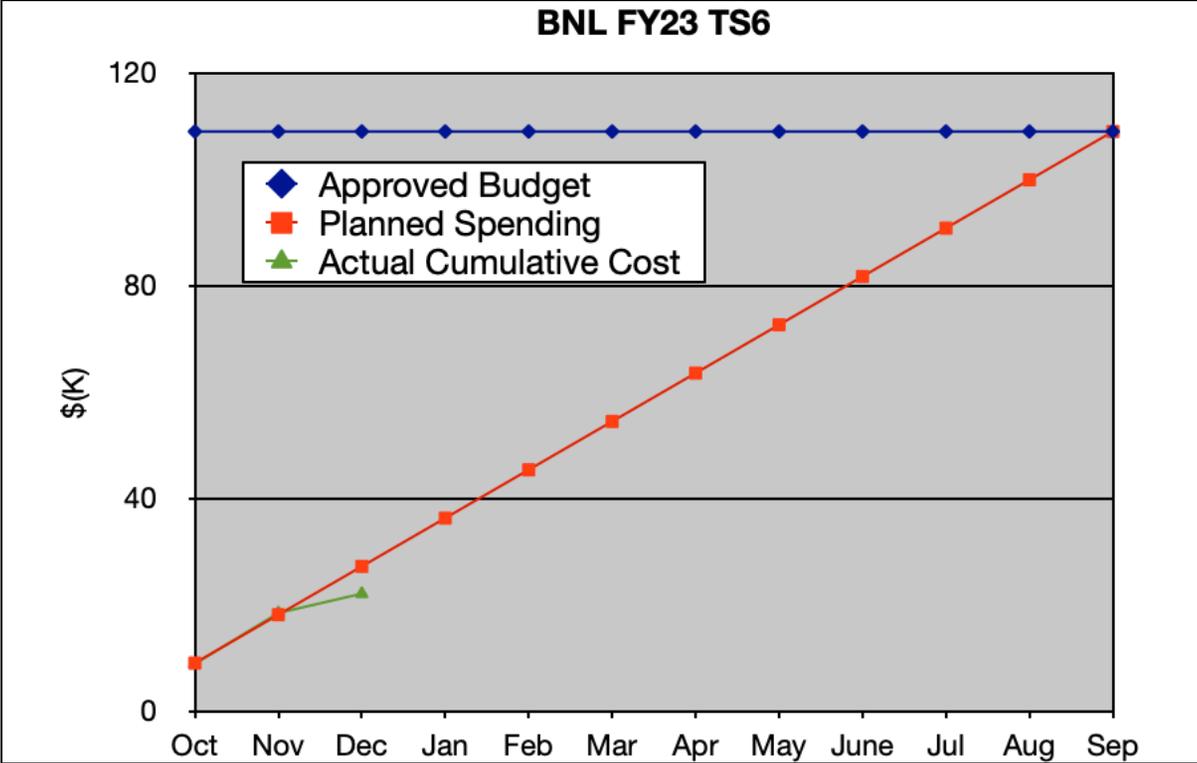
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS6 <b>M&amp;O Contractor Name:</b> BNL <b>Point of Contact Name:</b> Gustavo Nobre <b>Point of Contact Phone:</b> 631-344-5205	<b>Reference:</b> DP0909010 <b>Date of Report:</b> 20 January, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$ 9,027
  2. Approved FY 2023 Budget = \$100,00
  3. Total FY 2022 Budget w/Carryover = \$109,027
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$22,135
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$0
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$0
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$0
  8. Projected carryover into FY 2024 = \$5,451
- NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide NCSP Manager annual report of succession planning efforts. (TS6)	<span style="background-color: green; color: white; padding: 5px;"> </span>	Mentored two students who started working on the successor of the manuscript submitted last quarter (arXiv: 2209.14403). This work will use and make predictions on real 238U data instead of synthetic data.

## NCSP Quarterly Progress Report (FY-2023 Q1)

<b>Q2</b>	Provide NCSP Manager annual report of succession planning efforts. (TS6)		
<b>Q3</b>	Provide NCSP Manager annual report of succession planning efforts. (TS6)		
<b>Q4</b>	Provide NCSP Manager annual report of succession planning efforts. (TS6)		

### ACCOMPLISHMENTS

- The journal manuscript “A novel Machine-Learning method for spin classification of neutron resonances” (arXiv: 2209.14403v1), submitted to Physical Review C during FY22 Q4, is still under review. Another paper is expected to be submitted within the first three quarters of FY23.
- Mentored two interns in the project related to resonance spin reclassification:
  - Extrapolating the method so the machine-learning classifier can be trained with real 238U data instead of synthetic data like previous projects.
  - During collaboration with one of these interns, a small but impactful bug was found and fixed.

### PUBLICATIONS

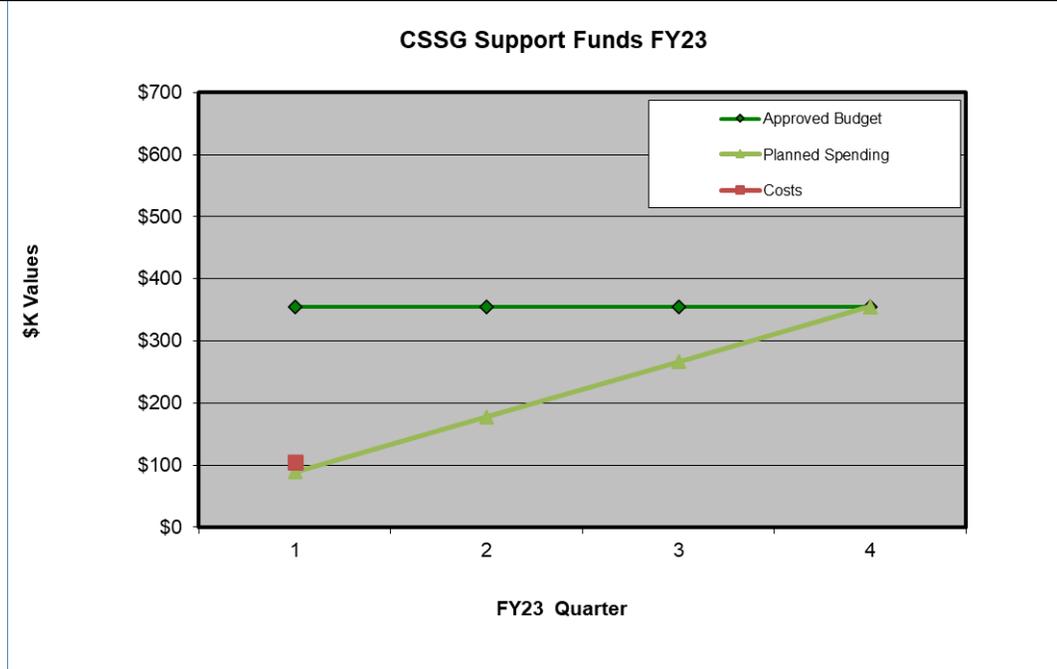
Any publications created during the quarter should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov).

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019	Sent to NCSP? Yes/no	If no, status of submittal
Q1			
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS1 <b>Task Title:</b> CSSG Support <b>Point of Contact Name:</b> David Hayes <b>Point of Contact Phone:</b> 505-667-4523	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
---	---

## BUDGET



1. Carryover into FY 2023 = \$ 0
  2. Approved FY 2023 Budget = \$ 355,000
  3. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$105,065
  4. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  5. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  6. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  7. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="color: blue;">■</span>	On Schedule <span style="color: green;">■</span>	Behind Schedule <span style="color: yellow;">■</span>	Missed Milestone <span style="color: red;">■</span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide NCSP Manager report of activities. (TS1)		Jim Morman will likely run out of budget early second quarter. Plus up?
Q2	Provide NCSP Manager report of activities. (TS1)		
Q3	Provide NCSP Manager report of activities. (TS1)		
Q4	Provide NCSP Manager report of activities. (TS1)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- TS1 – CSSG – Support for the Criticality Safety Support Group
  - Implementing Self-Assessment recommendations
  - Charter Revision
  - Face to Face meeting in conjunction with ANS Winter Meeting
  - Regularly scheduled Teams Meetings
  - Preparation for Tasking 2022-03 LANL Site Visit

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

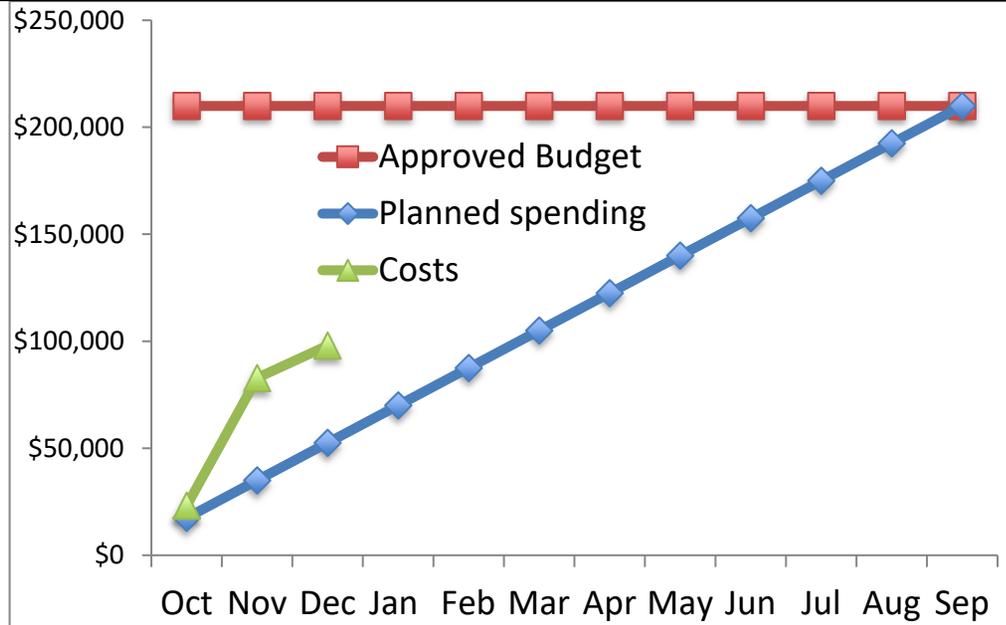
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS4 <b>M&amp;O Contractor Name:</b> LANL <b>Point of Contact Name:</b> Joetta Goda <b>Point of Contact Phone:</b> 505-667-2812	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$ 100,000
2. Approved FY 2023 Budget = \$ 110,000
3. Total FY23 Budget w/Carryover = \$ 210,000

	Spending	Commitments	Total
Q1	\$97,985	\$0	\$97,985
Q2			\$0
Q3			\$0
Q4			\$0

8. Projected carryover into FY 2024 = \$0
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="display: inline-block; width: 20px; height: 15px; background-color: blue; vertical-align: middle;"></span>	On Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: green; vertical-align: middle;"></span>	Behind Schedule <span style="display: inline-block; width: 20px; height: 15px; background-color: yellow; vertical-align: middle;"></span>	Missed Milestone <span style="display: inline-block; width: 20px; height: 15px; background-color: red; vertical-align: middle;"></span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide NCSP Manager report on succession planning efforts. (TS4)	<span style="display: inline-block; width: 20px; height: 15px; background-color: blue;"></span>	
Q2	Provide NCSP Manager report on succession planning efforts. (TS4)		
Q3	Provide NCSP Manager report on succession planning efforts. (TS4)		

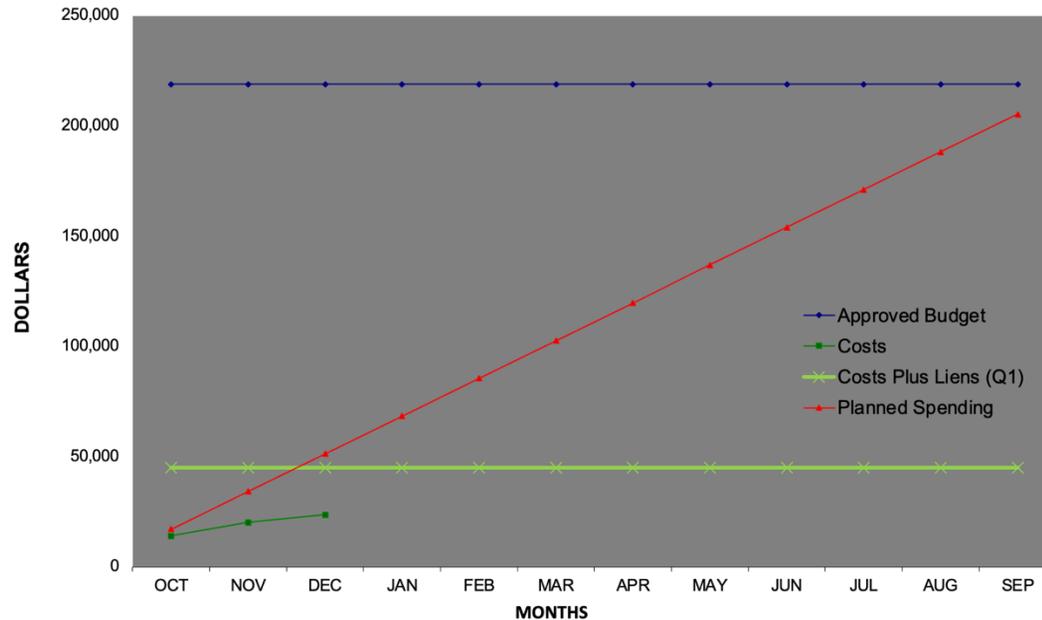
## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Provide NCSP Manager report on succession planning efforts. (TS4)		
<b>ACCOMPLISHMENTS</b>			
<ul style="list-style-type: none"> <li>• TS4 – AM, IE, ND Succession Planning             <ul style="list-style-type: none"> <li>○</li> </ul> </li> </ul>			
<b>PUBLICATIONS</b>			
<p>Any publications that have</p> <ul style="list-style-type: none"> <li>• Completed your institution’s review cycle during the quarter</li> </ul> <p>AND</p> <ul style="list-style-type: none"> <li>• Are publicly releasable</li> </ul> <p>Should be submitted to Marsha Henley, <a href="mailto:henleym@ornl.gov">henleym@ornl.gov</a> with your quarterly report.</p>			
<b>Quarter</b>	<b>Publication Reference</b>		
	<b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019		
Q1			
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS5 <b>M&amp;O Contractor Name:</b> LLNL <b>Point of Contact Name:</b> Catherine Percher <b>Point of Contact Phone:</b> (925) 579-4226	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 20, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$48,922
  2. Approved FY 2023 Budget = \$120,000
  3. Total FY23 budget w/Carryover = \$168,922
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$23,643
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$13,600
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete 	On Schedule 	Behind Schedule 	Missed Milestone 
--	---	---	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide a status report on succession planning efforts. (TS5)		
Q2	Provide a status report on succession planning efforts. (TS5)		
Q3	Provide a status report on succession planning efforts. (TS5)		

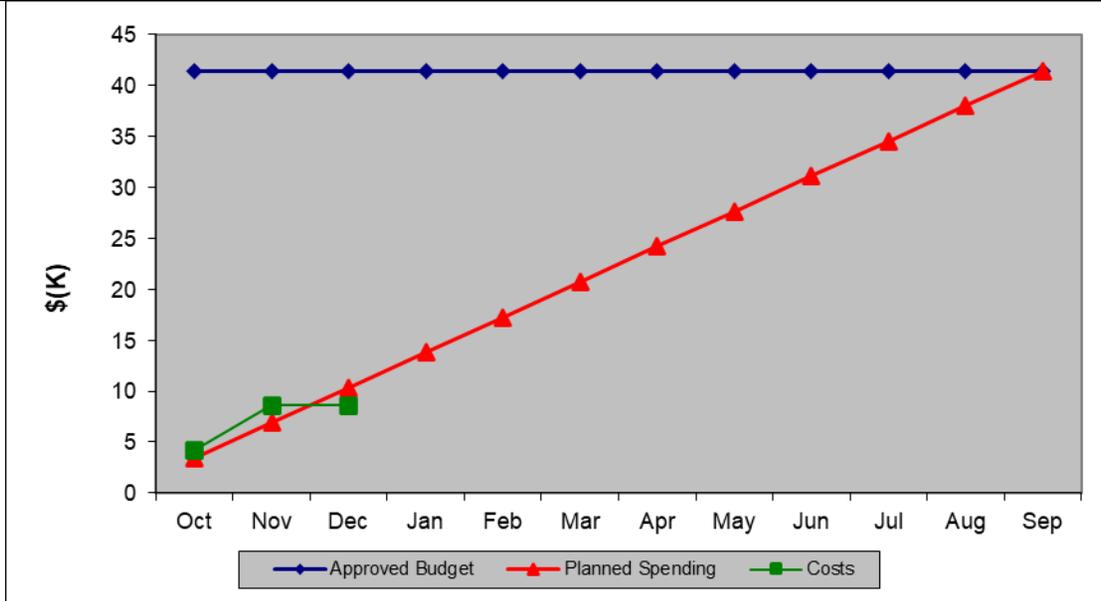
## NCSP Quarterly Progress Report (FY-2023 Q1)

Q4	Provide a status report on succession planning efforts. (TS5)		
<b>ACCOMPLISHMENTS</b>			
<ul style="list-style-type: none"> <li>• TS5 - AM, IE, ND Succession Planning             <ul style="list-style-type: none"> <li>○ R. Araj attended CSEWG in Nov 2022</li> <li>○ E. Aboud and J. Norris attended ANS Winter Meeting, November 2022</li> <li>○ D. Siefman attended IE monthly meeting, November and December 2022</li> </ul> </li> </ul>			
<b>PUBLICATIONS</b>			
<p>Any publications that have</p> <ul style="list-style-type: none"> <li>• Completed your institution's review cycle during the quarter AND</li> <li>• Are publicly releasable</li> </ul> <p>Should be submitted to Marsha Henley, <a href="mailto:henleym@ornl.gov">henleym@ornl.gov</a> with your quarterly report.</p>			
<b>Quarter</b>	<b>Publication Reference</b> <b>Example:</b> Author, "Title", LA-UR-18-27731, October 1, 2019		
Q1			
Q2			
Q3			
Q4			

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS9 <b>M&amp;O Contractor Name:</b> NNL <b>Point of Contact Name:</b> Mike Zerkle <b>Point of Contact Phone:</b> (412) 476-6188	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 27, 2023
---	--

## BUDGET



1. Carryover into FY 2023 = \$26K
  2. Approved FY 2023 Budget = \$15K
  3. Total FY 2023 Budget with Carryover = \$41K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$9K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px 10px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px 10px;"> </span>	Behind Schedule <span style="background-color: yellow; padding: 2px 10px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px 10px;"> </span>
--	--	---	---

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide status report on all NDAG chair activities (TS9)		
Q2	Provide status report on all NDAG chair activities (TS9)		
Q3	Provide status report on all NDAG chair activities (TS9)		
Q4	Provide status report on all NDAG chair activities (TS9)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- TS9 – Support for NDAG Chair activities
  - Participate in TEX-Hf Experiment (Oct 10-14, 2022)
  - Participate in NR/NCSP Program Review at RPI LINAC (Oct 18, 2022)
  - Participate in RNDWA-2022 Meeting (Oct 19-20, 2022)
  - Participate in NCSP IE Meeting (Oct 25-26, 2022)
  - Chair Nov 2022 NDAG Meeting (Oct 31, 2022)
  - Participate in 2022 CSEWG Meeting in capacity as Validation Chair (Oct 31-Nov 4, 2022)
  - Participate on several IER teams

### PUBLICATIONS

Any publications that have

- Completed your institution’s review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

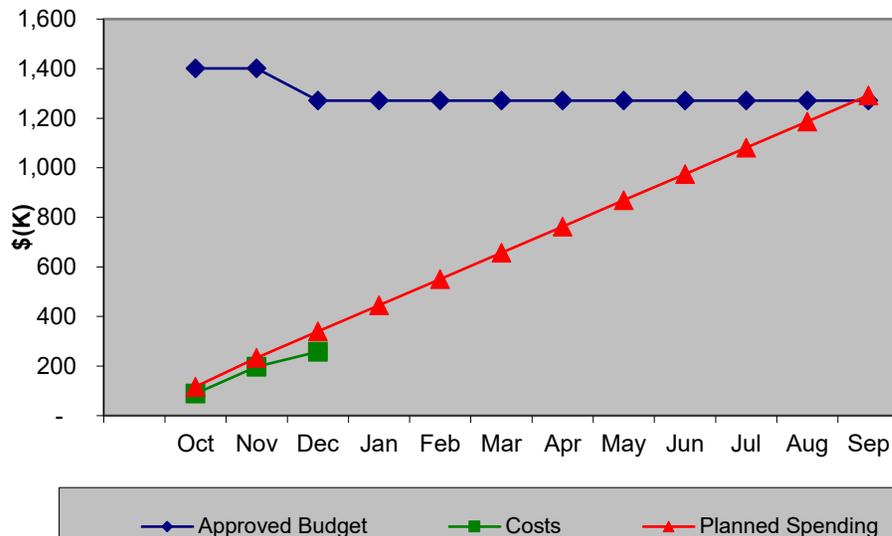
Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	D. Fritz, et al., “Total thermal neutron cross section measurements of yttrium hydride from 0.0005 - 3 eV,” <i>Annals of Nuclear Energy</i> , 181, 109475 (2023). <a href="https://doi.org/10.1016/j.anucene.2022.109475">https://doi.org/10.1016/j.anucene.2022.109475</a>  D. Fritz, et al., “Total thermal neutron cross section measurements of hydrogen dense polymers from 0.0005–20 eV,” <i>Annals of Nuclear Energy</i> , 183, 109651 (2023). <a href="https://doi.org/10.1016/j.anucene.2022.109651">https://doi.org/10.1016/j.anucene.2022.109651</a>
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS2, 7, 8, 13 <b>M&amp;O Contractor Name:</b> ORNL <b>Point of Contact Name:</b> Doug Bowen <b>Point of Contact Phone:</b> (865) 576-0315	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January 30, 2023
---	--

## BUDGET

**FY23 NCSP Technical Support**



1. Carryover into FY 2023 = \$391K
  2. Approved FY 2023 Budget = \$1010K
  3. Total FY 2023 Budget w/Carryover = \$1401K
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$258K
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
  9. TS budget decreased by \$130k in 12/2023 - \$30K recalled to HQ for G2 IER database work and \$100K transferred to NNSS to cover over-spending.
- NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)	<span style="background-color: blue; color: white; padding: 5px;"> </span>	

## NCSP Quarterly Progress Report (FY-2023 Q1)

<b>Q1</b>	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		
<b>Q1</b>	Provide NCSP Manager annual report of succession planning efforts (TS7)		
<b>Q1</b>	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
<b>Q1</b>	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		
<b>Q2</b>	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
<b>Q2</b>	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		
<b>Q2</b>	Provide NCSP Manager annual report of succession planning efforts (TS7)		
<b>Q2</b>	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
<b>Q2</b>	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		
<b>Q3</b>	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
<b>Q3</b>	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q3	Provide NCSP Manager annual report of succession planning efforts (TS7)		
Q3	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
Q3	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		
Q4	Maintain up-to-date spreadsheet of proposed tasks for NCSP Manager after the NCSP proposal review meeting and through the final task prioritization effort by the NCSP Management Team. (TS2)		
Q4	Manage 5-year plan development and maintenance and oversee the CEDT process and manage main 5-year plan and Integral Experiment Request Milestones. (TS2)		
Q4	Organize and lead the Budget Execution Meeting and assist NCSP Manager in finalization of approved tasks for next FY (TS2)		
Q4	Publish final Five-Year Plan. (TS2)		
Q4	Provide NCSP Manager annual report of succession planning efforts (TS7)		
Q4	Provide NCSP Manager a status report of progress on the new IER system in G2 (TS8)		
Q4	Provide the NCSP manager an update of NDA Technical Support Group and NDA Technical Infrastructure Project activities. (TS13)		

### ACCOMPLISHMENTS

- TS2 - Support for Lead Lab to Execute the NCSP
  - Published IE section of the 5-year plan in November 2022
  - Revised the Main 5-year plan twice in Q1
  - Working with LLNL (Pam Williams), updated and maintained the content of the NCSP website; Pam Williams stated that she only provides support to the NCSP website part time, which seems adequate. Some updates to the website have been very slow over the last several months, especially with the website complement for the Hand Calculation primer update (NCSET module 9).
  - Monitor Five-Year Plan progress and completed FY22Q4 quarterly reporting process working with site task managers

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Coordinate student registrants, facility logistics, and instructor personnel for the NCSP training and education program (Jan 23-Feb 3, 2023 2-week hands-on course)
- Discuss/prioritize NCSP Nuclear Data work identified in the NCSP 5-year plan working with the NCSP manager and NDAG chair/members
- Support telecons for task planning and execution, monthly integral experiment meetings, standing weekly meetings with the NCSP manager, and coordinate/execute meetings needed to execute the NCSP program.
- Attend virtually and in-person, meetings to support the NCSP as needed
- Support CSSG and CSCT as required
- TS7 - AM, ND Succession Planning
  - Succession planning funds were used in Q1 to mentor/training new staff in the NCS and ND groups at ORNL. These staff are new to the NCSP and funding was used specifically to support training in the area of Analytical methods (Reed, Karriem) and nuclear data evaluation work (Brown, Ramic)
- TS8 - NCSP Program Management Tools Development
  - Bowen/Miller worked with ORNL and Federal project managers supporting the NNSA G2 system to update and maintain the IER G2 database to support execution work for the integral experiments in progress at Sandia and NCERC. In FY23Q1, Bowen/Miller met virtually with NNSA to prioritize work related to bug fixes and modest enhancements to the G2 IER system based on input from those using the IER database system. As was the case in FY22, a portion of the G2 work redundant and issues introduced into the IER database via G2 system modifications to other, non-NCSP modules.
- TS13 - NDA Technical Support Group and NDA Technical Infrastructure Project
  - Lousteau/Bowen discussed another holdup accumulation workshop in FY23Q4 similar to what was held in FY22Q4. No other work was performed for TS13 in FY23Q1.

## PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter
- AND
- Are publicly releasable

Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	Douglas Bowen, "Brief Overview of the DOE/NNSA Nuclear Criticality Safety Program", 2022 ANS Winter Meeting and Technology Expo, Phoenix, AZ, Nov 2022.
Q2	
Q3	

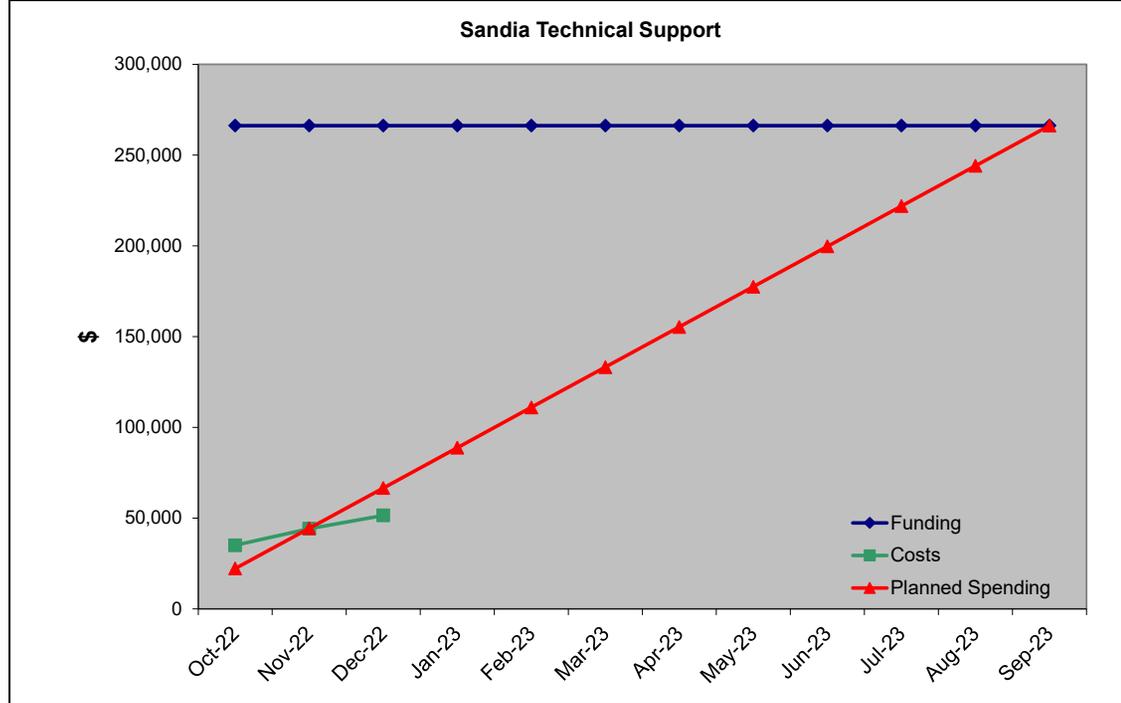
**NCSP Quarterly Progress Report (FY-2023 Q1)**

Q4	
----	--

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> TS3, 12 <b>M&amp;O Contractor Name:</b> Sandia National Laboratories (SNL) <b>Point of Contact Name:</b> Gary A. Harms <b>Point of Contact Phone:</b> (505)845-3244	<b>Reference:</b> DP0909010 <b>Date of Report:</b> January, 2023
---	---

## BUDGET



1. Carryover into FY 2023 = \$11,226
  2. Approved FY 2023 Budget = \$ 255,000
  3. Total FY 2023 Budget w/Carryover = \$266.226
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$51,463
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 2024 = \$
- NOTE:** Include commitments as part of spending

## MILESTONES

<b>STATUS (copy color code and paste below in 'STATUS' field)</b>			
Complete		On Schedule	
		Behind Schedule	
		Missed Milestone	
QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide NCSP Manager with report of succession planning efforts. (TS3)		
Q1	Provide the NCSP manager with a summary of NCSP CEEdT support (TS12)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

Q2	Provide NCSP Manager with report of succession planning efforts. (TS3)		
Q2	Provide the NCSP manager with a summary of NCSP CEdT support (TS12)		
Q3	Provide NCSP Manager with report of succession planning efforts. (TS3)		
Q3	Provide the NCSP manager with a summary of NCSP CEdT support (TS12)		
Q4	Provide NCSP Manager with report of succession planning efforts. (TS3)		
Q4	Provide the NCSP manager with a summary of NCSP CEdT support (TS12)		

### ACCOMPLISHMENTS

- TS3 – Support for Experimentalist Succession Planning
  - Matrixed employee performing as an experimenter.
  - Year-round Ph.D. student intern supporting the critical experiment team.
  - Both are actively participating in the NCS community by attending conferences and publishing papers.
- TS12 - NCSP C<sub>EdT</sub> Manager Support
 

Performed duties as the C<sub>EdT</sub> (IE) Manager in support of the IE program element.

  - Interacted with the site task mangers to track and assist progress on various IER milestones and MIHLs:
    - Run monthly IE meetings, distribute agenda and notes. Including an in person at Sandia with special tour.
    - Reported projected final milestone completions and IERs moved out to future FYs.
    - Processed BCR submissions (~6).
    - Reviewed reports and processed through approval in IER database (team members and NCSP manager) or ensured BCR submission.
    - Non-NCSP IERs tracked, and several new ones added.
    - Updated several team memberships per site leads direction
    - Facilitated discussions between LANL, LLNL and management team on use of NCSP materials for non-NCSP IERs.
  - Tracking progress/updates on experiments and MIHL items.
    - IER #517 CED-1 completed.
    - IER #532 (HF experiments) MIHL completed- 3B ongoing.
    - IER #557 CED-3B completed.
    - IER #574 CED-3A completed and experiments ongoing
  - Assisted IER team members with requested items, and participated in several different IER team meetings:
  - Interacted with NCSP Management Team, provided technical advice, and assisted on a broad scope of items (e.g., 5 year plans, TEX-2.0 meeting, IE priorities, MIHL lists items).

## NCSP Quarterly Progress Report (FY-2023 Q1)

- Worked in the IER database, assisted others with issues using database, work with G2 developers on database improvement items and issue resolution (scroll bar issues, lost document issues, etc.)
- Worked on TPR planning items.
- Minor progress on NCSP IE Manual Revision.

### PUBLICATIONS

Any publications that have

- Completed your institution's review cycle during the quarter  
AND
- Are publicly releasable

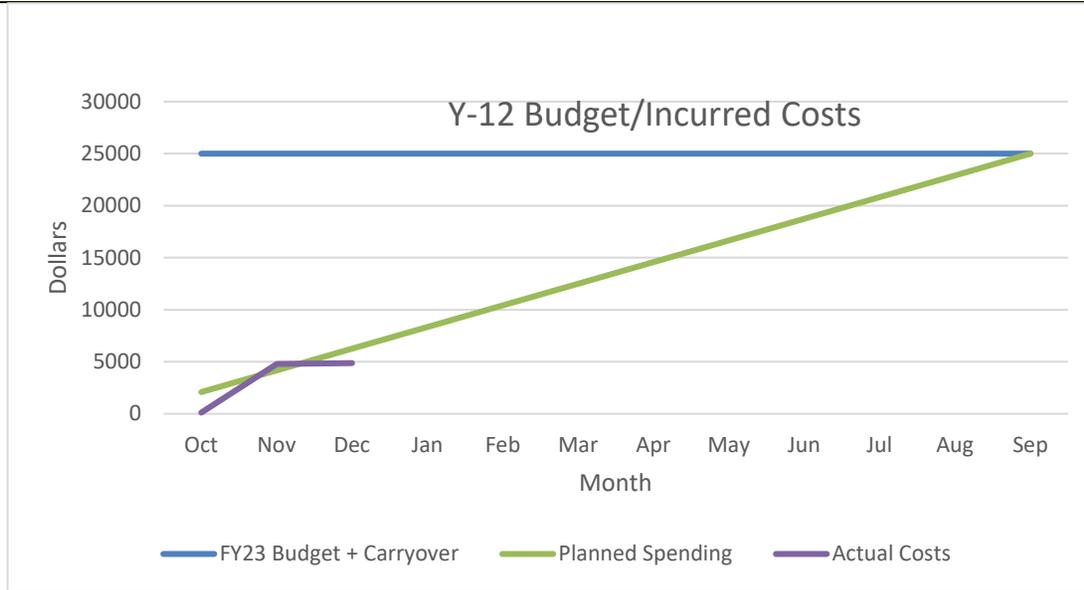
Should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov) with your quarterly report.

Quarter	Publication Reference Example: Author, "Title", LA-UR-18-27731, October 1, 2019
Q1	D.E. Ames, G.A. Harms and E.C. Lutz, "Design of Critical Experiments Targeting Epithermal Cross Sections of Tantalum," SAND2022-8816 C, presented at the 2022 ANS Winter Meeting, Nov. 13 – 17, 2022.
Q2	
Q3	
Q4	

# NCSP Quarterly Progress Report (FY-2023 Q1)

<b>NCSP Element and Subtask:</b> Technical Support & CSSG (TS) <b>M&amp;O Contractor Name:</b> Y12 <b>Point of Contact Name:</b> Kevin Reynolds <b>Point of Contact Phone:</b> (865) 241-9067	<b>Reference:</b> DP0909020 <b>Date of Report:</b> January 23, 2023
--	--

## BUDGET



1. Carryover into FY 2023 = \$0.0
  2. Approved FY 2023 Budget = \$25,000.00
  3. Total FY 2023 Budget w/Carryover = \$25,000.00
  4. Actual spending for 1<sup>st</sup> Quarter FY 2023 = \$4866.64
  5. Actual spending for 2<sup>nd</sup> Quarter FY 2023 = \$
  6. Actual spending for 3<sup>rd</sup> Quarter FY 2023 = \$
  7. Actual spending for 4<sup>th</sup> Quarter FY 2023 = \$
  8. Projected carryover into FY 20234= \$
- NOTE:** Include commitments as part of spending

## MILESTONES

**STATUS (copy color code and paste below in 'STATUS' field)**

Complete <span style="background-color: blue; color: white; padding: 2px;"> </span>	On Schedule <span style="background-color: green; color: white; padding: 2px;"> </span>	Behind Schedule <span style="background-color: yellow; color: black; padding: 2px;"> </span>	Missed Milestone <span style="background-color: red; color: white; padding: 2px;"> </span>
---	---	--	--

QUARTER	TASK	STATUS	ISSUES/PATH FORWARD
Q1	Provide the NCSP manager an update of Program activities (including CSSG)		
Q2	Provide the NCSP manager an update of Program activities (including CSSG)		
Q3	Provide the NCSP manager an update of Program activities (including CSSG)		
Q4	Provide the NCSP manager an update of Program activities (including CSSG)		

## NCSP Quarterly Progress Report (FY-2023 Q1)

### ACCOMPLISHMENTS

- Travel to BEM and NCERC Futures Meeting
- Attendance at several CSSG meetings (virtual or email votes).

### PUBLICATIONS

Any publications created during the quarter should be submitted to Marsha Henley, [henleym@ornl.gov](mailto:henleym@ornl.gov).

Quarter	Publication Reference (example)	Sent to NCSP? Yes/no	If no, status of submittal
Q1			
Q2			
Q3			
Q4			

## Summary of MCNP Classes in FY 2023 – Q1

M.E. Rising<sup>1</sup>, J.L. Alwin<sup>2</sup>

<sup>1</sup> Monte Carlo Codes (XCP-3), <sup>2</sup> Radiation Transport Applications (XCP-7), LANL

**FY2023 – Q1 classes are highlighted in red.**

### Total Students

- **FY2023 – Q1**            **82 students**        **(Intro, Intermediate, ~~VR~~, Criticality)**
- FY2023 – Q2:            TBD students    (Intermediate, Advanced, Safeguards)
- FY2023 – Q3:            TBD students    (Intro, Intermediate, Criticality, Safeguards)
- FY2023 – Q4:            TBD students    (Intro, ~~NJOY~~, Criticality)
- FY2023 – TOTAL thus far:    82 students

Due to COVID-19 and travel restrictions, many classes are currently being conducted online. Importantly, offering online classes has significantly increased class enrollment. We conducted our first on-site class at Y-12 in Q1 and are offering an in-person classes at LANL beginning in June

### Classes sponsored by DOE-NNSA-NCSP

- **Criticality Calculations with MCNP6 (LANL-AM1)**
  - **November 7-10, 2022**            **in-person @ Y12**            **15 students**

MCNP criticality class for NCS & reactor physics practitioners, with focus on best practices. Includes 1 day on NCS validation using MCNP6-Whisper. NCS participants at DOE sites do not pay registration fees.
- **Criticality Calculations with MCNP6 (LANL-AM1)**
  - **June 19 - 23, 2023**            **in-person @ LANL**            **TBD Students**

MCNP criticality class for NCS & reactor physics practitioners, with focus on best practices. Includes 1 day on NCS validation using MCNP6-Whisper.
- **Sensitivity-Uncertainty Tools & Practices for NCS Validation (LANL-TE4)**
  - **TBD**                                    **TBD**                                    **TBD students**

Joint LANL & ORNL effort, covering background material and specific usage of MCNP6-Whisper and SCALE-KENO-TSUNAMI-TSURFER. D. Bowen coordinates scheduling at DOE sites.

**Other Classes** - supported by student registration fees.

- **Introduction to MCNP6**            (includes 1/2 day on criticality calculations, without NCS validation & Whisper)
  - **Oct 24 – 28, 2022**            **online**                                **41 students**
  - **Jun 5 – 9, 2023**                **online**                                **TBD students**
  - **Aug 21 – 25, 2023**            **in-person, LANL**                **TBD students**
- **Intermediate MCNP6**
  - **Oct 3 – 7, 2022**                **online**                                **26 students**
  - **Feb 27 – Mar 3, 2023**        **OECD-NEA**                        **TBD students**
  - **Apr 10–14, 2023**                **online**                                **TBD students**
- **Advanced MCNP6 Features & Utilities**
  - **Mar 6 – 11, 2023**                **OECD-NEA**                        **TBD students**
- **NJOY**
  - **Aug 28 – Sep 1, 2023**        **in-person, LANL**                **TBD students**

**2023 Q1 – SCALE Training Courses Report for the Nuclear Criticality Safety Program**

<b><u>Class Name4</u></b>	SCALE/ORIGEN Standalone Fuel Depletion, Activation, and Source Term Analysis
<b><u>Class Dates</u></b>	October 3–7, 2022
<b><u>Location</u></b>	Oak Ridge National Laboratory, Oak Ridge, TN
<b><u>Number of Attendees</u></b>	19
<b><u>Short Description</u></b>	<p>This is a hands-on class that covers the use of ORIGEN for isotopic depletion, decay, decay heat, and radiation source-terms calculations. The course features the use of the Fulcrum consolidated SCALE graphical interface and its' plotting capabilities for displaying nuclear data and results. Participants will learn about ORIGEN's capabilities and nuclear data, how to generate ORIGEN libraries, and how to use ORIGEN for activation, spent fuel, and nuclear safeguards applications. This class introduces the ORIGAMI tool for convenient characterization of spent nuclear fuel with radially and axially varying burnup. Advanced applications including simulation of chemical processing, continuous feed and removal are also covered.</p> <p>No prior knowledge of SCALE is required.</p>

<b><u>Class Name</u></b>	SCALE Modeling and Simulation for Nuclide Inventory and Decay Heat in LWR Spent Nuclear Fuel
<b><u>Class Dates</u></b>	October 10–14, 2022
<b><u>Location</u></b>	Oak Ridge National Laboratory, Oak Ridge, TN
<b><u>Number of Attendees</u></b>	12
<b><u>Short Description</u></b>	<p>This is a hands-on training course that will provide instruction on best practices for modeling and simulations with SCALE of nuclide inventories and decay heat in LWR spent nuclear fuel. The course will summarize the underlying modules and sequences in SCALE that enable these types of simulations, including ORIGEN, ORIGAMI, TRITON. SCALE's graphical user interface, Fulcrum, designed to create, edit, validate, and visualize SCALE input, output, and data files, will be used throughout the course.</p> <p>Participants will learn how to apply different approaches for nuclide inventory and decay heat calculations for representative LWR fuel assemblies. That will include: how to generate ORIGEN reactor libraries with TRITON, how to perform rapid depletion and decay calculations with ORIGAMI for LWR fuel assemblies with assembly average or axially-varying burnup, how to perform ORIGEN decay simulations over a cooling time of interest. Participants will also learn how to use the Sampler uncertainty quantification tool in SCALE to estimate uncertainties in calculated nuclide inventories and decay heat that are due to uncertainties in input modeling data (geometry, materials, operating parameters).</p> <p>No prior knowledge of SCALE is required.</p>

<b><u>Class Name</u></b>	IFE SCALE Training Part III: Radiation Transport and Shielding Training
<b><u>Class Dates</u></b>	October 17–20, 2022
<b><u>Location</u></b>	Virtual - Oak Ridge National Laboratory, Oak Ridge, TN
<b><u>Number of Attendees</u></b>	10
<b><u>Short Description</u></b>	<p>This training section will focus on radiation transport and shielding analyses. It will include the following topics:</p> <ul style="list-style-type: none"> <li>• Fixed-source neutron and photon field calculations using both CE and MG physics</li> <li>• Variance reduction techniques</li> <li>• Definition of tally responses, such as reaction rates and dose</li> <li>• Definition of sources, including spent fuel/activated materials</li> <li>• Integrated criticality accident alarm system (CAAS) analysis</li> </ul> <p>The main SCALE sequence for this section is Monaco with Automated Variance Reduction using Importance Calculations (MAVRIC), which is the SCALE shielding sequence with 3D automated variance reduction for deep-penetration problems. MAVRIC uses the Monaco 3D fixed-source MC code for shielding analysis. It also uses the SCALE Standard Composition Library and the SCALE Generalized Geometry Package (SGGP), which are also used in KENOVI. The Consistent Adjoint Driven Importance Sampling (CADIS) methodology for optimizing a tally employs an adjoint calculation from the Denovo 3D deterministic code to create both an importance map for weight windows and a biased source distribution. The Forward-Weighted CADIS (FW-CADIS) extension to the CADIS method, which uses both forward and adjoint discrete ordinates calculations, enables optimization of multiple point tallies or mesh tallies.</p> <p>Criticality Safety Training (or equivalent) experience is required, particularly the composition and geometry specification.</p>

<b><u>Class Name</u></b>	SCALE Criticality Safety Calculations
<b><u>Class Dates</u></b>	October 24–28, 2022
<b><u>Location</u></b>	Oak Ridge National Laboratory, Oak Ridge, TN
<b><u>Number of Attendees</u></b>	19
<b><u>Short Description</u></b>	<p>This course provides instruction on the use of the KENO Monte Carlo codes for criticality safety calculations and is appropriate for beginning through advanced users. KENO V.a is a fast and easy-to-use code that allows users to build complex geometry models using basic geometrical bodies such as cuboids, spheres, cylinders, hemispheres, and hemicylinders. KENO-VI is a 3-D generalized geometry Monte Carlo code that allows for versatile modeling of complex geometries. Both versions of KENO provide convenient, efficient methods for modeling repeated and nested geometry configurations such as lattices. Both versions of KENO use ENDF/B-VII.0 or ENDF/B-VII.1 cross-section data distributed with SCALE to perform either continuous energy (CE) or multigroup (MG) calculations. KENO includes a 2D color plotting capability and produces easy-to-navigate HTML output. This class uses the Fulcrum user interface for interactive model setup, visualization, computation, and output review. The KENO3D tool is still used in SCALE 6.2 for 3-D visualization. Instruction is also provided on the SCALE material input and resonance self-shielding capabilities and Fulcrum capabilities for visualizing fluxes, reaction rates, and cross-section data.</p>

No prior knowledge of SCALE is required.

<b><u>Class Name</u></b>	SCALE Criticality Safety and Radiation Shielding
<b><u>Class Dates</u></b>	November 14–18, 2022
<b><u>Location</u></b>	NEA Data Bank, Boulogne-Billancourt, France
<b><u>Number of Attendees</u></b>	13
<b><u>Short Description</u></b>	<p>This course provides instruction on the use of the KENO-VI Monte Carlo code for criticality safety calculations and the MAVRIC (Monaco with Automated Variance Reduction using Importance Calculations) shielding sequence with 3-D automated variance reduction for deep-penetration problems. KENO-VI is a 3D eigenvalue Monte Carlo code for criticality safety and Monaco is a 3D fixed-source Monte Carlo code for shielding analysis. Both codes use the SCALE Standard Composition Library and the SCALE Generalized Geometry Package (SGGP), which allows for versatile modeling of complex geometries and provides convenient, efficient methods for modeling repeated and nested geometry configurations such as lattices. The MAVRIC sequence is based on the CADIS (Consistent Adjoint Driven Importance Sampling) methodology. For a given tally in a Monte Carlo calculation that the user wants to optimize, the CADIS method uses the result of an adjoint calculation from the Denovo 3D deterministic code to create both an importance map for weight windows and a biased source distribution. MAVRIC is completely automated in that from a single user input, it creates the cross sections (forward and adjoint), computes the adjoint fluxes, creates the importance map and biased source, and then executes Monaco. An extension to the CADIS method using both forward and adjoint discrete ordinates calculations (FW-CADIS) is included in MAVRIC so that multiple point tallies or mesh tallies over large areas can be optimized (calculated with roughly the same relative uncertainty). Both KENO and Monaco use ENDF/B-VII.0 or ENDF/B-VII.1 cross-section data distributed with SCALE to perform continuous energy (CE) or multigroup (MG) calculations. Both codes can also be used with the Fulcrum consolidated SCALE user interface and KENO3D for interactive model setup, computation, output review, and 3-D visualization. Instruction is also provided on the SCALE material input and resonance self-shielding capabilities and the data visualization capabilities within Fulcrum for visualizing fluxes, reaction rates, and cross-section data as well as mesh tallies. KENO-VI and MAVRIC can be applied together to perform an integrated criticality accident alarm system (CAAS) analysis.</p> <p>No prior knowledge of SCALE is required.</p>

# STATUS REPORT

## on the

### International Collaboration with the Atomic Weapons Establishment (AWE)

Reference			AWE Contributions and POCs			
AWE Reference	Task Description	NCSP Reference	FY2022 AWE Contribution	AWE Technical POC	Collaborator POC	DOE Lab
<b>Analytical Methods</b>						
AWE-AM1	Slide rule update	ORNL-AM6 LLNL-AM3 IRSN-AM5	Perform calculations; attend meetings; review analysis and reports	R. JONES	M. DULUC M. DUPONT/C. CELIK D. HEINRICHS	IRSN ORNL LLNL
AWE effort currently on hold due to lack of resource.						
<b>INTEGRAL EXPERIMENTS</b>						
AWE-IE2	Development of Passive Neutron Spectrometer (PNS)	LLNL-IE1	Fully commission TLD version of the PNS; Perform validation irradiations at NPL; develop unfolding tools for directionality	P. ANGUS	D. STONE	ORNL
Passive Neutron Spectrometer has been developed and deployed alongside LLNL sphere et al at the Godiva intercomparison in both gold and TLD configurations. Discussions have now been recently held regarding presentations regarding the SPECTRA-UF unfolding code and access for international labs.						
AWE-IE3 <b>IER 406</b>	Cf-252 CAAS benchmark	LLNL-IE1	Perform/support PNS(TLD) measurements with a shadow cone	P. ANGUS	D. HEINRICHS F. TROMPIER	LLNL IRSN
Dependent on completion of IE2.						
AWE-IE5	Correction factor for dosimetry linked to orientation of the victim	LLNL-IE1	Participate in experiment design; use PNS data to determine directional components of neutron fields (Godiva, Flattop, LLNL RCL)	P. ANGUS	D. STONE F. TROMPIER	LLNL IRSN
Dependent on completion of IE2 (unfolding tools for directionality). Linked with IE11 (International inter-comparison)						
AWE-IE6	ICSBEP shielding benchmark for shipping containers	Proposal FY20-25 (Low priority Experiment for FY2022)	Participate in experiment design; PNS(TLD) could be deployed as primary measurement device AWE to do some preliminary design	P. ANGUS	S. KIM	LLNL
Not started due to long lead time (2023) and dependence on PNS availability (see IE2). Scope definition required.						
AWE-IE7 <b>IER 153</b>	Measure fission neutron spectrum shape using threshold activation detectors	LANL-IE3	Provide input into foil selection; use AWE unfolding codes to provide independent analysis.	P. ANGUS	T. CUTLER J. GODA	LANL
Contact made regarding AWE involvement; would like to contribute regarding providing access to our unfolding tools to increase user base. Discussions being held with UKAEA to set up a session to discuss the code and our applications.						

Reference			AWE Contributions and POCs			
AWE Reference	Task Description	NCSP Reference	FY2022 AWE Contribution	AWE Technical POC	Collaborator POC	DOE Lab
AWE-IE8	Diagnostic development for measurement of correlated leakage radiations	LLNL-IE1	A feasibility study is being developed at AWE to ascertain suitable counting scenarios and methods. An experimental design will then be produced in the following years based upon the outcomes of this study	N. KELSALL	D. HEINRICHS	LLNL
An internal AWE report has been issued summarizing the outcome of the fast neutron liquid scintillation trials conducted at the DAF in 2019. This will inform future measurement aspirations but the schedule for measurement campaigns is currently on hold.						
AWE-IE9	AWE/LLNL NCT 5 year measurement campaign	LLNL-IE1	Participate in experiment design, measurements and reporting	N. KELSALL	D. HEINRICHS	LLNL
DAF measurement campaign undertaken on bulk metal systems during November 2022.						
AWE-IE10	NAD Research & Development	LLNL-IE1	Develop prototypes, participate in design, execution and reporting of dosimetry experiments	P. ANGUS	F. TROMPIER	LLNL
No progress to date. Potentially use IE11 as an opportunity to compare & test any new instrumentation.						
AWE-IE11 (IER 538)	NAD Exercise	LLNL-IE1	Produce experiment design; participate in exercise; produce final report. Repeat even years.	P. ANGUS	D. STONE	LLNL
Next international inter-comparison is anticipated in 2024.						
AWE-IE12	CIDAAS testing	Proposal FY19-20	Deploy AWE CIDAAS for test irradiation. Repeat odd years as needed	T. BIRKETT	D. HEINRICHS D. STONE	LLNL
Next test planned for 2023.						
AWE-IE13	Characterization of AFRR1 TRIGA reactor radiation field AWE will provide onsite measurement	LLNL-IE1 SNL-IE1ST2	Provide support to experiment design	P. ANGUS	A. ROMANYUKHA G. HARMS	LLNL SNL
Due to visit AFRR1 in February to discuss experimental plan with participants. Introductory discussion related to previously produced AWE experimental plan held on 13 <sup>th</sup> January 2022						
<b>INFORMATION PRESERVATION AND DISSEMINATION</b>						
AWE-IPD1	Conduct benchmark evaluations of legacy IEU integral experiments.	LLNL-IPD1	Assess feasibility of sponsoring PhD; determine availability of data.	R. JONES	D. HEINRICHS	LLNL
Considered unlikely to make any material progress.						
<b>TRAINING AND EDUCATION</b>						
AWE-TE1	Hands-on criticality safety training	ORNL-TE1	AWE personnel to attend training course	R. JONES	D. BOWEN	ORNL
No AWE personnel attended courses during the reporting period. Four criticality assessors are expected to attend courses in the next quarter.						



## APPENDIX E: International Collaboration with the Institut de Radioprotection et de Sûreté Nucléaire (IRSN) for FY2023

IRSN has an active and growing program of collaboration with the NCSP that aims to underpin and enhance IRSN's nuclear criticality safety. IRSN will provide its expertise and capabilities to support the NCSP's mission and vision so that the collaboration is mutually beneficial to both organizations.

REFERENCE		IRSN Contribution / POC				
IRSN Reference	Task Title	DOE Reference	FY 2022 IRSN Contribution	IRSN Technical POC	DOE Technical POC	DOE LAB
<b>ANALYTICAL METHODS</b>						
IRSN-AM5	Update of the slide rule	ORNL-AM6 LLNL-AM3 AWE-AM1	Contribution to final report	M. DULUC	D. BOWEN D. HEINRICHS R. JONES	ORNL LLNL AWE
<b>Q1 status</b>						
A meeting is going to be scheduled to identify work to be done this year to close the action.						
IRSN-AM8	Analytical Methods Working Group	LANL-AM1 ORNL-AM2 LLNL-AM3	IRSN participation to NCSP Analytical Methods Working Group, NDAG meeting, and TPR meeting	S. PIGNET	J. ALWIN B.J. MARSHALL D. HEINRICHS	NCSP
<b>Q1 status</b>						
Participation of IRSN to TPR meeting. Needs to set up an intercomparison between MACSENS and TSUNAMI/TSURFER for bias estimation.						
IRSN-AM9	Cross sections processing validation	ORNL-AM3	AMPX training - Development of an interface between GAIA and AMPX and test interface capabilities.	R. ICHOU	A. HOLCOMB D. BOWEN	ORNL
<b>Q1 status</b>						
First tests of covariance matrixes generation with in-house code GAIA, comparison with AMPX to be done.						
IRSN-AM13	Benchmark intercomparison study	(FY21 5 YP) LLNL-AM5 ORNL-AM10 LANL-AM5 Y12-AM1 FY22-02	Definition of common set of developed benchmark models. Extension 2022-2024	N. LECLAIRE	D. HEINRICHS B.J. MARSHALL J. ALWIN	LLNL ORNL LANL

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	Task Title	DOE Reference	FY 2022 IRSN Contribution	IRSN Technical POC	DOE Technical POC	DOE LAB
<b>Q1 status</b>						
The report on the intercomparison study on keff has been sent on January 19 <sup>th</sup> to the NCSP partners.						
<b>INTEGRAL EXPERIMENTS</b>						
<b>IRSN-IE25 IER 296</b>	TEX-MOX	LLNL-IE1	Leading the design, supplying materials if needed. In 2023, working on CED2	M. BROVCHENKO	C. PERCHER	LLNL
<b>Q1 status</b>						
CED-1 report sent to CED Team. Mechanical/thermal mock-up to demonstrate the heat removal design shared with the CED Team during the meeting on 12 <sup>th</sup> January 2023. Inputs from LANL calculations. New meeting scheduled during TPR week.						
<b>IRSN-IE30 IER 538</b>	Full dosimetry exercise around GODIVA	LLNL-IE1	Participation to the experiment in 2022. Provide support for CED4a in 2023.	F. TROMPIER	D. HEINRICHS	LLNL AWE
<b>Q1 status</b>						
IRSN's results from the last exercise (Godiva IV, august 2022) have been sent on time. Note that this exercise was not a "full exercise". Depending on the visit at AFFRI, it could be also foreseen to organize it at AFFRI and to advantage of the cytogenetic laboratory available at AFFRI.						
<b>IRSN-IE30 IER 484</b>	Dosimetry collaboration with Armed Forces Radiobiology Research Institute (AFRRI)	LLNL-IE1 AWE IE13	Participation to the characterization work in 2023.	F. TROMPIER	D. HEINRICHS	LLNL AWE
<b>Q1 status</b>						
IRSN participation to visit AFFRI facility (scheduled early 2023) in order to participate to preliminary measurements and discussions on the organization of the next national US exercise						

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	Task Title	DOE Reference	FY 2022 IRSN Contribution	IRSN Technical POC	DOE Technical POC	DOE LAB
<b>IRSN-IE46 IER 518</b>	High Multiplication Subcritical (Multiplicity) Benchmark Experiments	LLNL-IE1 SNL-IE1 LANL-IE3	Review of CED4a.	W. MONANGE	G. HARMS/C. PERCHER	SNL/LLNL
<b>Q1 status</b> Discussion about the submission of an abstract at ICNC						
<b>IRSN-IE51 IER 479</b>	TEX HEU with poly at very low temperatures	LLNL-IE1	Contribution to design, supplying materials if needed, participation to the experiment	J. BEZ	C. PERCHER	LLNL
<b>Q1 status</b> Discussion about LLNL's abstracts for ICNC and about the technical delays for thermal surrogate testings						
<b>IRSN-IE53 IER 551</b>	True Intermediate Energy System with Pu-239 and Pu-240	LANL IE3 (Funded as low priority IER for FY2022)	Contribution to design and CED-1 report	M. BROVCHENKO	J. GODA D. BOWEN	LANL ORNL
<b>Q1 status</b> No update						
<b>IRSN-IE7 IER 305</b>	Critical Experiments with UO2 Rods and Molybdenum foils	SNL-IE1	Contribution to ICSBEP evaluation of baseline experiments.	N. LECLAIRE	G. HARMS	SNL
<b>Q1 status</b> IRSN started reviewing of parts of CED-4 report (ICSBEP evaluation). To be continued as soon as new parts are available.						
<b>IRSN-IE11 IER 532</b>	TEX-Hf experiments	LLNL-IE1	Contribution to the analysis of the experiments (CED-4)	M. BROVCHENKO	C. PERCHER	LLNL
<b>Q1 status</b> No update						
<b>IRSN-IE27 IER 498</b>	GODIVA CAAS benchmark	ORNL-IE1	Participation to the experiments in 2024	F. TROMPIER	D. BOWEN R. CUMBERLAND	ORNL

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	Task Title	DOE Reference	FY 2022 IRSN Contribution	IRSN Technical POC	DOE Technical POC	DOE LAB
<b>Q1 status</b>						
No update						
<b>IRSN-IE45 IER 517</b>	Integral Experiments for Validation of Molybdenum Neutron Cross Sections on the whole energy spectrum	LANL-IE3	Participation in experiments design, external review of CED1	N. LECLAIRE	N. THOMSON	LANL
<b>Q1 status</b>						
CED1 External review CED1 completed in October 2022						
<b>IRSN-IE41 IER 499</b>	Thermal/Epithermal Experiments (TEX) with Chlorine	LLNL-IE1	Participation to the experiments.	M. BROVCHENKO	C. PERCHER	LLNL
<b>Q1 status</b>						
LLNL shared the CED 2 report with IRSN.						
<b>IRSN-IE34 IER 488</b>	MUSIC (HEU) critical and Subcritical measurements.	LANL-IE3	Analysis of results, contribution to CED4	J-B. CLAVEL	J. HUTCHINSON	LANL
<b>Q1 status</b>						
ICSBEP benchmark received from LANL early January. External review in progress, to be completed for February 15 <sup>th</sup> , schedule is very tight.						
<b>IRSN-IE47 IER 537</b>	Copper Critical Experiment	LANL-IE3	Participation to the experiments	J-B. CLAVEL	T. CUTLER K. AMUNDSON	LANL
<b>Q1 status</b>						
No update						
<b>IRSN-IE56 IER 578</b>	Jupiter ZPPR high 240 plates benchmark report	LANL-IE3	Independent review of the ICSBEP evaluation.	J. BEZ	J. GODA	LANL
<b>Q1 status</b>						
No update, waiting for LANL inputs						
<b>INFORMATION PRESERVATION AND DISSEMINATION</b>						
<b>IRSN-IPD1</b>	ICSBEP reviewing	LLNL-IPD1	IRSN ICSBEP reviewing tasks are reported in the IE tasks	S. PIGNET	D. HEINRICHS	LLNL

	REFERENCE		IRSN Contribution / POC			
IRSN Reference	Task Title	DOE Reference	FY 2022 IRSN Contribution	IRSN Technical POC	DOE Technical POC	DOE LAB
IRSN-IPD2	LFE Database	ORNL-IPD4	Sharing experience on French LFE database	M. DULUC		ORNL
<b>Q1 status</b> ICNC Abstract on IRSN LFE database to be submitted.						
<b>NUCLEAR DATA</b>						
<b>TRAINING AND EDUCATION</b>						
IRSN-TE1	Hands-on criticality safety training	ORNL-TE1 LANL-TE3 LLNL-TE1 SNL-TE1	IRSN attendance to NCSP classes. Possible lectures by IRSN working with NCSP training and education coordinator.	S. PIGNET	D. BOWEN	NCSP
<b>Q1 status</b> Participation of 2 IRSN staff on August session.						